MatchZoo Documentation

Release 1.0

MatchZoo

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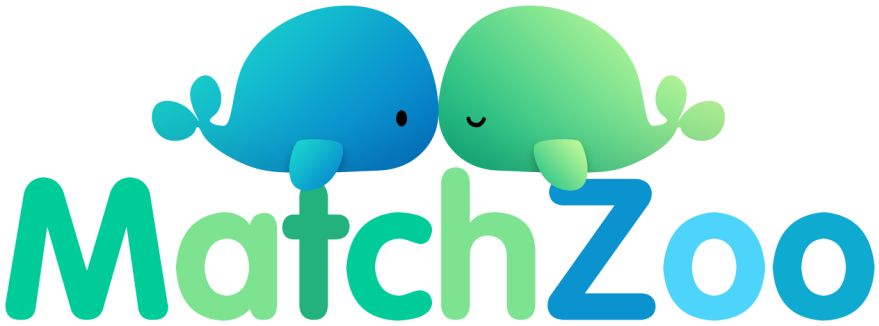
Contents:



MatchZoo is a toolkit for text matching. It was developed with a focus on facilitating the designing, comparing and sharing of deep text matching models. There are a number of deep matching methods, such as DRMM, MatchPyramid, MV-LSTM, aNMM, DUET, ARC-I, ARC-II, DSSM, and CDSSM, designed with a unified interface. Potential tasks related to MatchZoo include document retrieval, question answering, conversational response ranking, paraphrase identification, etc. We are always happy to receive any code contributions, suggestions, comments from all our MatchZoo users.

CHAPTER 1

matchzoo

CHAPTER 2

MatchZoo Model Reference

2.1 DenseBaseline

2.1.1 Model Documentation

A simple densely connected baseline model.

Examples:

```
>>> model = DenseBaseline()
>>> model.params['mlp_num_layers'] = 2
>>> model.params['mlp_num_units'] = 300
>>> model.params['mlp_num_fan_out'] = 128
>>> model.params['mlp_activation_func'] = 'relu'
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

2.1.2 Model Hyper Parameters

	Name	Description	Default Value	Default Hyper-Space
0	model_class	Model class. Used internally for save/load. Changing this may cause unexpected behaviors.	<class 'matchzoo.models.dense_baseline.DenseBaseline'>	
1	task	Decides model output shape, loss, and metrics.		
2	out_activation_func	Activation function used in output layer.		
3	with_embedding	A flag used help *auto* module. Shouldn't be changed.	True	
4	embedding	FloatTensor containing weights for the Embedding.		
5	embedding_input_dim	Usually equals vocab size + 1. Should be set manually.		
6	embedding_output_dim	Should be set manually.		
7	padding_idx	If given, pads the output with the embedding vector atpadding_idx (initialized to zeros) whenever it encounterthe index.	0	
8	embedding_freeze	*True* to freeze embedding layer training, *False* to enable embedding parameters.	False	
9	with_multi_layer_perceptron	A flag of whether a multiple layer perceptron is used. Shouldn't be changed.	True	
10	mlp_num_units	Number of units in first *mlp_num_layers* layers.	256	quantitative uniform distribution in [16, 512), with a step size of 1
11	mlp_num_layers	Number of layers of the multiple layer percetron.	3	quantitative uniform distribution in [1, 5), with a step size of 1
12	mlp_num_fan_out	Number of units of the layer that connects the multiple layer percetron and the output.	64	quantitative uniform distribution in [4, 128), with a step size of 4
13	mlp_activation_func	Activation function used in the multiple layer perceptron.	relu	

2.2 DSSM

2.2.1 Model Documentation

Deep structured semantic model.

Examples:

```
>>> model = DSSM()
>>> model.params['mlp_num_layers'] = 3
>>> model.params['mlp_num_units'] = 300
>>> model.params['mlp_num_fan_out'] = 128
>>> model.params['mlp_activation_func'] = 'relu'
```

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```
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

2.2.2 Model Hyper Parameters

	Name	Description	Default Value	Default Hyper-Space
0	model_class	Model class. Used internally for save/load. Changing this may cause unexpected behaviors.	<class 'matchzoo.models.dssm.DSSM'>	
1	task	Decides model output shape, loss, and metrics.		
2	out_activation_func	Activation function used in output layer.		
3	with_multi_layer_perceptron	A flag of whether a multiple layer perceptron is used. Shouldn't be changed.	True	
4	mlp_num_units	Number of units in first *mlp_num_layers* layers.	128	quantitative uniform distribution in [8, 256), with a step size of 8
5	mlp_num_layers	Number of layers of the multiple layer percetron.	3	quantitative uniform distribution in [1, 6), with a step size of 1
6	mlp_num_fan_out	Number of units of the layer that connects the multiple layer percetron and the output.	64	quantitative uniform distribution in [4, 128), with a step size of 4
7	mlp_activation_func	Activation function used in the multiple layer perceptron.	relu	
8	vocab_size	Size of vocabulary.	419	

2.3 CDSSM

2.3.1 Model Documentation

CDSSM Model implementation.

Learning Semantic Representations Using Convolutional Neural Networks for Web Search. (2014a) A Latent Semantic Model with Convolutional-Pooling Structure for Information Retrieval. (2014b)

Examples:

```
>>> import matchzoo as mz
>>> model = CDSSM()
>>> model.params['task'] = mz.tasks.Ranking()
>>> model.params['vocab_size'] = 4
>>> model.params['filters'] =  32
>>> model.params['kernel_size'] = 3
>>> model.params['conv_activation_func'] = 'relu'
>>> model.build()
```

2.3.2 Model Hyper Parameters

	Name	Description	Default Value	Default Hyper-Space
0	model_class	Model class. Used internally for save/load. Changing this may cause unexpected behaviors.	<class 'matchzoo.models.cdssm.CDSSM'>	
1	task	Decides model output shape, loss, and metrics.		
2	out_activation_func	Activation function used in output layer.		
3	with_multi_layer_perceptron	A flag of whether a multiple layer perceptron is used. Shouldn't be changed.	True	
4	mlp_num_units	Number of units in first *mlp_num_layers* layers.	128	quantitative uniform distribution in [8, 256), with a step size of 8
5	mlp_num_layers	Number of layers of the multiple layer percetron.	3	quantitative uniform distribution in [1, 6), with a step size of 1
6	mlp_num_fan_out	Number of units of the layer that connects the multiple layer percetron and the output.	64	quantitative uniform distribution in [4, 128), with a step size of 4
7	mlp_activation_func	Activation function used in the multiple layer perceptron.	relu	
8	vocab_size	Size of vocabulary.	419	
9	filters	Number of filters in the 1D convolution layer.	3	
10	kernel_size	Number of kernel size in the 1D convolution layer.	3	
11	conv_activation_func	Activation function in the convolution layer.	relu	
12	dropout_rate	The dropout rate.	0.3	

2.4 DRMM

2.4.1 Model Documentation

DRMM Model.

Examples:

```
>>> model = DRMM()
>>> model.params['mlp_num_layers'] = 1
>>> model.params['mlp_num_units'] = 5
>>> model.params['mlp_num_fan_out'] = 1
>>> model.params['mlp_activation_func'] = 'tanh'
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

2.4.2 Model Hyper Parameters

	Name	Description	Default Value	Default Hyper-Space
0	model_class	Model class. Used internally for save/load. Changing this may cause unexpected behaviors.	<class 'matchzoo.models.drmm.DRMM'>	
1	task	Decides model output shape, loss, and metrics.		
2	out_activation_func	Activation function used in output layer.		
3	with_embedding	A flag used help *auto* module. Shouldn't be changed.	True	
4	embedding	FloatTensor containing weights for the Embedding.		
5	embedding_input_dim	Usually equals vocab size + 1. Should be set manually.		
6	embedding_output_dim	Should be set manually.		
7	padding_idx	If given, pads the output with the embedding vector atpadding_idx (initialized to zeros) whenever it encounterstheindex.	0	
8	embedding_freeze	*True* to freeze embedding layer training, *False* to enable embedding parameters.	False	
9	with_multi_layer_perceptron	A flag of whether a multiple layer perceptron is used. Shouldn't be changed.	True	
10	mlp_num_units	Number of units in first *mlp_num_layers* layers.	128	quantitative uniform distribution in [8, 256), with a step size of 8
11	mlp_num_layers	Number of layers of the multiple layer percetron.	3	quantitative uniform distribution in [1, 6), with a step size of 1
12	mlp_num_fan_out	Number of units of the layer that connects the multiple layer percetron and the output.	1	quantitative uniform distribution in [4, 128), with a step size of 4
13	mlp_activation_func	Activation function used in the multiple layer perceptron.	relu	
14	mask_value	The value to be masked from inputs.	0	
15	hist_bin_size	The number of bin size of the histogram.	30	

2.5 DRMMTKS

2.5.1 Model Documentation

DRMMTKS Model.

Examples:

```
>>> model = DRMMTKS()
>>> model.params['top_k'] = 10
>>> model.params['mlp_num_layers'] = 1
>>> model.params['mlp_num_units'] = 5
>>> model.params['mlp_num_fan_out'] = 1
>>> model.params['mlp_activation_func'] = 'tanh'
```

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```
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

2.5.2 Model Hyper Parameters

	Name	Description	Default Value	Default Hyper-Space
0	model_class	Model class. Used internally for save/load. Changing this may cause unexpected behaviors.	<class 'matchzoo.models.drmmtks.DRMMTKS'>	
1	task	Decides model output shape, loss, and metrics.		
2	out_activation_func	Activation function used in output layer.		
3	with_embedding	A flag used help *auto* module. Shouldn't be changed.	True	
4	embedding	FloatTensor containing weights for the Embedding.		
5	embedding_input_dim	Usually equals vocab size + 1. Should be set manually.		
6	embedding_output_dim	Should be set manually.		
7	padding_idx	If given, pads the output with the embedding vector atpadding_idx (initialized to zeros) whenever it encountersthe index.	0	
8	embedding_freeze	*True* to freeze embedding layer training, *False* to enable embedding parameters.	False	
9	with_multi_layer_perceptron	A flag of whether a multiple layer perceptron is used. Shouldn't be changed.	True	
10	mlp_num_units	Number of units in first *mlp_num_layers* layers.	128	quantitative uniform distribution in [8, 256), with a step size of 8
11	mlp_num_layers	Number of layers of the multiple layer percetron.	3	quantitative uniform distribution in [1, 6), with a step size of 1
12	mlp_num_fan_out	Number of units of the layer that connects the multiple layer percetron and the output.	1	quantitative uniform distribution in [4, 128), with a step size of 4
13	mlp_activation_func	Activation function used in the multiple layer perceptron.	relu	
14	mask_value	The value to be masked from inputs.	0	
15	top_k	Size of top-k pooling layer.	10	quantitative uniform distribution in [2, 100), with a step size of 1

2.6 ESIM

2.6.1 Model Documentation

ESIM Model.

Examples:

```
>>> model = ESIM()
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

2.6.2 Model Hyper Parameters

	Name	Description	Default Value	Default Hyper-Space
0	model_class	Model class. Used internally for save/load. Changing this may cause unexpected behaviors.	<class 'matchzoo.models.esim.ESIM'>	
1	task	Decides model output shape, loss, and metrics.		
2	out_activation_func	Activation function used in output layer.		
3	with_embedding	A flag used help *auto* module. Shouldn't be changed.	True	
4	embedding	FloatTensor containing weights for the Embedding.		
5	embedding_input_dim	Usually equals vocab size + 1. Should be set manually.		
6	embedding_output_dim	Should be set manually.		
7	padding_idx	If given, pads the output with the embedding vector at padding_idx (initialized to zeros) whenever it encounters the index.	0	
8	embedding_freeze	*True* to freeze embedding layer training, *False* to enable embedding parameters.	False	
9	mask_value	The value to be masked from inputs.	0	
10	dropout	Dropout rate.	0.2	
11	hidden_size	Hidden size.	200	
12	lstm_layer	Number of LSTM layers	1	
13	drop_lstm	Whether dropout LSTM.	False	
14	concat_lstm	Whether concat intermediate outputs.	True	
15	rnn_type	Choose rnn type, lstm or gru.	lstm	

2.7 KNRM

2.7.1 Model Documentation

KNRM Model.

Examples:

```
>>> model = KNRM()
>>> model.params['kernel_num'] = 11
>>> model.params['sigma'] = 0.1
>>> model.params['exact_sigma'] = 0.001
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

2.7.2 Model Hyper Parameters

	Name	Description	Default Value	Default Hyper-Space
0	model_class	Model class. Used internally for save/load. Changing this may cause unexpected behaviors.	<class 'matchzoo.models.knrm.KNRM'>	
1	task	Decides model output shape, loss, and metrics.		
2	out_activation_func	Activation function used in output layer.		
3	with_embedding	A flag used help *auto* module. Shouldn't be changed.	True	
4	embedding	FloatTensor containing weights for the Embedding.		
5	embedding_input_dim	Usually equals vocab size + 1. Should be set manually.		
6	embedding_output_dim	Should be set manually.		
7	padding_idx	If given, pads the output with the embedding vector atpadding_idx (initialized to zeros) whenever it encountersthe index.	0	
8	embedding_freeze	*True* to freeze embedding layer training, *False* to enable embedding parameters.	False	
9	kernel_num	The number of RBF kernels.	11	quantitative uniform distribution in [5, 20), with a step size of 1
10	sigma	The *sigma* defines the kernel width.	0.1	quantitative uniform distribution in [0.01, 0.2), with a step size of 0.01
11	exact_sigma	The *exact_sigma* denotes the *sigma* for exact match.	0.001	

2.8 ConvKNRM

2.8.1 Model Documentation

ConvKNRM Model.

Examples:

```
>>> model = ConvKNRM()
>>> model.params['filters'] = 128
>>> model.params['conv_activation_func'] = 'tanh'
>>> model.params['max_ngram'] = 3
>>> model.params['use_crossmatch'] = True
>>> model.params['kernel_num'] = 11
>>> model.params['sigma'] = 0.1
>>> model.params['exact_sigma'] = 0.001
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

2.8.2 Model Hyper Parameters

	Name	Description	Default Value	Default Hyper-Space
0	model_class	Model class. Used internally for save/load. Changing this may cause unexpected behaviors.	<class 'matchzoo.models.conv_knrm.ConvKNRM'>	
1	task	Decides model output shape, loss, and metrics.		
2	out_activation_func	Activation function used in output layer.		
3	with_embedding	A flag used help *auto* module. Shouldn't be changed.	True	
4	embedding	FloatTensor containing weights for the Embedding.		
5	embedding_input_dim	Usually equals vocab size + 1. Should be set manually.		
6	embedding_output_dim	Should be set manually.		
7	padding_idx	If given, pads the output with the embedding vector atpadding_idx (initialized to zeros) whenever it encountersthe index.	0	
8	embedding_freeze	*True* to freeze embedding layer training, *False* to enable embedding parameters.	False	
9	filters	The filter size in the convolution layer.	128	
10	conv_activation_func	The activation function in the convolution layer.	relu	
11	max_ngram	The maximum length of n-grams for the convolution layer.	3	
12	use_crossmatch	Whether to match left n-grams and right n-grams of different lengths	True	
13	kernel_num	The number of RBF kernels.	11	quantitative uniform distribution in [5, 20), with a step size of 1
14	sigma	The *sigma* defines the kernel width.	0.1	quantitative uniform distribution in [0.01, 0.2), with a step size of 0.01
15	exact_sigma	The *exact_sigma* denotes the *sigma* for exact match.	0.001	

2.9 BiMPM

2.9.1 Model Documentation

BiMPM Model.

Reference: - https://github.com/galsang/BIMPM-pytorch/blob/master/model/BIMPM.py

Examples:

```
>>> model = BiMPM()
>>> model.params['num_perspective'] = 4
```

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```
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

2.9.2 Model Hyper Parameters

	Name	Description	Default Value	Default Hyper-Space
0	model_class	Model class. Used internally for save/load. Changing this may cause unexpected behaviors.	<class 'matchzoo.models.bimpm.BiMPM'>	
1	task	Decides model output shape, loss, and metrics.		
2	out_activation_func	Activation function used in output layer.		
3	with_embedding	A flag used help *auto* module. Shouldn't be changed.	True	
4	embedding	FloatTensor containing weights for the Embedding.		
5	embedding_input_dim	Usually equals vocab size + 1. Should be set manually.		
6	embedding_output_dim	Should be set manually.		
7	padding_idx	If given, pads the output with the embedding vector atpadding_idx (initialized to zeros) whenever it encountersthe index.	0	
8	embedding_freeze	*True* to freeze embedding layer training, *False* to enable embedding parameters.	False	
9	mask_value	The value to be masked from inputs.	0	
10	dropout	Dropout rate.	0.2	
11	hidden_size	Hidden size.	100	quantitative uniform distribution in [100, 300), with a step size of 100
12	num_perspective	num_perspective	20	quantitative uniform distribution in [20, 100), with a step size of 20

2.10 MatchLSTM

2.10.1 Model Documentation

MatchLSTM Model.

https://github.com/shuohangwang/mprc/blob/master/qa/rankerReader.lua.

Examples:

```
>>> model = MatchLSTM()
>>> model.params['dropout'] = 0.2
>>> model.params['hidden_size'] = 200
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

2.10.2 Model Hyper Parameters

	Name	Description	Default Value	Default Hyper-Space
0	model_class	Model class. Used internally for save/load. Changing this may cause unexpected behaviors.	<class 'matchzoo.models.matchlstm.MatchLSTM'>	
1	task	Decides model output shape, loss, and metrics.		
2	out_activation_func	Activation function used in output layer.		
3	with_embedding	A flag used help *auto* module. Shouldn't be changed.	True	
4	embedding	FloatTensor containing weights for the Embedding.		
5	embedding_input_dim	Usually equals vocab size + 1. Should be set manually.		
6	embedding_output_dim	Should be set manually.		
7	padding_idx	If given, pads the output with the embedding vector at padding_idx (initialized to zeros) whenever it encounters the index.	0	
8	embedding_freeze	*True* to freeze embedding layer training, *False* to enable embedding parameters.	False	
9	mask_value	The value to be masked from inputs.	0	
10	dropout	Dropout rate.	0.2	
11	hidden_size	Hidden size.	200	
12	lstm_layer	Number of LSTM layers	1	
13	drop_lstm	Whether dropout LSTM.	False	
14	concat_lstm	Whether concat intermediate outputs.	True	
15	rnn_type	Choose rnn type, lstm or gru.	lstm	

2.11 ArcI

2.11.1 Model Documentation

ArcI Model.

Examples:

```
>>> model = ArcI()
>>> model.params['left_filters'] = [32]
>>> model.params['right_filters'] = [32]
>>> model.params['left_kernel_sizes'] = [3]
>>> model.params['right_kernel_sizes'] = [3]
>>> model.params['left_pool_sizes'] = [2]
>>> model.params['right_pool_sizes'] = [4]
>>> model.params['conv_activation_func'] = 'relu'
>>> model.params['mlp_num_layers'] = 1
>>> model.params['mlp_num_units'] = 64
>>> model.params['mlp_num_fan_out'] = 32
>>> model.params['mlp_activation_func'] = 'relu'
```

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```
>>> model.params['dropout_rate'] = 0.5
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

2.11.2 Model Hyper Parameters

	Name	Description	Default Value	Default Hyper-Space
0	model_class	Model class. Used internally for save/load. Changing this may cause unexpected behaviors.	<class 'matchzoo.models.arci.ArcI'>	
1	task	Decides model output shape, loss, and metrics.		
2	out_activation_func	Activation function used in output layer.		
3	with_embedding	A flag used help *auto* module. Shouldn't be changed.	True	
4	embedding	FloatTensor containing weights for the Embedding.		
5	embedding_input_dim	Usually equals vocab size + 1. Should be set manually.		
6	embedding_output_dim	Should be set manually.		
7	padding_idx	If given, pads the output with the embedding vector atpadding_idx (initialized to zeros) whenever it encountersthe index.	0	
8	embedding_freeze	*True* to freeze embedding layer training, *False* to enable embedding parameters.	False	
9	with_multi_layer_perceptron	A flag of whether a multiple layer perceptron is used. Shouldn't be changed.	True	
10	mlp_num_units	Number of units in first *mlp_num_layers* layers.	128	quantitative uniform distribution in [8, 256), with a step size of 8
11	mlp_num_layers	Number of layers of the multiple layer percetron.	3	quantitative uniform distribution in [1, 6), with a step size of 1
12	mlp_num_fan_out	Number of units of the layer that connects the multiple layer percetron and the output.	64	quantitative uniform distribution in [4, 128), with a step size of 4
13	mlp_activation_func	Activation function used in the multiple layer perceptron.	relu	
14	left_length	Length of left input.	10	
15	right_length	Length of right input.	100	
16	conv_activation_func	The activation function in the convolution layer.	relu	
17	left_filters	The filter size of each convolution blocks for the left input.	[32]	
18	left_kernel_sizes	The kernel size of each convolution blocks for the left input.	[3]	
19	left_pool_sizes	The pooling size of each convolution blocks for the left input.	[2]	
20	right_filters	The filter size of each convolution blocks for the right input.	[32]	
21	right_kernel_sizes	The kernel size of each convolution blocks for the right input.	[3]	
22	right_pool_sizes	The pooling size of each convolution blocks for the right input.	[2]	
23	dropout_rate	The dropout rate.	0.0	quantitative uniform distribution in [0.0, 0.8), with a step size of 0.01

2.12 ArcII

2.12.1 Model Documentation

ArcII Model.

Examples:

```
>>> model = ArcII()
>>> model.params['embedding_output_dim'] = 300
>>> model.params['kernel_1d_count'] = 32
>>> model.params['kernel_1d_size'] = 3
>>> model.params['kernel_2d_count'] = [16, 32]
>>> model.params['kernel_2d_size'] = [[3, 3], [3, 3]]
>>> model.params['pool_2d_size'] = [[2, 2], [2, 2]]
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

2.12.2 Model Hyper Parameters

	Name	Description	Default Value	Default Hyper-Space
0	model_class	Model class. Used internally for save/load. Changing this may cause unexpected behaviors.	<class 'matchzoo.models.arcii.ArcII'>	
1	task	Decides model output shape, loss, and metrics.		
2	out_activation_func	Activation function used in output layer.		
3	with_embedding	A flag used help *auto* module. Shouldn't be changed.	True	
4	embedding	FloatTensor containing weights for the Embedding.		
5	embedding_input_dim	Usually equals vocab size + 1. Should be set manually.		
6	embedding_output_dim	Should be set manually.		
7	padding_idx	If given, pads the output with the embedding vector atpadding_idx (initialized to zeros) whenever it encountersthe index.	0	
8	embedding_freeze	*True* to freeze embedding layer training, *False* to enable embedding parameters.	False	
9	left_length	Length of left input.	10	
10	right_length	Length of right input.	100	
11	kernel_1d_count	Kernel count of 1D convolution layer.	32	
12	kernel_1d_size	Kernel size of 1D convolution layer.	3	
13	kernel_2d_count	Kernel count of 2D convolution layer ineach block	[32]	
14	kernel_2d_size	Kernel size of 2D convolution layer in each block.	[(3, 3)]	
15	activation	Activation function.	relu	
16	pool_2d_size	Size of pooling layer in each block.	[(2, 2)]	
17	dropout_rate	The dropout rate.	0.0	quantitative uniform distribution in [0.0, 0.8), with a step size of 0.01

2.13 Bert

2.13.1 Model Documentation

Bert Model.

2.13.2 Model Hyper Parameters

	Name	Description	Default Value	Default Hyper-Space
0	model_class	Model class. Used internally for save/load. Changing this may cause unexpected behaviors.	<class 'matchzoo.models.bert.Bert'>	
1	task	Decides model output shape, loss, and metrics.		
2	out_activation_func	Activation function used in output layer.		
3	mode	Pretrained Bert model.	bert-base-uncased	
4	dropout_rate	The dropout rate.	0.0	quantitative uniform distribution in [0.0, 0.8), with a step size of 0.01

2.14 MVLSTM

2.14.1 Model Documentation

MVLSTM Model.

Examples:

```
>>> model = MVLSTM()
>>> model.params['hidden_size'] = 32
>>> model.params['top_k'] = 50
>>> model.params['mlp_num_layers'] = 2
>>> model.params['mlp_num_units'] = 20
>>> model.params['mlp_num_fan_out'] = 10
>>> model.params['mlp_activation_func'] = 'relu'
>>> model.params['dropout_rate'] = 0.0
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

2.14.2 Model Hyper Parameters

	Name	Description	Default Value	Default Hyper-Space
0	model_class	Model class. Used internally for save/load. Changing this may cause unexpected behaviors.	<class 'matchzoo.models.mvlstm.MVLSTM'>	
1	task	Decides model output shape, loss, and metrics.		
2	out_activation_func	Activation function used in output layer.		
3	with_embedding	A flag used help *auto* module. Shouldn't be changed.	True	
4	embedding	FloatTensor containing weights for the Embedding.		
5	embedding_input_dim	Usually equals vocab size + 1. Should be set manually.		
6	embedding_output_dim	Should be set manually.		
7	padding_idx	If given, pads the output with the embedding vector atpadding_idx (initialized to zeros) whenever it encountersthe index.	0	
8	embedding_freeze	*True* to freeze embedding layer training, *False* to enable embedding parameters.	False	
9	with_multi_layer_perceptron	A flag of whether a multiple layer perceptron is used. Shouldn't be changed.	True	
10	mlp_num_units	Number of units in first *mlp_num_layers* layers.	128	quantitative uniform distribution in [8, 256), with a step size of 8
11	mlp_num_layers	Number of layers of the multiple layer percetron.	3	quantitative uniform distribution in [1, 6), with a step size of 1
12	mlp_num_fan_out	Number of units of the layer that connects the multiple layer percetron and the output.	64	quantitative uniform distribution in [4, 128), with a step size of 4
13	mlp_activation_func	Activation function used in the multiple layer perceptron.	relu	
14	hidden_size	Integer, the hidden size in the bi-directional LSTM layer.	32	
15	num_layers	Integer, number of recurrent layers.	1	
16	top_k	Size of top-k pooling layer.	10	quantitative uniform distribution in [2, 100), with a step size of 1
17	dropout_rate	Float, the dropout rate.	0.0	quantitative uniform distribution in [0.0, 0.8), with a step size of 0.01

2.15 MatchPyramid

2.15.1 Model Documentation

MatchPyramid Model.

Examples:

```
>>> model = MatchPyramid()
>>> model.params['embedding_output_dim'] = 300
>>> model.params['kernel_count'] = [16, 32]
>>> model.params['kernel_size'] = [[3, 3], [3, 3]]
>>> model.params['dpool_size'] = [3, 10]
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

2.15.2 Model Hyper Parameters

	Name	Description	Default Value	Default Hyper-Space
0	model_class	Model class. Used internally for save/load. Changing this may cause unexpected behaviors.	<class 'matchzoo.models.match_pyramid.MatchPyramid'>	
1	task	Decides model output shape, loss, and metrics.		
2	out_activation_func	Activation function used in output layer.		
3	with_embedding	A flag used help *auto* module. Shouldn't be changed.	True	
4	embedding	FloatTensor containing weights for the Embedding.		
5	embedding_input_dim	Usually equals vocab size + 1. Should be set manually.		
6	embedding_output_dim	Should be set manually.		
7	padding_idx	If given, pads the output with the embedding vector atpadding_idx (initialized to zeros) whenever it encounters the index.	0	
8	embedding_freeze	*True* to freeze embedding layer training, *False* to enable embedding parameters.	False	
9	kernel_count	The kernel count of the 2D convolution of each block.	[32]	
10	kernel_size	The kernel size of the 2D convolution of each block.	[[3, 3]]	
11	activation	The activation function.	relu	
12	dpool_size	The max-pooling size of each block.	[3, 10]	
13	dropout_rate	The dropout rate.	0.0	quantitative uniform distribution in [0.0, 0.8), with a step size of 0.01

2.16 aNMM

2.16.1 Model Documentation

aNMM: Ranking Short Answer Texts with Attention-Based Neural Matching Model.

Examples:

```
>>> model = aNMM()
>>> model.params['embedding_output_dim'] = 300
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

2.16.2 Model Hyper Parameters

	Name	Description	Default Value	Default Hyper-Space
0	model_class	Model class. Used internally for save/load. Changing this may cause unexpected behaviors.	<class 'matchzoo.models.anmm.aNMM'>	
1	task	Decides model output shape, loss, and metrics.		
2	out_activation_func	Activation function used in output layer.		
3	with_embedding	A flag used help *auto* module. Shouldn't be changed.	True	
4	embedding	FloatTensor containing weights for the Embedding.		
5	embedding_input_dim	Usually equals vocab size + 1. Should be set manually.		
6	embedding_output_dim	Should be set manually.		
7	padding_idx	If given, pads the output with the embedding vector atpadding_idx (initialized to zeros) whenever it encounters the index.	0	
8	embedding_freeze	*True* to freeze embedding layer training, *False* to enable embedding parameters.	False	
9	mask_value	The value to be masked from inputs.	0	
10	num_bins	Integer, number of bins.	200	
11	hidden_sizes	Number of hidden size for each hidden layer	[100]	
12	activation	The activation function.	relu	
13	dropout_rate	The dropout rate.	0.0	quantitative uniform distribution in [0.0, 0.8), with a step size of 0.01

2.17 HBMP

2.17.1 Model Documentation

HBMP model.

Examples:

```
>>> model = HBMP()
>>> model.params['embedding_input_dim'] = 200
>>> model.params['embedding_output_dim'] = 100
>>> model.params['mlp_num_layers'] = 1
>>> model.params['mlp_num_units'] = 10
```

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```
>>> model.params['mlp_num_fan_out'] = 10
>>> model.params['mlp_activation_func'] = nn.LeakyReLU(0.1)
>>> model.params['lstm_hidden_size'] = 5
>>> model.params['lstm_num'] = 3
>>> model.params['num_layers'] = 3
>>> model.params['dropout_rate'] = 0.1
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

2.17.2 Model Hyper Parameters

	Name	Description	Default Value	Default Hyper-Space
0	model_class	Model class. Used internally for save/load. Changing this may cause unexpected behaviors.	<class 'matchzoo.models.hbmp.HBMP'>	
1	task	Decides model output shape, loss, and metrics.		
2	out_activation_func	Activation function used in output layer.		
3	with_embedding	A flag used help *auto* module. Shouldn't be changed.	True	
4	embedding	FloatTensor containing weights for the Embedding.		
5	embedding_input_dim	Usually equals vocab size + 1. Should be set manually.		
6	embedding_output_dim	Should be set manually.		
7	padding_idx	If given, pads the output with the embedding vector atpadding_idx (initialized to zeros) whenever it encounterstheindex.	0	
8	embedding_freeze	*True* to freeze embedding layer training, *False* to enable embedding parameters.	False	
9	with_multi_layer_perceptron	A flag of whether a multiple layer perceptron is used. Shouldn't be changed.	True	
10	mlp_num_units	Number of units in first *mlp_num_layers* layers.	128	quantitative uniform distribution in [8, 256), with a step size of 8
11	mlp_num_layers	Number of layers of the multiple layer percetron.	3	quantitative uniform distribution in [1, 6), with a step size of 1
12	mlp_num_fan_out	Number of units of the layer that connects the multiple layer percetron and the output.	64	quantitative uniform distribution in [4, 128), with a step size of 4
13	mlp_activation_func	Activation function used in the multiple layer perceptron.	relu	
14	lstm_hidden_size	Integer, the hidden size of the bi-directional LSTM layer.	5	
15	lstm_num	Integer, number of LSTM units	3	
16	num_layers	Integer, number of LSTM layers.	1	
17	dropout_rate	The dropout rate.	0.0	quantitative uniform distribution in [0.0, 0.8), with a step size of 0.01

2.18 DUET

2.18.1 Model Documentation

Duet Model.

Examples:

```
>>> model = DUET()
>>> model.params['left_length'] = 10
>>> model.params['right_length'] = 40
>>> model.params['lm_filters'] = 300
>>> model.params['mlp_num_layers'] = 2
>>> model.params['mlp_num_units'] = 300
>>> model.params['mlp_num_fan_out'] = 300
>>> model.params['mlp_activation_func'] = 'relu'
>>> model.params['vocab_size'] = 2000
>>> model.params['dm_filters'] = 300
>>> model.params['dm_conv_activation_func'] = 'relu'
>>> model.params['dm_kernel_size'] = 3
>>> model.params['dm_right_pool_size'] = 8
>>> model.params['dropout_rate'] = 0.5
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

2.18.2 Model Hyper Parameters

	Name	Description	Default Value	Default Hyper-Space
0	model_class	Model class. Used internally for save/load. Changing this may cause unexpected behaviors.	<class 'matchzoo.models.duet.DUET'>	
1	task	Decides model output shape, loss, and metrics.		
2	out_activation_func	Activation function used in output layer.		
3	with_multi_layer_perceptron	A flag of whether a multiple layer perceptron is used. Shouldn't be changed.	True	
4	mlp_num_units	Number of units in first *mlp_num_layers* layers.	128	quantitative uniform distribution in [8, 256), with a step size of 8
5	mlp_num_layers	Number of layers of the multiple layer percetron.	3	quantitative uniform distribution in [1, 6), with a step size of 1
6	mlp_num_fan_out	Number of units of the layer that connects the multiple layer percetron and the output.	64	quantitative uniform distribution in [4, 128), with a step size of 4
7	mlp_activation_func	Activation function used in the multiple layer perceptron.	relu	
8	mask_value	The value to be masked from inputs.	0	
9	left_length	Length of left input.	10	
10	right_length	Length of right input.	40	
11	lm_filters	Filter size of 1D convolution layer in the local model.	300	
12	vocab_size	Vocabulary size of the tri-letters used in the distributed model.	419	
13	dm_filters	Filter size of 1D convolution layer in the distributed model.	300	
14	dm_kernel_size	Kernel size of 1D convolution layer in the distributed model.	3	
15	dm_conv_activation_func	Activation functions of the convolution layer in the distributed model.	relu	
16	dm_right_pool_size	Kernel size of 1D convolution layer in the distributed model.	8	
17	dropout_rate	The dropout rate.	0.5	quantitative uniform distribution in [0.0, 0.8), with a step size of 0.02

2.19 DIIN

2.19.1 Model Documentation

DIIN model.

Examples:

```
>>> model = DIIN()
>>> model.params['embedding_input_dim'] = 10000
>>> model.params['embedding_output_dim'] = 300
>>> model.params['mask_value'] = 0
>>> model.params['char_embedding_input_dim'] = 100
>>> model.params['char_embedding_output_dim'] = 8
>>> model.params['char_conv_filters'] = 100
>>> model.params['char_conv_kernel_size'] = 5
>>> model.params['first_scale_down_ratio'] = 0.3
>>> model.params['nb_dense_blocks'] = 3
>>> model.params['layers_per_dense_block'] = 8
>>> model.params['growth_rate'] = 20
>>> model.params['transition_scale_down_ratio'] = 0.5
>>> model.params['conv_kernel_size'] = (3, 3)
>>> model.params['pool_kernel_size'] = (2, 2)
>>> model.params['dropout_rate'] = 0.2
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

2.19.2 Model Hyper Parameters

	Name	Description	Default Value	Default Hyper-Space
0	model_class	Model class. Used internally for save/load. Changing this may cause unexpected behaviors.	<class 'matchzoo.models.diin.DIIN'>	
1	task	Decides model output shape, loss, and metrics.		
2	out_activation_func	Activation function used in output layer.		
3	with_embedding	A flag used help *auto* module. Shouldn't be changed.	True	
4	embedding	FloatTensor containing weights for the Embedding.		
5	embedding_input_dim	Usually equals vocab size + 1. Should be set manually.		
6	embedding_output_dim	Should be set manually.		
7	padding_idx	If given, pads the output with the embedding vector atpadding_idx (initialized to zeros) whenever it encounters the index.	0	
8	embedding_freeze	*True* to freeze embedding layer training, *False* to enable embedding parameters.	False	
9	mask_value	The value to be masked from inputs.	0	
10	char_embedding_input_dim	The input dimension of character embedding layer.	100	
11	char_embedding_output_dim	The output dimension of character embedding layer.	8	
12	char_conv_filters	The filter size of character convolution layer.	100	
13	char_conv_kernel_size	The kernel size of character convolution layer.	5	
14	first_scale_down_ratio	The channel scale down ratio of the convolution layer before densenet.	0.3	
15	nb_dense_blocks	The number of blocks in densenet.	3	
16	layers_per_dense_block	The number of convolution layers in dense block.	8	
17	growth_rate	The filter size of each convolution layer in dense block.	20	
18	transition_scale_down_ratio	The channel scale down ratio of the convolution layer in transition block.	0.5	
19	conv_kernel_size	The kernel size of convolution layer in dense block.	(3, 3)	
20	pool_kernel_size	The kernel size of pooling layer in transition block.	(2, 2)	
21	dropout_rate	The dropout rate.	0.0	quantitative uniform distribution in [0.0, 0.8), with a step size of 0.01

2.20 MatchSRNN

2.20.1 Model Documentation

Match-SRNN Model.

Examples:

```
>>> model = MatchSRNN()
>>> model.params['channels'] = 4
>>> model.params['units'] = 10
>>> model.params['dropout'] = 0.2
>>> model.params['direction'] = 'lt'
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

2.20.2 Model Hyper Parameters

	Name	Description	Default Value	Default Hyper-Space
0	model_class	Model class. Used internally for save/load. Changing this may cause unexpected behaviors.	<class 'matchzoo.models.match_srnn.MatchSRNN'>	
1	task	Decides model output shape, loss, and metrics.		
2	out_activation_func	Activation function used in output layer.		
3	with_embedding	A flag used help *auto* module. Shouldn't be changed.	True	
4	embedding	FloatTensor containing weights for the Embedding.		
5	embedding_input_dim	Usually equals vocab size + 1. Should be set manually.		
6	embedding_output_dim	Should be set manually.		
7	padding_idx	If given, pads the output with the embedding vector atpadding_idx (initialized to zeros) whenever it encountersthe index.	0	
8	embedding_freeze	*True* to freeze embedding layer training, *False* to enable embedding parameters.	False	
9	channels	Number of word interaction tensor channels	4	
10	units	Number of SpatialGRU units	10	
11	direction	Direction of SpatialGRU scanning	lt	
12	dropout	The dropout rate.	0.2	quantitative uniform distribution in [0.0, 0.8), with a step size of 0.01

CHAPTER 3

API Reference

This page contains auto-generated API reference documentation[1].

3.1 matchzoo

3.1.1 Subpackages

matchzoo.auto

Subpackages

matchzoo.auto.preparer

Submodules

matchzoo.auto.preparer.prepare

Module Contents

matchzoo.auto.preparer.prepare.**prepare**(*task: BaseTask, model_class: typing.Type[BaseModel], data_pack: mz.DataPack, callback: typing.Optional[BaseCallback] = None, preprocessor: typing.Optional[BasePreprocessor] = None, embedding: typing.Optional['mz.Embedding'] = None, config: typing.Optional[dict] = None*)

A simple shorthand for using `matchzoo.Preparer`.

[1] Created with sphinx-autoapi

config is used to control specific behaviors. The default *config* will be updated accordingly if a *config* dictionary is passed. e.g. to override the default *bin_size*, pass *config={'bin_size': 15}*.

Parameters

- **task** – Task.
- **model_class** – Model class.
- **data_pack** – DataPack used to fit the preprocessor.
- **callback** – Callback used to padding a batch. (default: the default callback of *model_class*)
- **preprocessor** – Preprocessor used to fit the *data_pack*. (default: the default preprocessor of *model_class*)
- **embedding** – Embedding to build a embedding matrix. If not set, then a correctly shaped randomized matrix will be built.
- **config** – Configuration of specific behaviors. (default: return value of *mz.Preparer.get_default_config()*)

Returns A tuple of *(model, preprocessor, data_generator_builder, embedding_matrix)*.

matchzoo.auto.preparer.preparer

Module Contents

class matchzoo.auto.preparer.preparer.**Preparer**(*task: BaseTask*, *config: typing.Optional[dict] = None*)

Bases: object

Unified setup processes of all MatchZoo models.

config is used to control specific behaviors. The default *config* will be updated accordingly if a *config* dictionary is passed. e.g. to override the default *bin_size*, pass *config={'bin_size': 15}*.

See *tutorials/automation.ipynb* for a detailed walkthrough on usage.

Default *config*:

{ # pair generator builder kwargs 'num_dup': 1,

histogram unit of DRMM 'bin_size': 30, 'hist_mode': 'LCH',

dynamic Pooling of MatchPyramid 'compress_ratio_left': 1.0, 'compress_ratio_right': 1.0,

if no *matchzoo.Embedding* is passed to *tune* 'embedding_output_dim': 50

}

Parameters

- **task** – Task.
- **config** – Configuration of specific behaviors.

Example

```
>>> import matchzoo as mz
>>> task = mz.tasks.Ranking(losses=mz.losses.RankCrossEntropyLoss())
>>> preparer = mz.auto.Preparer(task)
>>> model_class = mz.models.DenseBaseline
>>> train_raw = mz.datasets.toy.load_data('train', 'ranking')
>>> model, prpr, dsb, dlb = preparer.prepare(model_class,
...                                          train_raw)
>>> model.params.completed(exclude=['out_activation_func'])
True
```

prepare(*self, model_class: typing.Type[BaseModel], data_pack: mz.DataPack, callback: typing.Optional[BaseCallback] = None, preprocessor: typing.Optional[BasePreprocessor] = None, embedding: typing.Optional['mz.Embedding'] = None*)

Prepare.

Parameters

- **model_class** – Model class.
- **data_pack** – DataPack used to fit the preprocessor.
- **callback** – Callback used to padding a batch. (default: the default callback of *model_class*)
- **preprocessor** – Preprocessor used to fit the *data_pack*. (default: the default preprocessor of *model_class*)

Returns A tuple of *(model, preprocessor, dataset_builder, dataloader_builder)*.

_build_model(*self*, *model_class*, *preprocessor*, *embedding*)

_build_matrix(*self*, *preprocessor*, *embedding*)

_build_dataset_builder(*self*, *model*, *embedding_matrix*, *preprocessor*)

_build_dataloader_builder(*self*, *model*, *callback*)

_infer_num_neg(*self*)

classmethod get_default_config(*cls*)

Default config getter.

Package Contents

class matchzoo.auto.preparer.**Preparer**(*task: BaseTask, config: typing.Optional[dict] = None*)

Bases: object

Unified setup processes of all MatchZoo models.

config is used to control specific behaviors. The default *config* will be updated accordingly if a *config* dictionary is passed. e.g. to override the default *bin_size*, pass *config={'bin_size': 15}*.

See *tutorials/automation.ipynb* for a detailed walkthrough on usage.

Default *config*:

{ # pair generator builder kwargs 'num_dup': 1,

histogram unit of DRMM 'bin_size': 30, 'hist_mode': 'LCH',

dynamic Pooling of MatchPyramid 'compress_ratio_left': 1.0, 'compress_ratio_right': 1.0,

if no *matchzoo.Embedding* is passed to *tune* 'embedding_output_dim': 50

}

Parameters

- **task** – Task.
- **config** – Configuration of specific behaviors.

Example

```
>>> import matchzoo as mz
>>> task = mz.tasks.Ranking(losses=mz.losses.RankCrossEntropyLoss())
>>> preparer = mz.auto.Preparer(task)
>>> model_class = mz.models.DenseBaseline
>>> train_raw = mz.datasets.toy.load_data('train', 'ranking')
>>> model, prpr, dsb, dlb = preparer.prepare(model_class,
...                                          train_raw)
>>> model.params.completed(exclude=['out_activation_func'])
True
```

prepare(*self, model_class: typing.Type[BaseModel], data_pack: mz.DataPack, callback: typing.Optional[BaseCallback] = None, preprocessor: typing.Optional[BasePreprocessor] = None, embedding: typing.Optional['mz.Embedding'] = None*)

Prepare.

Parameters

- **model_class** – Model class.
- **data_pack** – DataPack used to fit the preprocessor.
- **callback** – Callback used to padding a batch. (default: the default callback of *model_class*)
- **preprocessor** – Preprocessor used to fit the *data_pack*. (default: the default preprocessor of *model_class*)

Returns A tuple of *(model, preprocessor, dataset_builder, dataloader_builder)*.

_build_model(*self*, *model_class*, *preprocessor*, *embedding*)

_build_matrix(*self*, *preprocessor*, *embedding*)

_build_dataset_builder(*self*, *model*, *embedding_matrix*, *preprocessor*)

_build_dataloader_builder(*self*, *model*, *callback*)

_infer_num_neg(*self*)

classmethod get_default_config(*cls*)

Default config getter.

matchzoo.auto.preparer.**prepare**(*task: BaseTask, model_class: typing.Type[BaseModel], data_pack: mz.DataPack, callback: typing.Optional[BaseCallback] = None, preprocessor: typing.Optional[BasePreprocessor] = None, embedding: typing.Optional['mz.Embedding'] = None, config: typing.Optional[dict] = None*)

A simple shorthand for using `matchzoo.Preparer`.

config is used to control specific behaviors. The default *config* will be updated accordingly if a *config* dictionary is passed. e.g. to override the default *bin_size*, pass *config={'bin_size': 15}*.

Parameters

- **task** – Task.
- **model_class** – Model class.
- **data_pack** – DataPack used to fit the preprocessor.
- **callback** – Callback used to padding a batch. (default: the default callback of *model_class*)
- **preprocessor** – Preprocessor used to fit the *data_pack*. (default: the default preprocessor of *model_class*)
- **embedding** – Embedding to build a embedding matrix. If not set, then a correctly shaped randomized matrix will be built.
- **config** – Configuration of specific behaviors. (default: return value of *mz.Preparer.get_default_config()*)

Returns A tuple of *(model, preprocessor, data_generator_builder, embedding_matrix)*.

matchzoo.auto.tuner

Submodules

matchzoo.auto.tuner.tune

Module Contents

matchzoo.auto.tuner.tune.**tune**(*params: mz.ParamTable*, *optimizer: str = 'adam'*, *trainloader: mz.dataloader.DataLoader = None*, *validloader: mz.dataloader.DataLoader = None*, *embedding: np.ndarray = None*, *fit_kwargs: dict = None*, *metric: typing.Union[str, BaseMetric] = None*, *mode: str = 'maximize'*, *num_runs: int = 10*, *verbose=1*)

Tune model hyper-parameters.

A simple shorthand for using *matchzoo.auto.Tuner*.

model.params.hyper_space reprensents the model's hyper-parameters search space, which is the cross-product of individual hyper parameter's hyper space. When a *Tuner* builds a model, for each hyper parameter in *model.params*, if the hyper-parameter has a hyper-space, then a sample will be taken in the space. However, if the hyper-parameter does not have a hyper-space, then the default value of the hyper-parameter will be used.

See *tutorials/model_tuning.ipynb* for a detailed walkthrough on usage.

Parameters

- **params** – A completed parameter table to tune. Usually *model.params* of the desired model to tune. *params.completed()* should be *True*.
- **optimizer** – Str or *Optimizer* class. Optimizer for optimizing model.
- **trainloader** – Training data to use. Should be a *DataLoader*.
- **validloader** – Testing data to use. Should be a *DataLoader*.
- **embedding** – Embedding used by model.

- **fit_kwargs** – Extra keyword arguments to pass to *fit*. (default: *dict(epochs=10, verbose=0)*)
- **metric** – Metric to tune upon. Must be one of the metrics in *model.params['task'].metrics*. (default: the first metric in *params.['task'].metrics*.
- **mode** – Either *maximize* the metric or *minimize* the metric. (default: 'maximize')
- **num_runs** – Number of runs. Each run takes a sample in *params.hyper_space* and build a model based on the sample. (default: 10)
- **callbacks** – A list of callbacks to handle. Handled sequentially at every callback point.
- **verbose** – Verbosity. (default: 1)

Example

```
>>> import matchzoo as mz
>>> import numpy as np
>>> train = mz.datasets.toy.load_data('train')
>>> valid = mz.datasets.toy.load_data('dev')
>>> prpr = mz.models.DenseBaseline.get_default_preprocessor()
>>> train = prpr.fit_transform(train, verbose=0)
>>> valid = prpr.transform(valid, verbose=0)
>>> trainset = mz.dataloader.Dataset(train)
>>> validset = mz.dataloader.Dataset(valid)
>>> padding = mz.models.DenseBaseline.get_default_padding_callback()
>>> trainloader = mz.dataloader.DataLoader(trainset, callback=padding)
>>> validloader = mz.dataloader.DataLoader(validset, callback=padding)
>>> model = mz.models.DenseBaseline()
>>> model.params['task'] = mz.tasks.Ranking()
>>> optimizer = 'adam'
>>> embedding = np.random.uniform(-0.2, 0.2,
...     (prpr.context['vocab_size'], 100))
>>> tuner = mz.auto.Tuner(
...     params=model.params,
...     optimizer=optimizer,
...     trainloader=trainloader,
...     validloader=validloader,
...     embedding=embedding,
...     num_runs=1,
...     verbose=0
... )
>>> results = tuner.tune()
>>> sorted(results['best'].keys())
['#', 'params', 'sample', 'score']
```

matchzoo.auto.tuner.tuner

Module Contents

class matchzoo.auto.tuner.tuner.**Tuner**(*params: mz.ParamTable*, *optimizer: str = 'adam'*, *trainloader: mz.dataloader.DataLoader = None*, *validloader: mz.dataloader.DataLoader = None*, *embedding: np.ndarray = None*, *fit_kwargs: dict = None*, *metric: typing.Union[str, BaseMetric] = None*, *mode: str = 'maximize'*, *num_runs: int = 10*, *verbose=1*)

Bases: `object`

Model hyper-parameters tuner.

model.params.hyper_space reprensents the model's hyper-parameters search space, which is the cross-product of individual hyper parameter's hyper space. When a *Tuner* builds a model, for each hyper parameter in *model.params*, if the hyper-parameter has a hyper-space, then a sample will be taken in the space. However, if the hyper-parameter does not have a hyper-space, then the default value of the hyper-parameter will be used.

See *tutorials/model_tuning.ipynb* for a detailed walkthrough on usage.

Parameters

- **params** – A completed parameter table to tune. Usually *model.params* of the desired model to tune. *params.completed()* should be *True*.
- **optimizer** – Str or *Optimizer* class. Optimizer for optimizing model.
- **trainloader** – Training data to use. Should be a *DataLoader*.
- **validloader** – Testing data to use. Should be a *DataLoader*.
- **embedding** – Embedding used by model.
- **fit_kwargs** – Extra keyword arguments to pass to *fit*. (default: *dict(epochs=10, verbose=0)*)
- **metric** – Metric to tune upon. Must be one of the metrics in *model.params['task'].metrics*. (default: the first metric in *params.['task'].metrics*.
- **mode** – Either *maximize* the metric or *minimize* the metric. (default: 'maximize')
- **num_runs** – Number of runs. Each run takes a sample in *params.hyper_space* and build a model based on the sample. (default: 10)
- **verbose** – Verbosity. (default: 1)

params
params getter.

trainloader
trainloader getter.

validloader
validloader getter.

fit_kwargs
fit_kwargs getter.

metric
metric getter.

mode
mode getter.

num_runs
num_runs getter.

verbose
verbose getter.

tune(*self*)
Start tuning.

Notice that *tune* does not affect the tuner's inner state, so each new call to *tune* starts fresh. In other words, hyperspaces are suggestive only within the same *tune* call.

_fmin(*self*, *trials*)

_run(*self*, *sample*)

_create_full_params(*self*, *sample*)

_fix_loss_sign(*self*, *loss*)

classmethod _log_result(*cls*, *result*)

classmethod _validate_params(*cls*, *params*)

classmethod _validate_optimizer(*cls*, *optimizer*)

classmethod _validate_dataloader(*cls*, *data*)

classmethod _validate_kwargs(*cls*, *kwargs*)

classmethod _validate_mode(*cls*, *mode*)

classmethod _validate_metric(*cls*, *params*, *metric*)

classmethod _validate_num_runs(*cls*, *num_runs*)

Package Contents

class matchzoo.auto.tuner.**Tuner**(*params: mz.ParamTable*, *optimizer: str = 'adam'*, *trainloader: mz.dataloader.DataLoader = None*, *validloader: mz.dataloader.DataLoader = None*, *embedding: np.ndarray = None*, *fit_kwargs: dict = None*, *metric: typing.Union[str, BaseMetric] = None*, *mode: str = 'maximize'*, *num_runs: int = 10*, *verbose=1*)

Bases: object

Model hyper-parameters tuner.

model.params.hyper_space reprensents the model's hyper-parameters search space, which is the cross-product of individual hyper parameter's hyper space. When a *Tuner* builds a model, for each hyper parameter in *model.params*, if the hyper-parameter has a hyper-space, then a sample will be taken in the space. However, if the hyper-parameter does not have a hyper-space, then the default value of the hyper-parameter will be used.

See *tutorials/model_tuning.ipynb* for a detailed walkthrough on usage.

Parameters

- **params** – A completed parameter table to tune. Usually *model.params* of the desired model to tune. *params.completed()* should be *True*.
- **optimizer** – Str or *Optimizer* class. Optimizer for optimizing model.
- **trainloader** – Training data to use. Should be a *DataLoader*.
- **validloader** – Testing data to use. Should be a *DataLoader*.

- **embedding** – Embedding used by model.
- **fit_kwargs** – Extra keyword arguments to pass to *fit*. (default: *dict(epochs=10, verbose=0)*)
- **metric** – Metric to tune upon. Must be one of the metrics in *model.params['task'].metrics*. (default: the first metric in *params.['task'].metrics*.
- **mode** – Either *maximize* the metric or *minimize* the metric. (default: 'maximize')
- **num_runs** – Number of runs. Each run takes a sample in *params.hyper_space* and build a model based on the sample. (default: 10)
- **verbose** – Verbosity. (default: 1)

params
params getter.

trainloader
trainloader getter.

validloader
validloader getter.

fit_kwargs
fit_kwargs getter.

metric
metric getter.

mode
mode getter.

num_runs
num_runs getter.

verbose
verbose getter.

tune(*self*)
Start tuning.

Notice that *tune* does not affect the tuner's inner state, so each new call to *tune* starts fresh. In other words, hyperspaces are suggestive only within the same *tune* call.

_fmin(*self*, *trials*)

_run(*self*, *sample*)

_create_full_params(*self*, *sample*)

_fix_loss_sign(*self*, *loss*)

classmethod _log_result(*cls*, *result*)

classmethod _validate_params(*cls*, *params*)

classmethod _validate_optimizer(*cls*, *optimizer*)

classmethod _validate_dataloader(*cls*, *data*)

classmethod _validate_kwargs(*cls*, *kwargs*)

classmethod _validate_mode(*cls*, *mode*)

classmethod _validate_metric(*cls*, *params*, *metric*)

classmethod _validate_num_runs(*cls*, *num_runs*)

matchzoo.auto.tuner.**tune**(*params: mz.ParamTable*, *optimizer: str = 'adam'*, *trainloader: mz.dataloader.DataLoader = None*, *validloader: mz.dataloader.DataLoader = None*, *embedding: np.ndarray = None*, *fit_kwargs: dict = None*, *metric: typing.Union[str, BaseMetric] = None*, *mode: str = 'maximize'*, *num_runs: int = 10*, *verbose=1*)

Tune model hyper-parameters.

A simple shorthand for using *matchzoo.auto.Tuner*.

model.params.hyper_space reprensents the model's hyper-parameters search space, which is the cross-product of individual hyper parameter's hyper space. When a *Tuner* builds a model, for each hyper parameter in *model.params*, if the hyper-parameter has a hyper-space, then a sample will be taken in the space. However, if the hyper-parameter does not have a hyper-space, then the default value of the hyper-parameter will be used.

See *tutorials/model_tuning.ipynb* for a detailed walkthrough on usage.

Parameters

- **params** – A completed parameter table to tune. Usually *model.params* of the desired model to tune. *params.completed()* should be *True*.
- **optimizer** – Str or *Optimizer* class. Optimizer for optimizing model.
- **trainloader** – Training data to use. Should be a *DataLoader*.
- **validloader** – Testing data to use. Should be a *DataLoader*.
- **embedding** – Embedding used by model.
- **fit_kwargs** – Extra keyword arguments to pass to *fit*. (default: *dict(epochs=10, verbose=0)*)
- **metric** – Metric to tune upon. Must be one of the metrics in *model.params['task'].metrics*. (default: the first metric in *params.['task'].metrics*.
- **mode** – Either *maximize* the metric or *minimize* the metric. (default: 'maximize')
- **num_runs** – Number of runs. Each run takes a sample in *params.hyper_space* and build a model based on the sample. (default: 10)
- **callbacks** – A list of callbacks to handle. Handled sequentially at every callback point.
- **verbose** – Verbosity. (default: 1)

Example

```
>>> import matchzoo as mz
>>> import numpy as np
>>> train = mz.datasets.toy.load_data('train')
>>> valid = mz.datasets.toy.load_data('dev')
>>> prpr = mz.models.DenseBaseline.get_default_preprocessor()
>>> train = prpr.fit_transform(train, verbose=0)
>>> valid = prpr.transform(valid, verbose=0)
>>> trainset = mz.dataloader.Dataset(train)
>>> validset = mz.dataloader.Dataset(valid)
>>> padding = mz.models.DenseBaseline.get_default_padding_callback()
>>> trainloader = mz.dataloader.DataLoader(trainset, callback=padding)
>>> validloader = mz.dataloader.DataLoader(validset, callback=padding)
>>> model = mz.models.DenseBaseline()
```

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```
>>> model.params['task'] = mz.tasks.Ranking()
>>> optimizer = 'adam'
>>> embedding = np.random.uniform(-0.2, 0.2,
...     (prpr.context['vocab_size'], 100))
>>> tuner = mz.auto.Tuner(
...     params=model.params,
...     optimizer=optimizer,
...     trainloader=trainloader,
...     validloader=validloader,
...     embedding=embedding,
...     num_runs=1,
...     verbose=0
... )
>>> results = tuner.tune()
>>> sorted(results['best'].keys())
['#', 'params', 'sample', 'score']
```

Package Contents

class matchzoo.auto.**Preparer**(*task: BaseTask*, *config: typing.Optional[dict] = None*)

Bases: object

Unified setup processes of all MatchZoo models.

config is used to control specific behaviors. The default *config* will be updated accordingly if a *config* dictionary is passed. e.g. to override the default *bin_size*, pass *config={'bin_size': 15}*.

See *tutorials/automation.ipynb* for a detailed walkthrough on usage.

Default *config*:

{ # pair generator builder kwargs 'num_dup': 1,

histogram unit of DRMM 'bin_size': 30, 'hist_mode': 'LCH',

dynamic Pooling of MatchPyramid 'compress_ratio_left': 1.0, 'compress_ratio_right': 1.0,

if no *matchzoo.Embedding* is passed to *tune* 'embedding_output_dim': 50

}

Parameters

- **task** – Task.
- **config** – Configuration of specific behaviors.

Example

```
>>> import matchzoo as mz
>>> task = mz.tasks.Ranking(losses=mz.losses.RankCrossEntropyLoss())
>>> preparer = mz.auto.Preparer(task)
>>> model_class = mz.models.DenseBaseline
>>> train_raw = mz.datasets.toy.load_data('train', 'ranking')
>>> model, prpr, dsb, dlb = preparer.prepare(model_class,
...                                          train_raw)
>>> model.params.completed(exclude=['out_activation_func'])
True
```

prepare(*self, model_class: typing.Type[BaseModel], data_pack: mz.DataPack, callback: typing.Optional[BaseCallback] = None, preprocessor: typing.Optional[BasePreprocessor] = None, embedding: typing.Optional['mz.Embedding'] = None*)

Prepare.

Parameters

- **model_class** – Model class.
- **data_pack** – DataPack used to fit the preprocessor.
- **callback** – Callback used to padding a batch. (default: the default callback of *model_class*)
- **preprocessor** – Preprocessor used to fit the *data_pack*. (default: the default preprocessor of *model_class*)

Returns A tuple of *(model, preprocessor, dataset_builder, dataloader_builder)*.

_build_model(*self*, *model_class*, *preprocessor*, *embedding*)

_build_matrix(*self*, *preprocessor*, *embedding*)

_build_dataset_builder(*self*, *model*, *embedding_matrix*, *preprocessor*)

_build_dataloader_builder(*self*, *model*, *callback*)

_infer_num_neg(*self*)

classmethod get_default_config(*cls*)

Default config getter.

class matchzoo.auto.**Tuner**(*params: mz.ParamTable*, *optimizer: str = 'adam'*, *trainloader: mz.dataloader.DataLoader = None*, *validloader: mz.dataloader.DataLoader = None*, *embedding: np.ndarray = None*, *fit_kwargs: dict = None*, *metric: typing.Union[str, BaseMetric] = None*, *mode: str = 'maximize'*, *num_runs: int = 10*, *verbose=1*)

Bases: object

Model hyper-parameters tuner.

model.params.hyper_space reprensents the model's hyper-parameters search space, which is the cross-product of individual hyper parameter's hyper space. When a *Tuner* builds a model, for each hyper parameter in *model.params*, if the hyper-parameter has a hyper-space, then a sample will be taken in the space. However, if the hyper-parameter does not have a hyper-space, then the default value of the hyper-parameter will be used.

See *tutorials/model_tuning.ipynb* for a detailed walkthrough on usage.

Parameters

- **params** – A completed parameter table to tune. Usually *model.params* of the desired model to tune. *params.completed()* should be *True*.
- **optimizer** – Str or *Optimizer* class. Optimizer for optimizing model.
- **trainloader** – Training data to use. Should be a *DataLoader*.
- **validloader** – Testing data to use. Should be a *DataLoader*.
- **embedding** – Embedding used by model.
- **fit_kwargs** – Extra keyword arguments to pass to *fit*. (default: *dict(epochs=10, verbose=0)*)
- **metric** – Metric to tune upon. Must be one of the metrics in *model.params['task'].metrics*. (default: the first metric in *params.['task'].metrics*.

- **mode** – Either *maximize* the metric or *minimize* the metric. (default: 'maximize')
- **num_runs** – Number of runs. Each run takes a sample in *params.hyper_space* and build a model based on the sample. (default: 10)
- **verbose** – Verbosity. (default: 1)

params
params getter.

trainloader
trainloader getter.

validloader
validloader getter.

fit_kwargs
fit_kwargs getter.

metric
metric getter.

mode
mode getter.

num_runs
num_runs getter.

verbose
verbose getter.

tune(*self*)
Start tuning.

Notice that *tune* does not affect the tuner's inner state, so each new call to *tune* starts fresh. In other words, hyperspaces are suggestive only within the same *tune* call.

_fmin(*self*, *trials*)

_run(*self*, *sample*)

_create_full_params(*self*, *sample*)

_fix_loss_sign(*self*, *loss*)

classmethod _log_result(*cls*, *result*)

classmethod _validate_params(*cls*, *params*)

classmethod _validate_optimizer(*cls*, *optimizer*)

classmethod _validate_dataloader(*cls*, *data*)

classmethod _validate_kwargs(*cls*, *kwargs*)

classmethod _validate_mode(*cls*, *mode*)

classmethod _validate_metric(*cls*, *params*, *metric*)

classmethod _validate_num_runs(*cls*, *num_runs*)

matchzoo.data_pack

Submodules

matchzoo.data_pack.data_pack

Matchzoo DataPack, pair-wise tuple (feature) and context as input.

Module Contents

matchzoo.data_pack.data_pack.**_convert_to_list_index**(*index: typing.Union[int, slice, np.array], length: int*)

class matchzoo.data_pack.data_pack.**DataPack**(*relation: pd.DataFrame*, *left: pd.DataFrame*, *right: pd.DataFrame*)

Bases: object

Matchzoo *DataPack* data structure, store dataframe and context.

DataPack is a MatchZoo native data structure that most MatchZoo data handling processes build upon. A *DataPack* consists of three parts: *left*, *right* and *relation*, each one of is a *pandas.DataFrame*.

Parameters

- **relation** – Store the relation between left document and right document use ids.
- **left** – Store the content or features for id_left.
- **right** – Store the content or features for id_right.

Example

```
>>> left = [
...     ['qid1', 'query 1'],
...     ['qid2', 'query 2']
... ]
>>> right = [
...     ['did1', 'document 1'],
...     ['did2', 'document 2']
... ]
>>> relation = [['qid1', 'did1', 1], ['qid2', 'did2', 1]]
>>> relation_df = pd.DataFrame(relation)
>>> left = pd.DataFrame(left)
>>> right = pd.DataFrame(right)
>>> dp = DataPack(
...     relation=relation_df,
...     left=left,
...     right=right,
... )
>>> len(dp)
2
```

class FrameView(*data_pack: DataPack*)

Bases: object

FrameView.

__getitem__(*self, index: typing.Union[int, slice, np.array]*)

Slicer.

__call__(*self*)

Returns A full copy. Equivalant to *frame[:]*.

DATA_FILENAME = data.dill

has_label :bool
True if *label* column exists, *False* other wise.

Type return

frame :'DataPack.FrameView'
View the data pack as a `pandas.DataFrame`.

Returned data frame is created by merging the left data frame, the right dataframe and the relation data frame. Use *[]* to access an item or a slice of items.

Returns A *matchzoo.DataPack.FrameView* instance.

Example

```
>>> import matchzoo as mz
>>> data_pack = mz.datasets.toy.load_data()
>>> type(data_pack.frame)
<class 'matchzoo.data_pack.data_pack.DataPack.FrameView'>
>>> frame_slice = data_pack.frame[0:5]
>>> type(frame_slice)
<class 'pandas.core.frame.DataFrame'>
>>> list(frame_slice.columns)
['id_left', 'text_left', 'id_right', 'text_right', 'label']
>>> full_frame = data_pack.frame()
>>> len(full_frame) == len(data_pack)
True
```

relation
relation getter.

left :pd.DataFrame
Get *left()* of *DataPack*.

right :pd.DataFrame
Get *right()* of *DataPack*.

__len__(*self*)
Get numer of rows in the class:*DataPack* object.

unpack(*self*)
Unpack the data for training.

The return value can be directly feed to *model.fit* or *model.fit_generator*.

Returns A tuple of (X, y). *y* is *None* if *self* has no label.

Example

```
>>> import matchzoo as mz
>>> data_pack = mz.datasets.toy.load_data()
>>> X, y = data_pack.unpack()
>>> type(X)
<class 'dict'>
>>> sorted(X.keys())
['id_left', 'id_right', 'text_left', 'text_right']
```

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```
>>> type(y)
<class 'numpy.ndarray'>
>>> X, y = data_pack.drop_label().unpack()
>>> type(y)
<class 'NoneType'>
```

__getitem__ (*self, index: typing.Union[int, slice, np.array]*)
Get specific item(s) as a new *DataPack*.

The returned *DataPack* will be a copy of the subset of the original *DataPack*.

Parameters **index** – Index of the item(s) to get.

Returns An instance of *DataPack*.

copy (*self*)

Returns A deep copy.

save (*self, dirpath: typing.Union[str, Path]*)
Save the *DataPack* object.

A saved *DataPack* is represented as a directory with a *DataPack* object (transformed user input as features and context), it will be saved by *pickle*.

Parameters **dirpath** – directory path of the saved *DataPack*.

_optional_inplace (*func*)
Decorator that adds *inplace* key word argument to a method.

Decorate any method that modifies inplace to make that inplace change optional.

drop_empty (*self*)
Process empty data by removing corresponding rows.

Parameters **inplace** – *True* to modify inplace, *False* to return a modified copy. (default: *False*)

shuffle (*self*)
Shuffle the data pack by shuffling the relation column.

Parameters **inplace** – *True* to modify inplace, *False* to return a modified copy. (default: *False*)

Example

```
>>> import matchzoo as mz
>>> import numpy.random
>>> numpy.random.seed(0)
>>> data_pack = mz.datasets.toy.load_data()
>>> orig_ids = data_pack.relation['id_left']
>>> shuffled = data_pack.shuffle()
>>> (shuffled.relation['id_left'] != orig_ids).any()
True
```

drop_label (*self*)
Remove *label* column from the data pack.

Parameters **inplace** – *True* to modify inplace, *False* to return a modified copy. (default: *False*)

Example

```
>>> import matchzoo as mz
>>> data_pack = mz.datasets.toy.load_data()
>>> data_pack.has_label
True
>>> data_pack.drop_label(inplace=True)
>>> data_pack.has_label
False
```

append_text_length(*self*, *verbose=1*)

Append *length_left* and *length_right* columns.

Parameters

- **inplace** – *True* to modify inplace, *False* to return a modified copy. (default: *False*)
- **verbose** – Verbosity.

Example

```
>>> import matchzoo as mz
>>> data_pack = mz.datasets.toy.load_data()
>>> 'length_left' in data_pack.frame[0].columns
False
>>> new_data_pack = data_pack.append_text_length(verbose=0)
>>> 'length_left' in new_data_pack.frame[0].columns
True
>>> 'length_left' in data_pack.frame[0].columns
False
>>> data_pack.append_text_length(inplace=True, verbose=0)
>>> 'length_left' in data_pack.frame[0].columns
True
```

apply_on_text(*self*, *func: typing.Callable*, *mode: str = 'both'*, *rename: typing.Optional[str] = None*, *verbose: int = 1*)

Apply *func* to text columns based on *mode*.

Parameters

- **func** – The function to apply.
- **mode** – One of "both", "left" and "right".
- **rename** – If set, use new names for results instead of replacing the original columns. To set *rename* in "both" mode, use a tuple of *str*, e.g. ("text_left_new_name", "text_right_new_name").
- **inplace** – *True* to modify inplace, *False* to return a modified copy. (default: *False*)
- **verbose** – Verbosity.

Examples::

```
>>> import matchzoo as mz
>>> data_pack = mz.datasets.toy.load_data()
>>> frame = data_pack.frame
```

To apply *len* on the left text and add the result as 'length_left':

```
>>> data_pack.apply_on_text(len, mode='left',
...                         rename='length_left',
...                         inplace=True,
...                         verbose=0)
>>> list(frame[0].columns)  # noqa: E501
['id_left', 'text_left', 'length_left', 'id_right', 'text_right', 'label']
```

To do the same to the right text:

```
>>> data_pack.apply_on_text(len, mode='right',
...                         rename='length_right',
...                         inplace=True,
...                         verbose=0)
>>> list(frame[0].columns)  # noqa: E501
['id_left', 'text_left', 'length_left', 'id_right', 'text_right', 'length_
↪right', 'label']
```

To do the same to the both texts at the same time:

```
>>> data_pack.apply_on_text(len, mode='both',
...                         rename=('extra_left', 'extra_right'),
...                         inplace=True,
...                         verbose=0)
>>> list(frame[0].columns)  # noqa: E501
['id_left', 'text_left', 'length_left', 'extra_left', 'id_right', 'text_
↪right', 'length_right', 'extra_right', 'label']
```

To suppress outputs:

```
>>> data_pack.apply_on_text(len, mode='both', verbose=0,
...                         inplace=True)
```

_apply_on_text_right(*self*, *func*, *rename*, *verbose=1*)

_apply_on_text_left(*self*, *func*, *rename*, *verbose=1*)

_apply_on_text_both(*self*, *func*, *rename*, *verbose=1*)

matchzoo.data_pack.data_pack.**load_data_pack**(*dirpath: typing.Union[str, Path]*) → DataPack

Load a *DataPack*. The reverse function of `save()`.

Parameters **dirpath** – directory path of the saved model.

Returns a *DataPack* instance.

matchzoo.data_pack.pack

Convert list of input into class:*DataPack* expected format.

Module Contents

matchzoo.data_pack.pack.**pack**(*df: pd.DataFrame*, *task: typing.Union[str, BaseTask] = 'ranking'*) → 'matchzoo.DataPack'

Pack a `DataPack` using *df*.

The *df* must have *text_left* and *text_right* columns. Optionally, the *df* can have *id_left*, *id_right* to index *text_left* and *text_right* respectively. *id_left*, *id_right* will be automatically generated if not specified.

Parameters

- **df** – Input `pandas.DataFrame` to use.
- **task** – Could be one of *ranking*, *classification* or a `matchzoo.engine.BaseTask` instance.

Examples::

```
>>> import matchzoo as mz
>>> import pandas as pd
>>> df = pd.DataFrame(data={'text_left': list('AABC'),
...                         'text_right': list('abbc'),
...                         'label': [0, 1, 1, 0]})
>>> mz.pack(df, task='classification').frame()
  id_left text_left id_right text_right  label
0      L-0         A      R-0          a      0
1      L-0         A      R-1          b      1
2      L-1         B      R-1          b      1
3      L-2         C      R-2          c      0
>>> mz.pack(df, task='ranking').frame()
  id_left text_left id_right text_right  label
0      L-0         A      R-0          a    0.0
1      L-0         A      R-1          b    1.0
2      L-1         B      R-1          b    1.0
3      L-2         C      R-2          c    0.0
```

`matchzoo.data_pack.pack.`**_merge**(*data: pd.DataFrame, ids: typing.Union[list, np.array], text_label: str, id_label: str*)

`matchzoo.data_pack.pack.`**_gen_ids**(*data: pd.DataFrame*, *col: str*, *prefix: str*)

Package Contents

class `matchzoo.data_pack.`**DataPack**(*relation: pd.DataFrame*, *left: pd.DataFrame*, *right: pd.DataFrame*)

Bases: `object`

Matchzoo *DataPack* data structure, store dataframe and context.

DataPack is a MatchZoo native data structure that most MatchZoo data handling processes build upon. A *DataPack* consists of three parts: *left*, *right* and *relation*, each one of is a *pandas.DataFrame*.

Parameters

- **relation** – Store the relation between left document and right document use ids.
- **left** – Store the content or features for id_left.
- **right** – Store the content or features for id_right.

Example

```
>>> left = [
...     ['qid1', 'query 1'],
...     ['qid2', 'query 2']
... ]
>>> right = [
...     ['did1', 'document 1'],
...     ['did2', 'document 2']
... ]
>>> relation = [['qid1', 'did1', 1], ['qid2', 'did2', 1]]
>>> relation_df = pd.DataFrame(relation)
>>> left = pd.DataFrame(left)
>>> right = pd.DataFrame(right)
>>> dp = DataPack(
...     relation=relation_df,
...     left=left,
...     right=right,
... )
>>> len(dp)
2
```

class FrameView(*data_pack: DataPack*)

Bases: object

FrameView.

__getitem__(*self, index: typing.Union[int, slice, np.array]*)

Slicer.

__call__(*self*)

Returns A full copy. Equivalant to *frame[:]*.

DATA_FILENAME = data.dill

has_label :bool

True if *label* column exists, *False* other wise.

Type return

frame :'DataPack.FrameView'

View the data pack as a pandas.DataFrame.

Returned data frame is created by merging the left data frame, the right dataframe and the relation data frame. Use *[]* to access an item or a slice of items.

Returns A *matchzoo.DataPack.FrameView* instance.

Example

```
>>> import matchzoo as mz
>>> data_pack = mz.datasets.toy.load_data()
>>> type(data_pack.frame)
<class 'matchzoo.data_pack.data_pack.DataPack.FrameView'>
>>> frame_slice = data_pack.frame[0:5]
>>> type(frame_slice)
<class 'pandas.core.frame.DataFrame'>
>>> list(frame_slice.columns)
['id_left', 'text_left', 'id_right', 'text_right', 'label']
>>> full_frame = data_pack.frame()
```

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```
>>> len(full_frame) == len(data_pack)
True
```

relation
relation getter.

left :pd.DataFrame
Get *left()* of *DataPack*.

right :pd.DataFrame
Get *right()* of *DataPack*.

__len__ (*self*)
Get numer of rows in the class:*DataPack* object.

unpack (*self*)
Unpack the data for training.

The return value can be directly feed to *model.fit* or *model.fit_generator*.

Returns A tuple of (X, y). *y* is *None* if *self* has no label.

Example

```
>>> import matchzoo as mz
>>> data_pack = mz.datasets.toy.load_data()
>>> X, y = data_pack.unpack()
>>> type(X)
<class 'dict'>
>>> sorted(X.keys())
['id_left', 'id_right', 'text_left', 'text_right']
>>> type(y)
<class 'numpy.ndarray'>
>>> X, y = data_pack.drop_label().unpack()
>>> type(y)
<class 'NoneType'>
```

__getitem__ (*self, index: typing.Union[int, slice, np.array]*)
Get specific item(s) as a new *DataPack*.

The returned *DataPack* will be a copy of the subset of the original *DataPack*.

Parameters **index** – Index of the item(s) to get.

Returns An instance of *DataPack*.

copy (*self*)

Returns A deep copy.

save (*self, dirpath: typing.Union[str, Path]*)
Save the *DataPack* object.

A saved *DataPack* is represented as a directory with a *DataPack* object (transformed user input as features and context), it will be saved by *pickle*.

Parameters **dirpath** – directory path of the saved *DataPack*.

_optional_inplace (*func*)
Decorator that adds *inplace* key word argument to a method.

Decorate any method that modifies inplace to make that inplace change optional.

drop_empty (*self*)
Process empty data by removing corresponding rows.

Parameters **inplace** – *True* to modify inplace, *False* to return a modified copy. (default: *False*)

shuffle (*self*)
Shuffle the data pack by shuffling the relation column.

Parameters **inplace** – *True* to modify inplace, *False* to return a modified copy. (default: *False*)

Example

```
>>> import matchzoo as mz
>>> import numpy.random
>>> numpy.random.seed(0)
>>> data_pack = mz.datasets.toy.load_data()
>>> orig_ids = data_pack.relation['id_left']
>>> shuffled = data_pack.shuffle()
>>> (shuffled.relation['id_left'] != orig_ids).any()
True
```

drop_label (*self*)
Remove *label* column from the data pack.

Parameters **inplace** – *True* to modify inplace, *False* to return a modified copy. (default: *False*)

Example

```
>>> import matchzoo as mz
>>> data_pack = mz.datasets.toy.load_data()
>>> data_pack.has_label
True
>>> data_pack.drop_label(inplace=True)
>>> data_pack.has_label
False
```

append_text_length (*self*, *verbose=1*)
Append *length_left* and *length_right* columns.

Parameters

- **inplace** – *True* to modify inplace, *False* to return a modified copy. (default: *False*)
- **verbose** – Verbosity.

Example

```
>>> import matchzoo as mz
>>> data_pack = mz.datasets.toy.load_data()
>>> 'length_left' in data_pack.frame[0].columns
False
```

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```
>>> new_data_pack = data_pack.append_text_length(verbose=0)
>>> 'length_left' in new_data_pack.frame[0].columns
True
>>> 'length_left' in data_pack.frame[0].columns
False
>>> data_pack.append_text_length(inplace=True, verbose=0)
>>> 'length_left' in data_pack.frame[0].columns
True
```

apply_on_text (*self*, *func: typing.Callable*, *mode: str = 'both'*, *rename: typing.Optional[str] = None*, *verbose: int = 1*)

Apply *func* to text columns based on *mode*.

Parameters

- **func** – The function to apply.
- **mode** – One of "both", "left" and "right".
- **rename** – If set, use new names for results instead of replacing the original columns. To set *rename* in "both" mode, use a tuple of *str*, e.g. ("text_left_new_name", "text_right_new_name").
- **inplace** – *True* to modify inplace, *False* to return a modified copy. (default: *False*)
- **verbose** – Verbosity.

Examples::

```
>>> import matchzoo as mz
>>> data_pack = mz.datasets.toy.load_data()
>>> frame = data_pack.frame
```

To apply *len* on the left text and add the result as 'length_left':

```
>>> data_pack.apply_on_text(len, mode='left',
...                         rename='length_left',
...                         inplace=True,
...                         verbose=0)
>>> list(frame[0].columns) # noqa: E501
['id_left', 'text_left', 'length_left', 'id_right', 'text_right', 'label']
```

To do the same to the right text:

```
>>> data_pack.apply_on_text(len, mode='right',
...                         rename='length_right',
...                         inplace=True,
...                         verbose=0)
>>> list(frame[0].columns) # noqa: E501
['id_left', 'text_left', 'length_left', 'id_right', 'text_right', 'length_
↪right', 'label']
```

To do the same to the both texts at the same time:

```
>>> data_pack.apply_on_text(len, mode='both',
...                         rename=('extra_left', 'extra_right'),
...                         inplace=True,
...                         verbose=0)
```

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```
>>> list(frame[0].columns) # noqa: E501
['id_left', 'text_left', 'length_left', 'extra_left', 'id_right', 'text_
↪right', 'length_right', 'extra_right', 'label']
```

To suppress outputs:

```
>>> data_pack.apply_on_text(len, mode='both', verbose=0,
...                         inplace=True)
```

_apply_on_text_right(*self*, *func*, *rename*, *verbose=1*)

_apply_on_text_left(*self*, *func*, *rename*, *verbose=1*)

_apply_on_text_both(*self*, *func*, *rename*, *verbose=1*)

matchzoo.data_pack.**load_data_pack**(*dirpath: typing.Union[str, Path]*) → DataPack

Load a *DataPack*. The reverse function of `save()`.

Parameters **dirpath** – directory path of the saved model.

Returns a *DataPack* instance.

matchzoo.data_pack.**pack**(*df: pd.DataFrame*, *task: typing.Union[str, BaseTask] = 'ranking'*) → 'matchzoo.DataPack'

Pack a *DataPack* using *df*.

The *df* must have *text_left* and *text_right* columns. Optionally, the *df* can have *id_left*, *id_right* to index *text_left* and *text_right* respectively. *id_left*, *id_right* will be automatically generated if not specified.

Parameters

- **df** – Input `pandas.DataFrame` to use.
- **task** – Could be one of *ranking*, *classification* or a `matchzoo.engine.BaseTask` instance.

Examples::

```
>>> import matchzoo as mz
>>> import pandas as pd
>>> df = pd.DataFrame(data={'text_left': list('AABC'),
...                         'text_right': list('abbc'),
...                         'label': [0, 1, 1, 0]})
>>> mz.pack(df, task='classification').frame()
  id_left text_left id_right text_right  label
0     L-0         A      R-0          a      0
1     L-0         A      R-1          b      1
2     L-1         B      R-1          b      1
3     L-2         C      R-2          c      0
>>> mz.pack(df, task='ranking').frame()
  id_left text_left id_right text_right  label
0     L-0         A      R-0          a    0.0
1     L-0         A      R-1          b    1.0
2     L-1         B      R-1          b    1.0
3     L-2         C      R-2          c    0.0
```

matchzoo.dataloader

Subpackages

matchzoo.dataloader.callbacks

Submodules

matchzoo.dataloader.callbacks.histogram

Module Contents

class matchzoo.dataloader.callbacks.histogram.**Histogram**(*embedding_matrix: np.ndarray*, *bin_size: int = 30*, *hist_mode: str = 'CH'*)

Bases: *matchzoo.engine.base_callback.BaseCallback*

Generate data with matching histogram.

Parameters

- **embedding_matrix** – The embedding matrix used to generator match histogram.
- **bin_size** – The number of bin size of the histogram.
- **hist_mode** – The mode of the `MatchingHistogramUnit`, one of *CH*, *NH*, and *LCH*.

on_batch_unpacked(*self*, *x*, *y*)

Insert *match_histogram* to *x*.

matchzoo.dataloader.callbacks.histogram.**_trunc_text**(*input_text: list*, *length: list*) → list

Truncating the input text according to the input length.

Parameters

- **input_text** – The input text need to be truncated.
- **length** – The length used to truncated the text.

Returns The truncated text.

matchzoo.dataloader.callbacks.histogram.**_build_match_histogram**(*x: dict*, *match_hist_unit: mz.preprocessors.units.MatchingHistogr* → np.ndarray

Generate the matching hisogram for input.

Parameters

- **x** – The input *dict*.
- **match_hist_unit** – The histogram unit `MatchingHistogramUnit`.

Returns The matching histogram.

matchzoo.dataloader.callbacks.lambda_callback

Module Contents

class matchzoo.dataloader.callbacks.lambda_callback.**LambdaCallback**(*on_batch_data_pack=None*, *on_batch_unpacked=None*)

Bases: *matchzoo.engine.base_callback.BaseCallback*

LambdaCallback. Just a shorthand for creating a callback class.

See *matchzoo.engine.base_callback.BaseCallback* for more details.

Example

```
>>> import matchzoo as mz
>>> from matchzoo.dataloader.callbacks import LambdaCallback
>>> data = mz.datasets.toy.load_data()
>>> batch_func = lambda x: print(type(x))
>>> unpack_func = lambda x, y: print(type(x), type(y))
>>> callback = LambdaCallback(on_batch_data_pack=batch_func,
...                           on_batch_unpacked=unpack_func)
>>> dataset = mz.dataloader.Dataset(
...     data, callbacks=[callback])
>>> _ = dataset[0]
<class 'matchzoo.data_pack.data_pack.DataPack'>
<class 'dict'> <class 'numpy.ndarray'>
```

on_batch_data_pack(*self*, *data_pack*)
on_batch_data_pack.

on_batch_unpacked(*self*, *x*, *y*)
on_batch_unpacked.

matchzoo.dataloader.callbacks.ngram

Module Contents

class matchzoo.dataloader.callbacks.ngram.**Ngram**(*preprocessor: mz.preprocessors.BasicPreprocessor*, *mode: str = 'index'*)

Bases: *matchzoo.engine.base_callback.BaseCallback*

Generate the character n-gram for data.

Parameters

- **preprocessor** – The fitted `BasePreprocessor` object, which contains the n-gram units information.
- **mode** – It can be one of 'index', 'onehot', 'sum' or 'aggregate'.

Example

```
>>> import matchzoo as mz
>>> from matchzoo.dataloader.callbacks import Ngram
>>> data = mz.datasets.toy.load_data()
>>> preprocessor = mz.preprocessors.BasicPreprocessor(ngram_size=3)
```

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```
>>> data = preprocessor.fit_transform(data)
>>> callback = Ngram(preprocessor=preprocessor, mode='index')
>>> dataset = mz.dataloader.Dataset(
...     data, callbacks=[callback])
>>> _ = dataset[0]
```

on_batch_unpacked(*self*, *x*, *y*)
Insert *ngram_left* and *ngram_right* to *x*.

matchzoo.dataloader.callbacks.ngram.**_build_word_ngram_map**(*ngram_process_unit: mz.preprocessors.units.NgramLetter*, *ngram_vocab_unit: mz.preprocessors.units.Vocabulary*, *index_term: dict*, *mode: str = 'index'*) → dict
Generate the word to ngram vector mapping.

Parameters

- **ngram_process_unit** – The fitted `NgramLetter` object.
- **ngram_vocab_unit** – The fitted `Vocabulary` object.
- **index_term** – The index to term mapping dict.
- **mode** – It be one of 'index', 'onehot', 'sum' or 'aggregate'.

Returns the word to ngram vector mapping.

matchzoo.dataloader.callbacks.padding

Module Contents

matchzoo.dataloader.callbacks.padding.**_infer_dtype**(*value*)
Infer the dtype for the features.

It is required as the input is usually array of objects before padding.

matchzoo.dataloader.callbacks.padding.**_padding_2D**(*input*, *output*, *mode: str = 'pre'*)
Pad the input 2D-tensor to the output 2D-tensor.

Parameters

- **input** – The input 2D-tensor contains the origin values.
- **output** – The output is a shapped 2D-tensor which have filled with pad value.
- **mode** – The padding model, which can be 'pre' or 'post'.

matchzoo.dataloader.callbacks.padding.**_padding_3D**(*input*, *output*, *mode: str = 'pre'*)
Pad the input 3D-tensor to the output 3D-tensor.

Parameters

- **input** – The input 3D-tensor contains the origin values.
- **output** – The output is a shapped 3D-tensor which have filled with pad value.
- **mode** – The padding model, which can be 'pre' or 'post'.

class matchzoo.dataloader.callbacks.padding.**BasicPadding**(*fixed_length_left: int = None*, *fixed_length_right: int = None*, *pad_word_value: typing.Union[int, str] = 0*, *pad_word_mode: str = 'pre'*, *with_ngram: bool = False*, *fixed_ngram_length: int = None*, *pad_ngram_value: typing.Union[int, str] = 0*, *pad_ngram_mode: str = 'pre'*)

Bases: *matchzoo.engine.base_callback.BaseCallback*

Pad data for basic preprocessor.

Parameters

- **fixed_length_left** – Integer. If set, *text_left* will be padded to this length.
- **fixed_length_right** – Integer. If set, *text_right* will be padded to this length.
- **pad_word_value** – the value to fill text.
- **pad_word_mode** – String, *pre* or *post*: pad either before or after each sequence.
- **with_ngram** – Boolean. Whether to pad the n-grams.
- **fixed_ngram_length** – Integer. If set, each word will be padded to this length, or it will be set as the maximum length of words in current batch.
- **pad_ngram_value** – the value to fill empty n-grams.
- **pad_ngram_mode** – String, *pre* or *post*: pad either before of after each sequence.

on_batch_unpacked(*self*, *x: dict*, *y: np.ndarray*)

Pad *x['text_left']* and *x['text_right]*.

class matchzoo.dataloader.callbacks.padding.**DRMMPadding**(*fixed_length_left: int = None*, *fixed_length_right: int = None*, *pad_value: typing.Union[int, str] = 0*, *pad_mode: str = 'pre'*)

Bases: *matchzoo.engine.base_callback.BaseCallback*

Pad data for DRMM Model.

Parameters

- **fixed_length_left** – Integer. If set, *text_left* and *match_histogram* will be padded to this length.
- **fixed_length_right** – Integer. If set, *text_right* will be padded to this length.
- **pad_value** – the value to fill text.
- **pad_mode** – String, *pre* or *post*: pad either before or after each sequence.

on_batch_unpacked(*self*, *x: dict*, *y: np.ndarray*)

Padding.

Pad *x['text_left']*, *x['text_right]* and *x['match_histogram']*.

class matchzoo.dataloader.callbacks.padding.**BertPadding**(*fixed_length_left: int = None, fixed_length_right: int = None, pad_value: typing.Union[int, str] = 0, pad_mode: str = 'pre'*)

Bases: *matchzoo.engine.base_callback.BaseCallback*

Pad data for bert preprocessor.

Parameters

- **fixed_length_left** – Integer. If set, *text_left* will be padded to this length.
- **fixed_length_right** – Integer. If set, *text_right* will be padded to this length.
- **pad_value** – the value to fill text.
- **pad_mode** – String, *pre* or *post*: pad either before or after each sequence.

on_batch_unpacked(*self*, *x: dict*, *y: np.ndarray*)

Pad *x['text_left']* and *x['text_right']*.

Package Contents

class matchzoo.dataloader.callbacks.**LambdaCallback**(*on_batch_data_pack=None, on_batch_unpacked=None*)

Bases: *matchzoo.engine.base_callback.BaseCallback*

LambdaCallback. Just a shorthand for creating a callback class.

See *matchzoo.engine.base_callback.BaseCallback* for more details.

Example

```
>>> import matchzoo as mz
>>> from matchzoo.dataloader.callbacks import LambdaCallback
>>> data = mz.datasets.toy.load_data()
>>> batch_func = lambda x: print(type(x))
>>> unpack_func = lambda x, y: print(type(x), type(y))
>>> callback = LambdaCallback(on_batch_data_pack=batch_func,
...                           on_batch_unpacked=unpack_func)
>>> dataset = mz.dataloader.Dataset(
...     data, callbacks=[callback])
>>> _ = dataset[0]
<class 'matchzoo.data_pack.data_pack.DataPack'>
<class 'dict'> <class 'numpy.ndarray'>
```

on_batch_data_pack(*self*, *data_pack*)

on_batch_data_pack.

on_batch_unpacked(*self*, *x*, *y*)

on_batch_unpacked.

class matchzoo.dataloader.callbacks.**Histogram**(*embedding_matrix: np.ndarray, bin_size: int = 30, hist_mode: str = 'CH'*)

Bases: *matchzoo.engine.base_callback.BaseCallback*

Generate data with matching histogram.

Parameters

- **embedding_matrix** – The embedding matrix used to generator match histogram.
- **bin_size** – The number of bin size of the histogram.
- **hist_mode** – The mode of the `MatchingHistogramUnit`, one of *CH*, *NH*, and *LCH*.

on_batch_unpacked(*self*, *x*, *y*)
Insert *match_histogram* to *x*.

class matchzoo.dataloader.callbacks.**Ngram**(*preprocessor: mz.preprocessors.BasicPreprocessor*, *mode: str = 'index'*)
Bases: *matchzoo.engine.base_callback.BaseCallback*

Generate the character n-gram for data.

Parameters

- **preprocessor** – The fitted `BasePreprocessor` object, which contains the n-gram units information.
- **mode** – It can be one of 'index', 'onehot', 'sum' or 'aggregate'.

Example

```
>>> import matchzoo as mz
>>> from matchzoo.dataloader.callbacks import Ngram
>>> data = mz.datasets.toy.load_data()
>>> preprocessor = mz.preprocessors.BasicPreprocessor(ngram_size=3)
>>> data = preprocessor.fit_transform(data)
>>> callback = Ngram(preprocessor=preprocessor, mode='index')
>>> dataset = mz.dataloader.Dataset(
...     data, callbacks=[callback])
>>> _ = dataset[0]
```

on_batch_unpacked(*self*, *x*, *y*)
Insert *ngram_left* and *ngram_right* to *x*.

class matchzoo.dataloader.callbacks.**BasicPadding**(*fixed_length_left: int = None*, *fixed_length_right: int = None*, *pad_word_value: typing.Union[int, str] = 0*, *pad_word_mode: str = 'pre'*, *with_ngram: bool = False*, *fixed_ngram_length: int = None*, *pad_ngram_value: typing.Union[int, str] = 0*, *pad_ngram_mode: str = 'pre'*)
Bases: *matchzoo.engine.base_callback.BaseCallback*

Pad data for basic preprocessor.

Parameters

- **fixed_length_left** – Integer. If set, *text_left* will be padded to this length.
- **fixed_length_right** – Integer. If set, *text_right* will be padded to this length.
- **pad_word_value** – the value to fill text.
- **pad_word_mode** – String, *pre* or *post*: pad either before or after each sequence.
- **with_ngram** – Boolean. Whether to pad the n-grams.

- **fixed_ngram_length** – Integer. If set, each word will be padded to this length, or it will be set as the maximum length of words in current batch.
- **pad_ngram_value** – the value to fill empty n-grams.
- **pad_ngram_mode** – String, *pre* or *post*: pad either before of after each sequence.

on_batch_unpacked(*self*, *x: dict*, *y: np.ndarray*)
Pad *x['text_left']* and *x['text_right]*.

class matchzoo.dataloader.callbacks.**DRMMPadding**(*fixed_length_left: int = None*, *fixed_length_right: int = None*, *pad_value: typing.Union[int, str] = 0*, *pad_mode: str = 'pre'*)
Bases: *matchzoo.engine.base_callback.BaseCallback*

Pad data for DRMM Model.

Parameters

- **fixed_length_left** – Integer. If set, *text_left* and *match_histogram* will be padded to this length.
- **fixed_length_right** – Integer. If set, *text_right* will be padded to this length.
- **pad_value** – the value to fill text.
- **pad_mode** – String, *pre* or *post*: pad either before or after each sequence.

on_batch_unpacked(*self*, *x: dict*, *y: np.ndarray*)
Padding.

Pad *x['text_left']*, *x['text_right]* and *x['match_histogram']*.

class matchzoo.dataloader.callbacks.**BertPadding**(*fixed_length_left: int = None*, *fixed_length_right: int = None*, *pad_value: typing.Union[int, str] = 0*, *pad_mode: str = 'pre'*)
Bases: *matchzoo.engine.base_callback.BaseCallback*

Pad data for bert preprocessor.

Parameters

- **fixed_length_left** – Integer. If set, *text_left* will be padded to this length.
- **fixed_length_right** – Integer. If set, *text_right* will be padded to this length.
- **pad_value** – the value to fill text.
- **pad_mode** – String, *pre* or *post*: pad either before or after each sequence.

on_batch_unpacked(*self*, *x: dict*, *y: np.ndarray*)
Pad *x['text_left']* and *x['text_right]*.

Submodules

matchzoo.dataloader.dataloader

Basic data loader.

Module Contents

class matchzoo.dataloader.dataloader.**DataLoader**(*dataset: Dataset*, *device: typing.Union[torch.device, int, list, None] = None*, *stage='train'*, *callback: BaseCallback = None*, *pin_memory: bool = False*, *timeout: int = 0*, *num_workers: int = 0*, *worker_init_fn=None*)

Bases: `object`

DataLoader that loads batches of data from a Dataset.

Parameters

- **dataset** – The Dataset object to load data from.
- **device** – The desired device of returned tensor. Default: if None, use the current device. If *torch.device* or int, use device specified by user. If list, the first item will be used.
- **stage** – One of "train", "dev", and "test". (default: "train")
- **callback** – BaseCallback. See *matchzoo.engine.base_callback.BaseCallback* for more details.
- **pin_momory** – If set to *True*, tensors will be copied into pinned memory. (default: *False*)
- **timeout** – The timeout value for collecting a batch from workers. (default: 0)
- **num_workers** – The number of subprocesses to use for data loading. 0 means that the data will be loaded in the main process. (default: 0)
- **worker_init_fn** – If not `None`, this will be called on each worker subprocess with the worker id (an int in [0, num_workers - 1]) as input, after seeding and before data loading. (default: None)

Examples

```
>>> import matchzoo as mz
>>> data_pack = mz.datasets.toy.load_data(stage='train')
>>> preprocessor = mz.preprocessors.BasicPreprocessor()
>>> data_processed = preprocessor.fit_transform(data_pack)
>>> dataset = mz.dataloader.Dataset(
...     data_processed, mode='point', batch_size=32)
>>> padding_callback = mz.dataloader.callbacks.BasicPadding()
>>> dataloader = mz.dataloader.DataLoader(
...     dataset, stage='train', callback=padding_callback)
>>> len(dataloader)
4
```

id_left :np.ndarray
id_left getter.

label :np.ndarray
label getter.

__len__(*self*)
Get the total number of batches.

__iter__(*self*)
Iteration.

_handle_callbacks_on_batch_unpacked(*self*, *x*, *y*)

matchzoo.dataloader.dataloader_builder

Module Contents

class matchzoo.dataloader.dataloader_builder.**DataLoaderBuilder**(***kwargs*)

Bases: object

DataLoader Bulider. In essense a wrapped partial function.

Example

```
>>> import matchzoo as mz
>>> padding_callback = mz.dataloader.callbacks.BasicPadding()
>>> builder = mz.dataloader.DataLoaderBuilder(
...     stage='train', callback=padding_callback
... )
>>> data_pack = mz.datasets.toy.load_data()
>>> preprocessor = mz.preprocessors.BasicPreprocessor()
>>> data_processed = preprocessor.fit_transform(data_pack)
>>> dataset = mz.dataloader.Dataset(data_processed, mode='point')
>>> dataloder = builder.build(dataset)
>>> type(dataloder)
<class 'matchzoo.dataloader.dataloader.DataLoader'>
```

build(*self*, *dataset*, ***kwargs*)

Build a DataLoader.

Parameters

- **dataset** – Dataset to build upon.
- **kwargs** – Additional keyword arguments to override the keyword arguments passed in *__init__*.

matchzoo.dataloader.dataset

A basic class representing a Dataset.

Module Contents

class matchzoo.dataloader.dataset.**Dataset**(*data_pack: mz.DataPack*, *mode='point'*, *num_dup: int = 1*, *num_neg: int = 1*, *batch_size: int = 32*, *resample: bool = False*, *shuffle: bool = True*, *sort: bool = False*, *callbacks: typing.List[BaseCallback] = None*)

Bases: torch.utils.data.IterableDataset

Dataset that is built from a data pack.

Parameters

- **data_pack** – DataPack to build the dataset.

- **mode** – One of "point", "pair", and "list". (default: "point")
- **num_dup** – Number of duplications per instance, only effective when *mode* is "pair". (default: 1)
- **num_neg** – Number of negative samples per instance, only effective when *mode* is "pair". (default: 1)
- **batch_size** – Batch size. (default: 32)
- **resample** – Either to resample for each epoch, only effective when *mode* is "pair". (default: *True*)
- **shuffle** – Either to shuffle the samples/instances. (default: *True*)
- **sort** – Whether to sort data according to length_right. (default: *False*)
- **callbacks** – Callbacks. See *matchzoo.dataloader.callbacks* for more details.

Examples

```
>>> import matchzoo as mz
>>> data_pack = mz.datasets.toy.load_data(stage='train')
>>> preprocessor = mz.preprocessors.BasicPreprocessor()
>>> data_processed = preprocessor.fit_transform(data_pack)
>>> dataset_point = mz.dataloader.Dataset(
...     data_processed, mode='point', batch_size=32)
>>> len(dataset_point)
4
>>> dataset_pair = mz.dataloader.Dataset(
...     data_processed, mode='pair', num_dup=2, num_neg=2, batch_size=32)
>>> len(dataset_pair)
1
```

callbacks
callbacks getter.

num_neg
num_neg getter.

num_dup
num_dup getter.

mode
mode getter.

batch_size
batch_size getter.

shuffle
shuffle getter.

sort
sort getter.

resample
resample getter.

batch_indices
batch_indices getter.

__getitem__(*self*, *item*)
Get a batch from index idx.

Parameters **item** – the index of the batch.

__len__(*self*)
Get the total number of batches.

__iter__(*self*)
Create a generator that iterate over the Batches.

on_epoch_end(*self*)
Reorganize the index array if needed.

resample_data(*self*)
Reorganize data.

reset_index(*self*)
Set the `_batch_indices`.

Here the `_batch_indices` records the index of all the instances.

_handle_callbacks_on_batch_data_pack(*self*, *batch_data_pack*)

_handle_callbacks_on_batch_unpacked(*self*, *x*, *y*)

classmethod _reorganize_pair_wise(*cls*, *relation: pd.DataFrame*, *num_dup: int = 1*, *num_neg: int = 1*)
Re-organize the data pack as pair-wise format.

matchzoo.dataloader.dataset_builder

Module Contents

class matchzoo.dataloader.dataset_builder.**DatasetBuilder**(***kwargs*)
Bases: `object`

Dataset Bulider. In essense a wrapped partial function.

Example

```
>>> import matchzoo as mz
>>> builder = mz.dataloader.DatasetBuilder(
...     mode='point'
... )
>>> data = mz.datasets.toy.load_data()
>>> gen = builder.build(data)
>>> type(gen)
<class 'matchzoo.dataloader.dataset.Dataset'>
```

build(*self*, *data_pack*, ***kwargs*)
Build a Dataset.

Parameters

- **data_pack** – DataPack to build upon.
- **kwargs** – Additional keyword arguments to override the keyword arguments passed in *__init__*.

Package Contents

class matchzoo.dataloader.**Dataset**(*data_pack: mz.DataPack*, *mode='point'*, *num_dup: int = 1*, *num_neg: int = 1*, *batch_size: int = 32*, *resample: bool = False*, *shuffle: bool = True*, *sort: bool = False*, *callbacks: typing.List[BaseCallback] = None*)

Bases: torch.utils.data.IterableDataset

Dataset that is built from a data pack.

Parameters

- **data_pack** – DataPack to build the dataset.
- **mode** – One of "point", "pair", and "list". (default: "point")
- **num_dup** – Number of duplications per instance, only effective when *mode* is "pair". (default: 1)
- **num_neg** – Number of negative samples per instance, only effective when *mode* is "pair". (default: 1)
- **batch_size** – Batch size. (default: 32)
- **resample** – Either to resample for each epoch, only effective when *mode* is "pair". (default: *True*)
- **shuffle** – Either to shuffle the samples/instances. (default: *True*)
- **sort** – Whether to sort data according to length_right. (default: *False*)
- **callbacks** – Callbacks. See *matchzoo.dataloader.callbacks* for more details.

Examples

```
>>> import matchzoo as mz
>>> data_pack = mz.datasets.toy.load_data(stage='train')
>>> preprocessor = mz.preprocessors.BasicPreprocessor()
>>> data_processed = preprocessor.fit_transform(data_pack)
>>> dataset_point = mz.dataloader.Dataset(
...     data_processed, mode='point', batch_size=32)
>>> len(dataset_point)
4
>>> dataset_pair = mz.dataloader.Dataset(
...     data_processed, mode='pair', num_dup=2, num_neg=2, batch_size=32)
>>> len(dataset_pair)
1
```

callbacks
callbacks getter.

num_neg
num_neg getter.

num_dup
num_dup getter.

mode
mode getter.

batch_size
batch_size getter.

shuffle
shuffle getter.

sort
sort getter.

resample
resample getter.

batch_indices
batch_indices getter.

__getitem__(*self*, *item*)
Get a batch from index idx.

Parameters **item** – the index of the batch.

__len__(*self*)
Get the total number of batches.

__iter__(*self*)
Create a generator that iterate over the Batches.

on_epoch_end(*self*)
Reorganize the index array if needed.

resample_data(*self*)
Reorganize data.

reset_index(*self*)
Set the `_batch_indices`.

Here the `_batch_indices` records the index of all the instances.

_handle_callbacks_on_batch_data_pack(*self*, *batch_data_pack*)

_handle_callbacks_on_batch_unpacked(*self*, *x*, *y*)

classmethod _reorganize_pair_wise(*cls*, *relation: pd.DataFrame*, *num_dup: int = 1*, *num_neg: int = 1*)
Re-organize the data pack as pair-wise format.

class matchzoo.dataloader.**DataLoader**(*dataset: Dataset*, *device: typing.Union[torch.device, int, list, None] = None*, *stage='train'*, *callback: BaseCallback = None*, *pin_memory: bool = False*, *timeout: int = 0*, *num_workers: int = 0*, *worker_init_fn=None*)

Bases: `object`

DataLoader that loads batches of data from a Dataset.

Parameters

- **dataset** – The Dataset object to load data from.
- **device** – The desired device of returned tensor. Default: if None, use the current device. If *torch.device* or int, use device specified by user. If list, the first item will be used.
- **stage** – One of "train", "dev", and "test". (default: "train")
- **callback** – BaseCallback. See *matchzoo.engine.base_callback.BaseCallback* for more details.
- **pin_momory** – If set to *True*, tensors will be copied into pinned memory. (default: *False*)

- **timeout** – The timeout value for collecting a batch from workers. (default: 0)
- **num_workers** – The number of subprocesses to use for data loading. 0 means that the data will be loaded in the main process. (default: 0)
- **worker_init_fn** – If not `None`, this will be called on each worker subprocess with the worker id (an int in [0, num_workers - 1]) as input, after seeding and before data loading. (default: None)

Examples

```
>>> import matchzoo as mz
>>> data_pack = mz.datasets.toy.load_data(stage='train')
>>> preprocessor = mz.preprocessors.BasicPreprocessor()
>>> data_processed = preprocessor.fit_transform(data_pack)
>>> dataset = mz.dataloader.Dataset(
...     data_processed, mode='point', batch_size=32)
>>> padding_callback = mz.dataloader.callbacks.BasicPadding()
>>> dataloader = mz.dataloader.DataLoader(
...     dataset, stage='train', callback=padding_callback)
>>> len(dataloader)
4
```

id_left :np.ndarray
id_left getter.

label :np.ndarray
label getter.

__len__(*self*)
Get the total number of batches.

__iter__(*self*)
Iteration.

_handle_callbacks_on_batch_unpacked(*self*, *x*, *y*)

class matchzoo.dataloader.**DataLoaderBuilder**(***kwargs*)
Bases: `object`

DataLoader Bulider. In essense a wrapped partial function.

Example

```
>>> import matchzoo as mz
>>> padding_callback = mz.dataloader.callbacks.BasicPadding()
>>> builder = mz.dataloader.DataLoaderBuilder(
...     stage='train', callback=padding_callback
... )
>>> data_pack = mz.datasets.toy.load_data()
>>> preprocessor = mz.preprocessors.BasicPreprocessor()
>>> data_processed = preprocessor.fit_transform(data_pack)
>>> dataset = mz.dataloader.Dataset(data_processed, mode='point')
>>> dataloder = builder.build(dataset)
>>> type(dataloder)
<class 'matchzoo.dataloader.dataloader.DataLoader'>
```

build(*self*, *dataset*, ***kwargs*)
Build a DataLoader.

Parameters

- **dataset** – Dataset to build upon.
- **kwargs** – Additional keyword arguments to override the keyword arguments passed in *__init__*.

class matchzoo.dataloader.**DatasetBuilder**(***kwargs*)
Bases: object

Dataset Bulider. In essense a wrapped partial function.

Example

```
>>> import matchzoo as mz
>>> builder = mz.dataloader.DatasetBuilder(
...     mode='point'
... )
>>> data = mz.datasets.toy.load_data()
>>> gen = builder.build(data)
>>> type(gen)
<class 'matchzoo.dataloader.dataset.Dataset'>
```

build(*self*, *data_pack*, ***kwargs*)
Build a Dataset.

Parameters

- **data_pack** – DataPack to build upon.
- **kwargs** – Additional keyword arguments to override the keyword arguments passed in *__init__*.

matchzoo.datasets

Subpackages

matchzoo.datasets.embeddings

Submodules

matchzoo.datasets.embeddings.load_fasttext_embedding

FastText embedding data loader.

Module Contents

matchzoo.datasets.embeddings.load_fasttext_embedding.**_fasttext_embedding_url = https://dl.**

matchzoo.datasets.embeddings.load_fasttext_embedding.**load_fasttext_embedding**(*language: str = 'en'*) → mz.embedding.Emb

Return the pretrained fasttext embedding.

Parameters **language** – the language of embedding. Supported language can be referred to "https://github.com/facebookresearch/fastText/blob/master" "/docs/pretrained-vectors.md"

Returns The `mz.embedding.Embedding` object.

matchzoo.datasets.embeddings.load_glove_embedding

GloVe Embedding data loader.

Module Contents

matchzoo.datasets.embeddings.load_glove_embedding.**_glove_embedding_url = http://nlp.stanfo**

matchzoo.datasets.embeddings.load_glove_embedding.**load_glove_embedding**(*dimension: int = 50*) → mz.embedding.Embedding

Return the pretrained glove embedding.

Parameters **dimension** – the size of embedding dimension, the value can only be 50, 100, or 300.

Returns The `mz.embedding.Embedding` object.

Package Contents

matchzoo.datasets.embeddings.**load_glove_embedding**(*dimension: int = 50*) → mz.embedding.Embedding

Return the pretrained glove embedding.

Parameters **dimension** – the size of embedding dimension, the value can only be 50, 100, or 300.

Returns The `mz.embedding.Embedding` object.

matchzoo.datasets.embeddings.**load_fasttext_embedding**(*language: str = 'en'*) → mz.embedding.Embedding

Return the pretrained fasttext embedding.

Parameters **language** – the language of embedding. Supported language can be referred to "https://github.com/facebookresearch/fastText/blob/master" "/docs/pretrained-vectors.md"

Returns The `mz.embedding.Embedding` object.

matchzoo.datasets.embeddings.**DATA_ROOT**

matchzoo.datasets.embeddings.**EMBED_RANK**

matchzoo.datasets.embeddings.**EMBED_10**

matchzoo.datasets.embeddings.**EMBED_10_GLOVE**

matchzoo.datasets.quora_qp

Submodules

matchzoo.datasets.quora_qp.load_data

Quora Question Pairs data loader.

Module Contents

matchzoo.datasets.quora_qp.load_data.**_url = https://firebasestorage.googleapis.com/v0/b/mtl**

matchzoo.datasets.quora_qp.load_data.**load_data**(*stage: str = 'train'*, *task: typing.Union[str, BaseTask] = 'classification'*, *return_classes: bool = False*) → typing.Union[matchzoo.DataPack, tuple]

Load QuoraQP data.

Parameters

- **path** – *None* for download from quora, specific path for downloaded data.
- **stage** – One of *train*, *dev*, and *test*.
- **task** – Could be one of *ranking*, *classification* or a `matchzoo.engine.BaseTask` instance.
- **return_classes** – Whether return classes for classification task.

Returns A DataPack if *ranking*, a tuple of (DataPack, classes) if *classification*.

matchzoo.datasets.quora_qp.load_data.**_download_data**()

matchzoo.datasets.quora_qp.load_data.**_read_data**(*path*, *stage*, *task*)

Package Contents

matchzoo.datasets.quora_qp.**load_data**(*stage: str = 'train'*, *task: typing.Union[str, BaseTask] = 'classification'*, *return_classes: bool = False*) → typing.Union[matchzoo.DataPack, tuple]

Load QuoraQP data.

Parameters

- **path** – *None* for download from quora, specific path for downloaded data.
- **stage** – One of *train*, *dev*, and *test*.
- **task** – Could be one of *ranking*, *classification* or a `matchzoo.engine.BaseTask` instance.
- **return_classes** – Whether return classes for classification task.

Returns A DataPack if *ranking*, a tuple of (DataPack, classes) if *classification*.

matchzoo.datasets.snli

Submodules

matchzoo.datasets.snli.load_data

SNLI data loader.

Module Contents

matchzoo.datasets.snli.load_data.**_url = https://nlp.stanford.edu/projects/snli/snli_1.0.zip**

matchzoo.datasets.snli.load_data.**load_data**(*stage: str = 'train'*, *task: typing.Union[str, BaseTask] = 'classification'*, *target_label: str = 'entailment'*, *return_classes: bool = False*) → typing.Union[matchzoo.DataPack, tuple]

Load SNLI data.

Parameters

- **stage** – One of *train*, *dev*, and *test*. (default: *train*)
- **task** – Could be one of *ranking*, *classification* or a `matchzoo.engine.BaseTask` instance. (default: *classification*)
- **target_label** – If *ranking*, chose one of *entailment*, *contradiction* and *neutral* as the positive label. (default: *entailment*)
- **return_classes** – *True* to return classes for classification task, *False* otherwise.

Returns A DataPack unless *task* is *classificiation* and *return_classes* is *True*: a tuple of *(DataPack, classes)* in that case.

matchzoo.datasets.snli.load_data.**_download_data**()

matchzoo.datasets.snli.load_data.**_read_data**(*path*, *task*, *target_label*)

Package Contents

matchzoo.datasets.snli.**load_data**(*stage: str = 'train'*, *task: typing.Union[str, BaseTask] = 'classification'*, *target_label: str = 'entailment'*, *return_classes: bool = False*) → typing.Union[matchzoo.DataPack, tuple]

Load SNLI data.

Parameters

- **stage** – One of *train*, *dev*, and *test*. (default: *train*)
- **task** – Could be one of *ranking*, *classification* or a `matchzoo.engine.BaseTask` instance. (default: *classification*)
- **target_label** – If *ranking*, chose one of *entailment*, *contradiction* and *neutral* as the positive label. (default: *entailment*)
- **return_classes** – *True* to return classes for classification task, *False* otherwise.

Returns A DataPack unless *task* is *classificiation* and *return_classes* is *True*: a tuple of *(DataPack, classes)* in that case.

matchzoo.datasets.toy

Package Contents

class matchzoo.datasets.toy.**BaseTask**(*losses=None*, *metrics=None*)

Bases: abc.ABC

Base Task, shouldn't be used directly.

TYPE = base

losses

Losses used in the task.

Type return

metrics

Metrics used in the task.

Type return

output_shape :tuple

output shape of a single sample of the task.

Type return

output_dtype

output data type for specific task.

Type return

_convert(*self*, *identifiers*, *parse*)

_assure_losses(*self*)

_assure_metrics(*self*)

classmethod list_available_losses(*cls*)

Returns a list of available losses.

classmethod list_available_metrics(*cls*)

Returns a list of available metrics.

matchzoo.datasets.toy.**load_data**(*stage: str = 'train'*, *task: typing.Union[str, BaseTask] = 'ranking'*, *return_classes: bool = False*) → typing.Union[matchzoo.DataPack, typing.Tuple[matchzoo.DataPack, list]]

Load toy data.

Parameters

- **stage** – One of *train*, *dev*, and *test*.
- **task** – Could be one of *ranking*, *classification* or a matchzoo.engine.BaseTask instance.
- **return_classes** – *True* to return classes for classification task, *False* otherwise.

Returns A DataPack unless *task* is *classificiation* and *return_classes* is *True*: a tuple of *(DataPack, classes)* in that case.

Example

```
>>> import matchzoo as mz
>>> stages = 'train', 'dev', 'test'
>>> tasks = 'ranking', 'classification'
>>> for stage in stages:
...     for task in tasks:
...         _ = mz.datasets.toy.load_data(stage, task)
```

matchzoo.datasets.toy.**load_embedding**()

matchzoo.datasets.wiki_qa

Submodules

matchzoo.datasets.wiki_qa.load_data

WikiQA data loader.

Module Contents

matchzoo.datasets.wiki_qa.load_data.**_url = https://download.microsoft.com/download/E/5/F/E5**

matchzoo.datasets.wiki_qa.load_data.**load_data**(*stage: str = 'train'*, *task: typing.Union[str, BaseTask] = 'ranking'*, *filtered: bool = False*, *return_classes: bool = False*) → typing.Union[matchzoo.DataPack, tuple]

Load WikiQA data.

Parameters

- **stage** – One of *train*, *dev*, and *test*.
- **task** – Could be one of *ranking*, *classification* or a matchzoo.engine.BaseTask instance.
- **filtered** – Whether remove the questions without correct answers.
- **return_classes** – *True* to return classes for classification task, *False* otherwise.

Returns A DataPack unless *task* is *classificiation* and *return_classes* is *True*: a tuple of *(DataPack, classes)* in that case.

matchzoo.datasets.wiki_qa.load_data.**_download_data**()

matchzoo.datasets.wiki_qa.load_data.**_read_data**(*path*, *task*)

Package Contents

matchzoo.datasets.wiki_qa.**load_data**(*stage: str = 'train'*, *task: typing.Union[str, BaseTask] = 'ranking'*, *filtered: bool = False*, *return_classes: bool = False*) → typing.Union[matchzoo.DataPack, tuple]

Load WikiQA data.

Parameters

- **stage** – One of *train*, *dev*, and *test*.
- **task** – Could be one of *ranking*, *classification* or a `matchzoo.engine.BaseTask` instance.
- **filtered** – Whether remove the questions without correct answers.
- **return_classes** – *True* to return classes for classification task, *False* otherwise.

Returns A DataPack unless *task* is *classificiation* and *return_classes* is *True*: a tuple of *(DataPack, classes)* in that case.

Package Contents

`matchzoo.datasets.list_available()`

matchzoo.embedding

Submodules

matchzoo.embedding.embedding

Matchzoo toolkit for token embedding.

Module Contents

class `matchzoo.embedding.embedding.Embedding`(*data: dict*, *output_dim: int*)

Bases: `object`

Embedding class.

Examples::

```
>>> import matchzoo as mz
>>> train_raw = mz.datasets.toy.load_data()
>>> pp = mz.preprocessors.NaivePreprocessor()
>>> train = pp.fit_transform(train_raw, verbose=0)
>>> vocab_unit = mz.build_vocab_unit(train, verbose=0)
>>> term_index = vocab_unit.state['term_index']
>>> embed_path = mz.datasets.embeddings.EMBED_RANK
```

To load from a file:

```
>>> embedding = mz.embedding.load_from_file(embed_path)
>>> matrix = embedding.build_matrix(term_index)
>>> matrix.shape[0] == len(term_index)
True
```

To build your own:

```
>>> data = {'A':[0, 1], 'B':[2, 3]}
>>> embedding = mz.Embedding(data, 2)
>>> matrix = embedding.build_matrix({'A': 2, 'B': 1, '_PAD': 0})
>>> matrix.shape == (3, 2)
True
```

build_matrix(*self, term_index: typing.Union[dict, mz.preprocessors.units.Vocabulary.TermIndex]*)
Build a matrix using *term_index*.

Parameters

- **term_index** – A *dict* or *TermIndex* to build with.
- **initializer** – A callable that returns a default value for missing terms in data. (default: a random uniform distribution in range) *(-0.2, 0.2)*).

Returns A matrix.

matchzoo.embedding.embedding.**load_from_file**(*file_path: str*, *mode: str = 'word2vec'*) → Embedding
Load embedding from *file_path*.

Parameters

- **file_path** – Path to file.
- **mode** – Embedding file format mode, one of 'word2vec', 'fasttext' or 'glove'.(default: 'word2vec')

Returns An *matchzoo.embedding.Embedding* instance.

Package Contents

class matchzoo.embedding.**Embedding**(*data: dict*, *output_dim: int*)
Bases: object

Embedding class.

Examples::

```
>>> import matchzoo as mz
>>> train_raw = mz.datasets.toy.load_data()
>>> pp = mz.preprocessors.NaivePreprocessor()
>>> train = pp.fit_transform(train_raw, verbose=0)
>>> vocab_unit = mz.build_vocab_unit(train, verbose=0)
>>> term_index = vocab_unit.state['term_index']
>>> embed_path = mz.datasets.embeddings.EMBED_RANK
```

To load from a file:

```
>>> embedding = mz.embedding.load_from_file(embed_path)
>>> matrix = embedding.build_matrix(term_index)
>>> matrix.shape[0] == len(term_index)
True
```

To build your own:

```
>>> data = {'A':[0, 1], 'B':[2, 3]}
>>> embedding = mz.Embedding(data, 2)
>>> matrix = embedding.build_matrix({'A': 2, 'B': 1, '_PAD': 0})
>>> matrix.shape == (3, 2)
True
```

build_matrix(*self, term_index: typing.Union[dict, mz.preprocessors.units.Vocabulary.TermIndex]*)
Build a matrix using *term_index*.

Parameters

- **term_index** – A *dict* or *TermIndex* to build with.
- **initializer** – A callable that returns a default value for missing terms in data. (default: a random uniform distribution in range) *(-0.2, 0.2)*).

Returns A matrix.

matchzoo.embedding.**load_from_file**(*file_path: str*, *mode: str = 'word2vec'*) → Embedding
Load embedding from *file_path*.

Parameters

- **file_path** – Path to file.
- **mode** – Embedding file format mode, one of 'word2vec', 'fasttext' or 'glove'.(default: 'word2vec')

Returns An *matchzoo.embedding.Embedding* instance.

matchzoo.engine

Submodules

matchzoo.engine.base_callback

Base callback.

Module Contents

class matchzoo.engine.base_callback.**BaseCallback**
Bases: abc.ABC

DataGenerator callback base class.

To build your own callbacks, inherit *mz.data_generator.callbacks.Callback* and overrides corresponding methods.

A batch is processed in the following way:

- slice data pack based on batch index
- handle *on_batch_data_pack* callbacks
- unpack data pack into x, y
- handle *on_batch_x_y* callbacks
- return x, y

on_batch_data_pack(*self*, *data_pack: mz.DataPack*)
on_batch_data_pack.

Parameters **data_pack** – a sliced DataPack before unpacking.

on_batch_unpacked(*self*, *x: dict*, *y: np.ndarray*)
on_batch_unpacked.

Parameters

- **x** – unpacked x.
- **y** – unpacked y.

matchzoo.engine.base_metric

Metric base class and some related utilities.

Module Contents

class matchzoo.engine.base_metric.**BaseMetric**
Bases: abc.ABC

Metric base class.

ALIAS = base_metric

__call__(*self*, *y_true: np.array*, *y_pred: np.array*)
Call to compute the metric.

Parameters

- **y_true** – An array of groud truth labels.
- **y_pred** – An array of predicted values.

Returns Evaluation of the metric.

__repr__(*self*)

Returns Formated string representation of the metric.

__eq__(*self*, *other*)

Returns *True* if two metrics are equal, *False* otherwise.

__hash__(*self*)

Returns Hashing value using the metric as *str*.

class matchzoo.engine.base_metric.**RankingMetric**
Bases: *matchzoo.engine.base_metric.BaseMetric*

Ranking metric base class.

ALIAS = ranking_metric

class matchzoo.engine.base_metric.**ClassificationMetric**
Bases: *matchzoo.engine.base_metric.BaseMetric*

Rangking metric base class.

ALIAS = classification_metric

matchzoo.engine.base_metric.**sort_and_couple**(*labels: np.array*, *scores: np.array*) → np.array

Zip the *labels* with *scores* into a single list.

matchzoo.engine.base_model

Base Model.

Module Contents

class matchzoo.engine.base_model.**BaseModel**(*params: typing.Optional[ParamTable] = None*)

Bases: torch.nn.Module, abc.ABC

Abstract base class of all MatchZoo models.

MatchZoo models are wrapped over pytorch models. *params* is a set of model hyper-parameters that deterministically builds a model. In other words, *params['model_class'](params=params)* of the same *params* always create models with the same structure.

Parameters **params** – Model hyper-parameters. (default: return value from *get_default_params()*)

Example

```
>>> BaseModel()  # doctest: +ELLIPSIS
Traceback (most recent call last):
...
TypeError: Can't instantiate abstract class BaseModel ...
>>> class MyModel(BaseModel):
...     def build(self):
...         pass
...     def forward(self):
...         pass
>>> isinstance(MyModel(), BaseModel)
True
```

params :ParamTable

model parameters.

Type return

classmethod **get_default_params**(*cls*, *with_embedding=False*, *with_multi_layer_perceptron=False*)

Model default parameters.

The common usage is to instantiate **matchzoo.engine.ModelParams** first, then set the model specific parametrs.

Examples

```
>>> class MyModel(BaseModel):
...     def build(self):
...         print(self._params['num_eggs'], 'eggs')
...         print('and', self._params['ham_type'])
...     def forward(self, greeting):
...         print(greeting)
...
...     @classmethod
...     def get_default_params(cls):
...         params = ParamTable()
...         params.add(Param('num_eggs', 512))
...         params.add(Param('ham_type', 'Parma Ham'))
...         return params
```

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```
>>> my_model = MyModel()
>>> my_model.build()
512 eggs
and Parma Ham
>>> my_model('Hello MatchZoo!')
Hello MatchZoo!
```

Notice that all parameters must be serialisable for the entire model to be serialisable. Therefore, it's strongly recommended to use python native data types to store parameters.

Returns model parameters

guess_and_fill_missing_params(*self*, *verbose=1*)

Guess and fill missing parameters in *params*.

Use this method to automatically fill-in other hyper parameters. This involves some guessing so the parameter it fills could be wrong. For example, the default task is *Ranking*, and if we do not set it to *Classification* manaully for data packs prepared for classification, then the shape of the model output and the data will mismatch.

Parameters **verbose** – Verbosity.

_set_param_default(*self*, *name: str*, *default_val: str*, *verbose: int = 0*)

classmethod get_default_preprocessor(*cls*, *truncated_mode: str = 'pre'*, *truncated_length_left: typing.Optional[int] = None*, *truncated_length_right: typing.Optional[int] = None*, *filter_mode: str = 'df'*, *filter_low_freq: float = 1*, *filter_high_freq: float = float('inf')*, *remove_stop_words: bool = False*, *ngram_size: typing.Optional[int] = None*)

Model default preprocessor.

The preprocessor's transform should produce a correctly shaped data pack that can be used for training.

Returns Default preprocessor.

classmethod get_default_padding_callback(*cls*, *fixed_length_left: int = None*, *fixed_length_right: int = None*, *pad_word_value: typing.Union[int, str] = 0*, *pad_word_mode: str = 'pre'*, *with_ngram: bool = False*, *fixed_ngram_length: int = None*, *pad_ngram_value: typing.Union[int, str] = 0*, *pad_ngram_mode: str = 'pre'*)

Model default padding callback.

The padding callback's on_batch_unpacked would pad a batch of data to a fixed length.

Returns Default padding callback.

build(*self*)

Build model, each subclass need to implement this method.

forward(*self*, **input*)

Defines the computation performed at every call.

Should be overridden by all subclasses.

_make_embedding_layer(*self*, *num_embeddings: int = 0*, *embedding_dim: int = 0*, *freeze: bool = True*, *embedding: typing.Optional[np.ndarray] = None*, ***kwargs*)

Returns an embedding module.

_make_default_embedding_layer(*self*, ***kwargs*)

Returns an embedding module.

_make_output_layer(*self*, *in_features: int = 0*)

Returns a correctly shaped torch module for model output.

_make_perceptron_layer(*self*, *in_features: int = 0*, *out_features: int = 0*, *activation: nn.Module = nn.ReLU()*)

Returns a perceptron layer.

_make_multi_layer_perceptron_layer(*self*, *in_features*)

Returns a multiple layer perceptron.

matchzoo.engine.base_preprocessor

BasePreprocessor define input and ouutput for processors.

Module Contents

matchzoo.engine.base_preprocessor.**validate_context**(*func*)
Validate context in the preprocessor.

class matchzoo.engine.base_preprocessor.**BasePreprocessor**
BasePreprocessor to input handle data.

A preprocessor should be used in two steps. First, *fit*, then, *transform*. *fit* collects information into *context*, which includes everything the preprocessor needs to *transform* together with other useful information for later use. *fit* will only change the preprocessor's inner state but not the input data. In contrast, *transform* returns a modified copy of the input data without changing the preprocessor's inner state.

DATA_FILENAME = preprocessor.dill

context
Return context.

fit(*self*, *data_pack: mz.DataPack*, *verbose: int = 1*)
Fit parameters on input data.

This method is an abstract base method, need to be implemented in the child class.

This method is expected to return itself as a callable object.

Parameters

- **data_pack** – Datapack object to be fitted.
- **verbose** – Verbosity.

transform(*self*, *data_pack: mz.DataPack*, *verbose: int = 1*)
Transform input data to expected manner.

This method is an abstract base method, need to be implemented in the child class.

Parameters

- **data_pack** – DataPack object to be transformed.
- **verbose** – Verbosity. or list of text-left, text-right tuples.

fit_transform(*self*, *data_pack: mz.DataPack*, *verbose: int = 1*)
Call fit-transform.

Parameters

- **data_pack** – DataPack object to be processed.
- **verbose** – Verbosity.

save(*self, dirpath: typing.Union[str, Path]*)
Save the DSSMPreprocessor object.

A saved DSSMPreprocessor is represented as a directory with the *context* object (fitted parameters on training data), it will be saved by *pickle*.

Parameters **dirpath** – directory path of the saved DSSMPreprocessor.

classmethod _default_units(*cls*)
Prepare needed process units.

matchzoo.engine.base_preprocessor.**load_preprocessor**(*dirpath: typing.Union[str, Path]*) → 'mz.DataPack'
Load the fitted *context*. The reverse function of save().

Parameters **dirpath** – directory path of the saved model.

Returns a DSSMPreprocessor instance.

matchzoo.engine.base_task

Base task.

Module Contents

class matchzoo.engine.base_task.**BaseTask**(*losses=None*, *metrics=None*)
Bases: abc.ABC

Base Task, shouldn't be used directly.

TYPE = base

losses
Losses used in the task.

Type return

metrics
Metrics used in the task.

Type return

output_shape :tuple
output shape of a single sample of the task.

Type return

output_dtype
output data type for specific task.

Type return

_convert(*self*, *identifiers*, *parse*)

_assure_losses(*self*)

_assure_metrics(*self*)

classmethod list_available_losses(*cls*)

Returns a list of available losses.

classmethod list_available_metrics(*cls*)

Returns a list of available metrics.

matchzoo.engine.hyper_spaces

Hyper parameter search spaces wrapping *hyperopt*.

Module Contents

class matchzoo.engine.hyper_spaces.**HyperoptProxy**(*hyperopt_func: typing.Callable[..., hyperopt.pyll.Apply], **kwargs*)

Bases: `object`

Hyperopt proxy class.

See *hyperopt*'s documentation for more details: https://github.com/hyperopt/hyperopt/wiki/FMin

Reason of these wrappers:

> A hyper space in *hyperopt* requires a *label* to instantiate. This *label* is used later as a reference to original hyper space that is sampled. In *matchzoo*, hyper spaces are used in `matchzoo.engine.Param`. Only if a hyper space's label matches its parent `matchzoo.engine.Param`'s name, *matchzoo* can correctly back-refrenced the parameter got sampled. This can be done by asking the user always use the same name for a parameter and its hyper space, but typos can occur. As a result, these wrappers are created to hide hyper spaces' *label*, and always correctly bind them with its parameter's name.

Examples::

```
>>> import matchzoo as mz
>>> from hyperopt.pyll.stochastic import sample
```

Basic Usage:

```
>>> model = mz.models.DenseBaseline()
>>> sample(model.params.hyper_space)  # doctest: +SKIP
 {'mlp_num_layers': 1.0, 'mlp_num_units': 274.0}
```

Arithmetic Operations:

```
>>> new_space = 2 ** mz.hyper_spaces.quniform(2, 6)
>>> model.params.get('mlp_num_layers').hyper_space = new_space
>>> sample(model.params.hyper_space)  # doctest: +SKIP
{'mlp_num_layers': 8.0, 'mlp_num_units': 292.0}
```

convert(*self*, *name: str*)

Attach *name* as *hyperopt.hp*'s *label*.

Parameters **name** –

Returns a *hyperopt* ready search space

__add__(*self*, *other*)
__add__.

__radd__(*self*, *other*)
__radd__.

__sub__(*self*, *other*)
__sub__.

__rsub__(*self*, *other*)
__rsub__.

__mul__(*self*, *other*)
__mul__.

__rmul__(*self*, *other*)
__rmul__.

__truediv__(*self*, *other*)
__truediv__.

__rtruediv__(*self*, *other*)
__rtruediv__.

__floordiv__(*self*, *other*)
__floordiv__.

__rfloordiv__(*self*, *other*)
__rfloordiv__.

__pow__(*self*, *other*)
__pow__.

__rpow__(*self*, *other*)
__rpow__.

__neg__(*self*)
__neg__.

matchzoo.engine.hyper_spaces.**_wrap_as_composite_func**(*self*, *other*, *func*)

class matchzoo.engine.hyper_spaces.**choice**(*options: list*)
Bases: *matchzoo.engine.hyper_spaces.HyperoptProxy*

hyperopt.hp.choice() proxy.

__str__(*self*)

Returns *str* representation of the hyper space.

class matchzoo.engine.hyper_spaces.**quniform**(*low: numbers.Number*, *high: numbers.Number*, *q: numbers.Number = 1*)
Bases: *matchzoo.engine.hyper_spaces.HyperoptProxy*

hyperopt.hp.quniform() proxy.

__str__(*self*)

Returns *str* representation of the hyper space.

class matchzoo.engine.hyper_spaces.**uniform**(*low: numbers.Number*, *high: numbers.Number*)
Bases: *matchzoo.engine.hyper_spaces.HyperoptProxy*

hyperopt.hp.uniform() proxy.

__str__(*self*)

Returns *str* representation of the hyper space.

matchzoo.engine.hyper_spaces.**sample**(*space*)

Take a sample in the hyper space.

This method is stateless, so the distribution of the samples is different from that of *tune* call. This function just gives a general idea of what a sample from the *space* looks like.

Example

```
>>> import matchzoo as mz
>>> space = mz.models.DenseBaseline.get_default_params().hyper_space
>>> mz.hyper_spaces.sample(space)  # doctest: +ELLIPSIS
{'mlp_num_fan_out': ...}
```

matchzoo.engine.param

Parameter class.

Module Contents

matchzoo.engine.param.**SpaceType**

class matchzoo.engine.param.**Param**(*name: str, value: typing.Any = None, hyper_space: typing.Optional[SpaceType] = None, validator: typing.Optional[typing.Callable[[typing.Any], bool]] = None, desc: typing.Optional[str] = None*)

Bases: object

Parameter class.

Basic usages with a name and value:

```
>>> param = Param('my_param', 10)
>>> param.name
'my_param'
>>> param.value
10
```

Use with a validator to make sure the parameter always keeps a valid value.

```
>>> param = Param(
...     name='my_param',
...     value=5,
...     validator=lambda x: 0 < x < 20
... )
>>> param.validator  # doctest: +ELLIPSIS
<function <lambda> at 0x...>
>>> param.value
5
>>> param.value = 10
```

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```
>>> param.value
10
>>> param.value = -1
Traceback (most recent call last):
    ...
ValueError: Validator not satisfied.
The validator's definition is as follows:
validator=lambda x: 0 < x < 20
```

Use with a hyper space. Setting up a hyper space for a parameter makes the parameter tunable in a `matchzoo.engine.Tuner`.

```
>>> from matchzoo.engine.hyper_spaces import quniform
>>> param = Param(
...     name='positive_num',
...     value=1,
...     hyper_space=quniform(low=1, high=5)
... )
>>> param.hyper_space  # doctest: +ELLIPSIS
<matchzoo.engine.hyper_spaces.quniform object at ...>
>>> from hyperopt.pyll.stochastic import sample
>>> hyperopt_space = param.hyper_space.convert(param.name)
>>> samples = [sample(hyperopt_space) for _ in range(64)]
>>> set(samples) == {1, 2, 3, 4, 5}
True
```

The boolean value of a *Param* instance is only *True* when the value is not *None*. This is because some default falsy values like zero or an empty list are valid parameter values. In other words, the boolean value means to be "if the parameter value is filled".

```
>>> param = Param('dropout')
>>> if param:
...     print('OK')
>>> param = Param('dropout', 0)
>>> if param:
...     print('OK')
OK
```

A *_pre_assignment_hook* is initialized as a data type convertor if the value is set as a number to keep data type consistency of the parameter. This conversion supports python built-in numbers, *numpy* numbers, and any number that inherits `numbers.Number`.

```
>>> param = Param('float_param', 0.5)
>>> param.value = 10
>>> param.value
10.0
>>> type(param.value)
<class 'float'>
```

name :str
Name of the parameter.

Type return

value :typing.Any
Value of the parameter.

Type return

hyper_space :SpaceType
Hyper space of the parameter.

Type return

validator :typing.Callable[[typing.Any], bool]
Validator of the parameter.

Type return

desc :str
Parameter description.

Type return

_infer_pre_assignment_hook(*self*)

_validate(*self*, *value*)

__bool__(*self*)

Returns *False* when the value is *None*, *True* otherwise.

set_default(*self*, *val*, *verbose=1*)
Set default value, has no effect if already has a value.

Parameters

- **val** – Default value to set.
- **verbose** – Verbosity.

reset(*self*)
Set the parameter's value to *None*, which means "not set".

This method bypasses validator.

Example

```
>>> import matchzoo as mz
>>> param = mz.Param(
...     name='str', validator=lambda x: isinstance(x, str))
>>> param.value = 'hello'
>>> param.value = None
Traceback (most recent call last):
    ...
ValueError: Validator not satisfied.
The validator's definition is as follows:
name='str', validator=lambda x: isinstance(x, str))
>>> param.reset()
>>> param.value is None
True
```

matchzoo.engine.param_table

Parameters table class.

Module Contents

class matchzoo.engine.param_table.**ParamTable**

Bases: object

Parameter table class.

Example

```
>>> params = ParamTable()
>>> params.add(Param('ham', 'Parma Ham'))
>>> params.add(Param('egg', 'Over Easy'))
>>> params['ham']
'Parma Ham'
>>> params['egg']
'Over Easy'
>>> print(params)
ham                             Parma Ham
egg                             Over Easy
>>> params.add(Param('egg', 'Sunny side Up'))
Traceback (most recent call last):
    ...
ValueError: Parameter named egg already exists.
To re-assign parameter egg value, use `params["egg"] = value` instead.
```

hyper_space :dict

Hyper space of the table, a valid *hyperopt* graph.

Type return

add(*self*, *param: Param*)

Parameters **param** – parameter to add.

get(*self*, *key*)

Returns The parameter in the table named *key*.

set(*self*, *key*, *param: Param*)

Set *key* to parameter *param*.

to_frame(*self*)

Convert the parameter table into a pandas data frame.

Returns A *pandas.DataFrame*.

Example

```
>>> import matchzoo as mz
>>> table = mz.ParamTable()
>>> table.add(mz.Param(name='x', value=10, desc='my x'))
>>> table.add(mz.Param(name='y', value=20, desc='my y'))
>>> table.to_frame()
  Name Description  Value Hyper-Space
0    x        my x     10        None
1    y        my y     20        None
```

__getitem__(*self*, *key: str*)

Returns The value of the parameter in the table named *key*.

__setitem__(*self*, *key: str*, *value: typing.Any*)
Set the value of the parameter named *key*.

Parameters

- **key** – Name of the parameter.
- **value** – New value of the parameter to set.

__str__(*self*)

Returns Pretty formatted parameter table.

__iter__(*self*)

Returns A iterator that iterates over all parameter instances.

completed(*self*, *exclude: typing.Optional[list] = None*)
Check if all params are filled.

Parameters **exclude** – List of names of parameters that was excluded from being computed.

Returns *True* if all params are filled, *False* otherwise.

Example

```
>>> import matchzoo
>>> model = matchzoo.models.DenseBaseline()
>>> model.params.completed(
...     exclude=['task', 'out_activation_func', 'embedding',
...              'embedding_input_dim', 'embedding_output_dim']
... )
True
```

keys(*self*)

Returns Parameter table keys.

__contains__(*self*, *item*)

Returns *True* if parameter in parameters.

update(*self*, *other: dict*)
Update *self*.

Update *self* with the key/value pairs from other, overwriting existing keys. Notice that this does not add new keys to *self*.

This method is usually used by models to obtain useful information from a preprocessor's context.

Parameters **other** – The dictionary used update.

Example

```
>>> import matchzoo as mz
>>> model = mz.models.DenseBaseline()
>>> prpr = model.get_default_preprocessor()
>>> _ = prpr.fit(mz.datasets.toy.load_data(), verbose=0)
>>> model.params.update(prpr.context)
```

matchzoo.losses

Submodules

matchzoo.losses.rank_cross_entropy_loss

The rank cross entropy loss.

Module Contents

class matchzoo.losses.rank_cross_entropy_loss.**RankCrossEntropyLoss**(*num_neg: int = 1*)

Bases: torch.nn.Module

Creates a criterion that measures rank cross entropy loss.

__constants__ = ['num_neg']

num_neg
num_neg getter.

forward(*self*, *y_pred: torch.Tensor*, *y_true: torch.Tensor*)
Calculate rank cross entropy loss.

Parameters

- **y_pred** – Predicted result.
- **y_true** – Label.

Returns Rank cross loss.

matchzoo.losses.rank_hinge_loss

The rank hinge loss.

Module Contents

class matchzoo.losses.rank_hinge_loss.**RankHingeLoss**(*num_neg: int = 1*, *margin: float = 1.0*, *reduction: str = 'mean'*)

Bases: torch.nn.Module

Creates a criterion that measures rank hinge loss.

Given inputs $x1$, $x2$, two 1D mini-batch *Tensors*, and a label 1D mini-batch tensor y (containing 1 or -1).

If $y = 1$ then it assumed the first input should be ranked higher (have a larger value) than the second input, and vice-versa for $y = -1$.

The loss function for each sample in the mini-batch is:

$$loss_{x,y} = max(0, -y * (x1 - x2) + margin)$$

__constants__ = ['num_neg', 'margin', 'reduction']

num_neg
num_neg getter.

margin
margin getter.

forward(*self*, *y_pred: torch.Tensor*, *y_true: torch.Tensor*)
Calculate rank hinge loss.

Parameters

- **y_pred** – Predicted result.
- **y_true** – Label.

Returns Hinge loss computed by user-defined margin.

Package Contents

class matchzoo.losses.**RankCrossEntropyLoss**(*num_neg: int = 1*)
Bases: torch.nn.Module

Creates a criterion that measures rank cross entropy loss.

__constants__ = ['num_neg']

num_neg
num_neg getter.

forward(*self*, *y_pred: torch.Tensor*, *y_true: torch.Tensor*)
Calculate rank cross entropy loss.

Parameters

- **y_pred** – Predicted result.
- **y_true** – Label.

Returns Rank cross loss.

class matchzoo.losses.**RankHingeLoss**(*num_neg: int = 1*, *margin: float = 1.0*, *reduction: str = 'mean'*)
Bases: torch.nn.Module

Creates a criterion that measures rank hinge loss.

Given inputs $x1$, $x2$, two 1D mini-batch *Tensors*, and a label 1D mini-batch tensor y (containing 1 or -1).

If $y = 1$ then it assumed the first input should be ranked higher (have a larger value) than the second input, and vice-versa for $y = -1$.

The loss function for each sample in the mini-batch is:

$$loss_{x,y} = max(0, -y * (x1 - x2) + margin)$$

__constants__ = ['num_neg', 'margin', 'reduction']

num_neg
num_neg getter.

margin
margin getter.

forward(*self*, *y_pred: torch.Tensor*, *y_true: torch.Tensor*)
Calculate rank hinge loss.

Parameters

- **y_pred** – Predicted result.
- **y_true** – Label.

Returns Hinge loss computed by user-defined margin.

matchzoo.metrics

Submodules

matchzoo.metrics.accuracy

Accuracy metric for Classification.

Module Contents

class matchzoo.metrics.accuracy.**Accuracy**
Bases: *matchzoo.engine.base_metric.ClassificationMetric*

Accuracy metric.

ALIAS = ['accuracy', 'acc']

__repr__(*self*)

Returns Formated string representation of the metric.

__call__(*self*, *y_true: np.array*, *y_pred: np.array*)
Calculate accuracy.

Example

```
>>> import numpy as np
>>> y_true = np.array([1])
>>> y_pred = np.array([[0, 1]])
>>> Accuracy()(y_true, y_pred)
1.0
```

Parameters

- **y_true** – The ground true label of each document.
- **y_pred** – The predicted scores of each document.

Returns Accuracy.

matchzoo.metrics.average_precision

Average precision metric for ranking.

Module Contents

class matchzoo.metrics.average_precision.**AveragePrecision**(*threshold: float = 0.0*)
Bases: *matchzoo.engine.base_metric.RankingMetric*

Average precision metric.

ALIAS = ['average_precision', 'ap']

__repr__(*self*)

Returns Formated string representation of the metric.

__call__(*self*, *y_true: np.array*, *y_pred: np.array*)
Calculate average precision (area under PR curve).

Example

```
>>> y_true = [0, 1]
>>> y_pred = [0.1, 0.6]
>>> round(AveragePrecision()(y_true, y_pred), 2)
0.75
>>> round(AveragePrecision()([], []), 2)
0.0
```

Parameters

- **y_true** – The ground true label of each document.
- **y_pred** – The predicted scores of each document.

Returns Average precision.

matchzoo.metrics.cross_entropy

CrossEntropy metric for Classification.

Module Contents

class matchzoo.metrics.cross_entropy.**CrossEntropy**
Bases: *matchzoo.engine.base_metric.ClassificationMetric*

Cross entropy metric.

ALIAS = ['cross_entropy', 'ce']

__repr__(*self*)

Returns Formated string representation of the metric.

__call__(*self*, *y_true: np.array*, *y_pred: np.array*, *eps: float = 1e-12*)
Calculate cross entropy.

Example

```
>>> y_true = [0, 1]
>>> y_pred = [[0.25, 0.25], [0.01, 0.90]]
>>> CrossEntropy()(y_true, y_pred)
0.7458274358333028
```

Parameters

- **y_true** – The ground true label of each document.
- **y_pred** – The predicted scores of each document.
- **eps** – The Log loss is undefined for p=0 or p=1, so probabilities are clipped to max(eps, min(1 - eps, p)).

Returns Average precision.

matchzoo.metrics.discounted_cumulative_gain

Discounted cumulative gain metric for ranking.

Module Contents

class matchzoo.metrics.discounted_cumulative_gain.**DiscountedCumulativeGain**(*k: int = 1*, *threshold: float = 0.0*)

Bases: *matchzoo.engine.base_metric.RankingMetric*

Disconunted cumulative gain metric.

ALIAS = ['discounted_cumulative_gain', 'dcg']

__repr__(*self*)

Returns Formated string representation of the metric.

__call__(*self*, *y_true: np.array*, *y_pred: np.array*)

Calculate discounted cumulative gain (dcg).

Relevance is positive real values or binary values.

Example

```
>>> y_true = [0, 1, 2, 0]
>>> y_pred = [0.4, 0.2, 0.5, 0.7]
>>> DiscountedCumulativeGain(1)(y_true, y_pred)
0.0
>>> round(DiscountedCumulativeGain(k=-1)(y_true, y_pred), 2)
```

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```
0.0
>>> round(DiscountedCumulativeGain(k=2)(y_true, y_pred), 2)
2.73
>>> round(DiscountedCumulativeGain(k=3)(y_true, y_pred), 2)
2.73
>>> type(DiscountedCumulativeGain(k=1)(y_true, y_pred))
<class 'float'>
```

Parameters

- **y_true** – The ground true label of each document.
- **y_pred** – The predicted scores of each document.

Returns Discounted cumulative gain.

matchzoo.metrics.mean_average_precision

Mean average precision metric for ranking.

Module Contents

class matchzoo.metrics.mean_average_precision.**MeanAveragePrecision**(*threshold: float = 0.0*)

Bases: *matchzoo.engine.base_metric.RankingMetric*

Mean average precision metric.

ALIAS = ['mean_average_precision', 'map']

__repr__(*self*)

Returns Formated string representation of the metric.

__call__(*self*, *y_true: np.array*, *y_pred: np.array*)

Calculate mean average precision.

Example

```
>>> y_true = [0, 1, 0, 0]
>>> y_pred = [0.1, 0.6, 0.2, 0.3]
>>> MeanAveragePrecision()(y_true, y_pred)
1.0
```

Parameters

- **y_true** – The ground true label of each document.
- **y_pred** – The predicted scores of each document.

Returns Mean average precision.

matchzoo.metrics.mean_reciprocal_rank

Mean reciprocal ranking metric.

Module Contents

class matchzoo.metrics.mean_reciprocal_rank.**MeanReciprocalRank**(*threshold: float = 0.0*)

Bases: *matchzoo.engine.base_metric.RankingMetric*

Mean reciprocal rank metric.

ALIAS = ['mean_reciprocal_rank', 'mrr']

__repr__(*self*)

Returns Formated string representation of the metric.

__call__(*self*, *y_true: np.array*, *y_pred: np.array*)

Calculate reciprocal of the rank of the first relevant item.

Example

```
>>> import numpy as np
>>> y_pred = np.asarray([0.2, 0.3, 0.7, 1.0])
>>> y_true = np.asarray([1, 0, 0, 0])
>>> MeanReciprocalRank()(y_true, y_pred)
0.25
```

Parameters

- **y_true** – The ground true label of each document.
- **y_pred** – The predicted scores of each document.

Returns Mean reciprocal rank.

matchzoo.metrics.normalized_discounted_cumulative_gain

Normalized discounted cumulative gain metric for ranking.

Module Contents

class matchzoo.metrics.normalized_discounted_cumulative_gain.**NormalizedDiscountedCumulative**

Bases: *matchzoo.engine.base_metric.RankingMetric*

Normalized discounted cumulative gain metric.

ALIAS = ['normalized_discounted_cumulative_gain', 'ndcg']

__repr__(*self*)

Returns Formated string representation of the metric.

__call__(*self*, *y_true: np.array*, *y_pred: np.array*)
Calculate normalized discounted cumulative gain (ndcg).

Relevance is positive real values or binary values.

Example

```
>>> y_true = [0, 1, 2, 0]
>>> y_pred = [0.4, 0.2, 0.5, 0.7]
>>> ndcg = NormalizedDiscountedCumulativeGain
>>> ndcg(k=1)(y_true, y_pred)
0.0
>>> round(ndcg(k=2)(y_true, y_pred), 2)
0.52
>>> round(ndcg(k=3)(y_true, y_pred), 2)
0.52
>>> type(ndcg()(y_true, y_pred))
<class 'float'>
```

Parameters

- **y_true** – The ground true label of each document.
- **y_pred** – The predicted scores of each document.

Returns Normalized discounted cumulative gain.

matchzoo.metrics.precision

Precision for ranking.

Module Contents

class matchzoo.metrics.precision.**Precision**(*k: int = 1*, *threshold: float = 0.0*)
Bases: *matchzoo.engine.base_metric.RankingMetric*

Precision metric.

ALIAS = precision

__repr__(*self*)

Returns Formated string representation of the metric.

__call__(*self*, *y_true: np.array*, *y_pred: np.array*)
Calculate precision@k.

Example

```
>>> y_true = [0, 0, 0, 1]
>>> y_pred = [0.2, 0.4, 0.3, 0.1]
>>> Precision(k=1)(y_true, y_pred)
0.0
>>> Precision(k=2)(y_true, y_pred)
0.0
>>> Precision(k=4)(y_true, y_pred)
0.25
>>> Precision(k=5)(y_true, y_pred)
0.2
```

Parameters

- **y_true** – The ground true label of each document.
- **y_pred** – The predicted scores of each document.

Returns Precision @ k

Raises ValueError: len(r) must be >= k.

Package Contents

class matchzoo.metrics.**Precision**(*k: int = 1*, *threshold: float = 0.0*)

Bases: *matchzoo.engine.base_metric.RankingMetric*

Precision metric.

ALIAS = precision

__repr__(*self*)

Returns Formated string representation of the metric.

__call__(*self*, *y_true: np.array*, *y_pred: np.array*)

Calculate precision@k.

Example

```
>>> y_true = [0, 0, 0, 1]
>>> y_pred = [0.2, 0.4, 0.3, 0.1]
>>> Precision(k=1)(y_true, y_pred)
0.0
>>> Precision(k=2)(y_true, y_pred)
0.0
>>> Precision(k=4)(y_true, y_pred)
0.25
>>> Precision(k=5)(y_true, y_pred)
0.2
```

Parameters

- **y_true** – The ground true label of each document.
- **y_pred** – The predicted scores of each document.

Returns Precision @ k

Raises ValueError: len(r) must be >= k.

class matchzoo.metrics.**DiscountedCumulativeGain**(*k: int = 1*, *threshold: float = 0.0*)
Bases: *matchzoo.engine.base_metric.RankingMetric*

Disconunted cumulative gain metric.

ALIAS = ['discounted_cumulative_gain', 'dcg']

__repr__(*self*)

Returns Formated string representation of the metric.

__call__(*self*, *y_true: np.array*, *y_pred: np.array*)
Calculate discounted cumulative gain (dcg).

Relevance is positive real values or binary values.

Example

```
>>> y_true = [0, 1, 2, 0]
>>> y_pred = [0.4, 0.2, 0.5, 0.7]
>>> DiscountedCumulativeGain(1)(y_true, y_pred)
0.0
>>> round(DiscountedCumulativeGain(k=-1)(y_true, y_pred), 2)
0.0
>>> round(DiscountedCumulativeGain(k=2)(y_true, y_pred), 2)
2.73
>>> round(DiscountedCumulativeGain(k=3)(y_true, y_pred), 2)
2.73
>>> type(DiscountedCumulativeGain(k=1)(y_true, y_pred))
<class 'float'>
```

Parameters

- **y_true** – The ground true label of each document.
- **y_pred** – The predicted scores of each document.

Returns Discounted cumulative gain.

class matchzoo.metrics.**MeanReciprocalRank**(*threshold: float = 0.0*)
Bases: *matchzoo.engine.base_metric.RankingMetric*

Mean reciprocal rank metric.

ALIAS = ['mean_reciprocal_rank', 'mrr']

__repr__(*self*)

Returns Formated string representation of the metric.

__call__(*self*, *y_true: np.array*, *y_pred: np.array*)
Calculate reciprocal of the rank of the first relevant item.

Example

```
>>> import numpy as np
>>> y_pred = np.asarray([0.2, 0.3, 0.7, 1.0])
>>> y_true = np.asarray([1, 0, 0, 0])
>>> MeanReciprocalRank()(y_true, y_pred)
0.25
```

Parameters

- **y_true** – The ground true label of each document.
- **y_pred** – The predicted scores of each document.

Returns Mean reciprocal rank.

class matchzoo.metrics.**MeanAveragePrecision**(*threshold: float = 0.0*)

Bases: *matchzoo.engine.base_metric.RankingMetric*

Mean average precision metric.

ALIAS = ['mean_average_precision', 'map']

__repr__(*self*)

Returns Formated string representation of the metric.

__call__(*self*, *y_true: np.array*, *y_pred: np.array*)

Calculate mean average precision.

Example

```
>>> y_true = [0, 1, 0, 0]
>>> y_pred = [0.1, 0.6, 0.2, 0.3]
>>> MeanAveragePrecision()(y_true, y_pred)
1.0
```

Parameters

- **y_true** – The ground true label of each document.
- **y_pred** – The predicted scores of each document.

Returns Mean average precision.

class matchzoo.metrics.**NormalizedDiscountedCumulativeGain**(*k: int = 1*, *threshold: float = 0.0*)

Bases: *matchzoo.engine.base_metric.RankingMetric*

Normalized discounted cumulative gain metric.

ALIAS = ['normalized_discounted_cumulative_gain', 'ndcg']

__repr__(*self*)

Returns Formated string representation of the metric.

__call__(*self*, *y_true: np.array*, *y_pred: np.array*)

Calculate normalized discounted cumulative gain (ndcg).

Relevance is positive real values or binary values.

Example

```
>>> y_true = [0, 1, 2, 0]
>>> y_pred = [0.4, 0.2, 0.5, 0.7]
>>> ndcg = NormalizedDiscountedCumulativeGain
>>> ndcg(k=1)(y_true, y_pred)
0.0
>>> round(ndcg(k=2)(y_true, y_pred), 2)
0.52
>>> round(ndcg(k=3)(y_true, y_pred), 2)
0.52
>>> type(ndcg()(y_true, y_pred))
<class 'float'>
```

Parameters

- **y_true** – The ground true label of each document.
- **y_pred** – The predicted scores of each document.

Returns Normalized discounted cumulative gain.

class matchzoo.metrics.**Accuracy**

Bases: *matchzoo.engine.base_metric.ClassificationMetric*

Accuracy metric.

ALIAS = ['accuracy', 'acc']

__repr__(*self*)

Returns Formated string representation of the metric.

__call__(*self*, *y_true: np.array*, *y_pred: np.array*)

Calculate accuracy.

Example

```
>>> import numpy as np
>>> y_true = np.array([1])
>>> y_pred = np.array([[0, 1]])
>>> Accuracy()(y_true, y_pred)
1.0
```

Parameters

- **y_true** – The ground true label of each document.
- **y_pred** – The predicted scores of each document.

Returns Accuracy.

class matchzoo.metrics.**CrossEntropy**

Bases: *matchzoo.engine.base_metric.ClassificationMetric*

Cross entropy metric.

ALIAS = ['cross_entropy', 'ce']

__repr__(*self*)

Returns Formated string representation of the metric.

__call__(*self*, *y_true: np.array*, *y_pred: np.array*, *eps: float = 1e-12*)
Calculate cross entropy.

Example

```
>>> y_true = [0, 1]
>>> y_pred = [[0.25, 0.25], [0.01, 0.90]]
>>> CrossEntropy()(y_true, y_pred)
0.7458274358333028
```

Parameters

- **y_true** – The ground true label of each document.
- **y_pred** – The predicted scores of each document.
- **eps** – The Log loss is undefined for p=0 or p=1, so probabilities are clipped to max(eps, min(1 - eps, p)).

Returns Average precision.

matchzoo.metrics.**list_available**() → list

matchzoo.models

Submodules

matchzoo.models.anmm

An implementation of aNMM Model.

Module Contents

class matchzoo.models.anmm.**aNMM**
Bases: *matchzoo.engine.base_model.BaseModel*

aNMM: Ranking Short Answer Texts with Attention-Based Neural Matching Model.

Examples

```
>>> model = aNMM()
>>> model.params['embedding_output_dim'] = 300
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

build(*self*)
Build model structure.

aNMM: Ranking Short Answer Texts with Attention-Based Neural Matching Model.

forward(*self*, *inputs*)
Forward.

matchzoo.models.arci

An implementation of ArcI Model.

Module Contents

class matchzoo.models.arci.**ArcI**
Bases: *matchzoo.engine.base_model.BaseModel*

ArcI Model.

Examples

```
>>> model = ArcI()
>>> model.params['left_filters'] = [32]
>>> model.params['right_filters'] = [32]
>>> model.params['left_kernel_sizes'] = [3]
>>> model.params['right_kernel_sizes'] = [3]
>>> model.params['left_pool_sizes'] = [2]
>>> model.params['right_pool_sizes'] = [4]
>>> model.params['conv_activation_func'] = 'relu'
>>> model.params['mlp_num_layers'] = 1
>>> model.params['mlp_num_units'] = 64
>>> model.params['mlp_num_fan_out'] = 32
>>> model.params['mlp_activation_func'] = 'relu'
>>> model.params['dropout_rate'] = 0.5
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

classmethod get_default_padding_callback(*cls*, *fixed_length_left: int = 10*, *fixed_length_right: int = 100*, *pad_word_value: typing.Union[int, str] = 0*, *pad_word_mode: str = 'pre'*, *with_ngram: bool = False*, *fixed_ngram_length: int = None*, *pad_ngram_value: typing.Union[int, str] = 0*, *pad_ngram_mode: str = 'pre'*)
Model default padding callback.

The padding callback's on_batch_unpacked would pad a batch of data to a fixed length.

Returns Default padding callback.

build(*self*)
Build model structure.

ArcI use Siamese arthitecture.

forward(*self*, *inputs*)
Forward.

classmethod _make_conv_pool_block(*cls*, *in_channels: int*, *out_channels: int*, *kernel_size: int*, *activation: nn.Module*, *pool_size: int*)
Make conv pool block.

matchzoo.models.arcii

An implementation of ArcII Model.

Module Contents

class matchzoo.models.arcii.**ArcII**
Bases: *matchzoo.engine.base_model.BaseModel*

ArcII Model.

Examples

```
>>> model = ArcII()
>>> model.params['embedding_output_dim'] = 300
>>> model.params['kernel_1d_count'] = 32
>>> model.params['kernel_1d_size'] = 3
>>> model.params['kernel_2d_count'] = [16, 32]
>>> model.params['kernel_2d_size'] = [[3, 3], [3, 3]]
>>> model.params['pool_2d_size'] = [[2, 2], [2, 2]]
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

classmethod get_default_padding_callback(*cls*, *fixed_length_left: int = 10*, *fixed_length_right: int = 100*, *pad_word_value: typing.Union[int, str] = 0*, *pad_word_mode: str = 'pre'*, *with_ngram: bool = False*, *fixed_ngram_length: int = None*, *pad_ngram_value: typing.Union[int, str] = 0*, *pad_ngram_mode: str = 'pre'*)
Model default padding callback.

The padding callback's on_batch_unpacked would pad a batch of data to a fixed length.

Returns Default padding callback.

build(*self*)
Build model structure.

ArcII has the desirable property of letting two sentences meet before their own high-level representations mature.

forward(*self*, *inputs*)
Forward.

classmethod _make_conv_pool_block(*cls*, *in_channels: int*, *out_channels: int*, *kernel_size: tuple*, *activation: nn.Module*, *pool_size: tuple*)
Make conv pool block.

matchzoo.models.bert

An implementation of Bert Model.

Module Contents

class matchzoo.models.bert.**Bert**
Bases: *matchzoo.engine.base_model.BaseModel*

Bert Model.

classmethod get_default_params(*cls*)

Returns model default parameters.

classmethod get_default_preprocessor(*cls*, *mode: str = 'bert-base-uncased'*)

Returns Default preprocessor.

classmethod get_default_padding_callback(*cls*, *fixed_length_left: int = None*, *fixed_length_right: int = None*, *pad_value: typing.Union[int, str] = 0*, *pad_mode: str = 'pre'*)

Returns Default padding callback.

build(*self*)
Build model structure.

forward(*self*, *inputs*)
Forward.

matchzoo.models.bimpm

An implementation of BiMPM Model.

Module Contents

class matchzoo.models.bimpm.**BiMPM**
Bases: *matchzoo.engine.base_model.BaseModel*

BiMPM Model.

Reference: - https://github.com/galsang/BIMPM-pytorch/blob/master/model/BIMPM.py

Examples

```
>>> model = BiMPM()
>>> model.params['num_perspective'] = 4
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

build(*self*)
Make function layers.

forward(*self*, *inputs*)
Forward.

reset_parameters(*self*)
Init Parameters.

dropout(*self*, *v*)
Dropout Layer.

matchzoo.models.bimpm.**mp_matching_func**(*v1*, *v2*, *w*)
Basic mp_matching_func.

Parameters

- **v1** – (batch, seq_len, hidden_size)
- **v2** – (batch, seq_len, hidden_size) or (batch, hidden_size)
- **w** – (num_psp, hidden_size)

Returns (batch, num_psp)

matchzoo.models.bimpm.**mp_matching_func_pairwise**(*v1*, *v2*, *w*)
Basic mp_matching_func_pairwise.

Parameters

- **v1** – (batch, seq_len1, hidden_size)
- **v2** – (batch, seq_len2, hidden_size)
- **w** – (num_psp, hidden_size)

:param num_psp :return: (batch, num_psp, seq_len1, seq_len2)

matchzoo.models.bimpm.**attention**(*v1*, *v2*)
Attention.

Parameters

- **v1** – (batch, seq_len1, hidden_size)
- **v2** – (batch, seq_len2, hidden_size)

Returns (batch, seq_len1, seq_len2)

matchzoo.models.bimpm.**div_with_small_value**(*n*, *d*, *eps=1e-08*)
Small values are replaced by 1e-8 to prevent it from exploding.

Parameters

- **n** – tensor

- **d** – tensor

Returns n/d: tensor

matchzoo.models.cdssm

An implementation of CDSSM (CLSM) model.

Module Contents

class matchzoo.models.cdssm.**CDSSM**

Bases: *matchzoo.engine.base_model.BaseModel*

CDSSM Model implementation.

Learning Semantic Representations Using Convolutional Neural Networks for Web Search. (2014a) A Latent Semantic Model with Convolutional-Pooling Structure for Information Retrieval. (2014b)

Examples

```
>>> import matchzoo as mz
>>> model = CDSSM()
>>> model.params['task'] = mz.tasks.Ranking()
>>> model.params['vocab_size'] = 4
>>> model.params['filters'] =  32
>>> model.params['kernel_size'] = 3
>>> model.params['conv_activation_func'] = 'relu'
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

classmethod get_default_preprocessor(*cls*, *truncated_mode: str = 'pre'*, *truncated_length_left: typing.Optional[int] = None*, *truncated_length_right: typing.Optional[int] = None*, *filter_mode: str = 'df'*, *filter_low_freq: float = 1*, *filter_high_freq: float = float('inf')*, *remove_stop_words: bool = False*, *ngram_size: typing.Optional[int] = 3*)

Model default preprocessor.

The preprocessor's transform should produce a correctly shaped data pack that can be used for training.

Returns Default preprocessor.

classmethod get_default_padding_callback(*cls*, *fixed_length_left: int = None*, *fixed_length_right: int = None*, *pad_word_value: typing.Union[int, str] = 0*, *pad_word_mode: str = 'pre'*, *with_ngram: bool = True*, *fixed_ngram_length: int = None*, *pad_ngram_value: typing.Union[int, str] = 0*, *pad_ngram_mode: str = 'pre'*)

Model default padding callback.

The padding callback's on_batch_unpacked would pad a batch of data to a fixed length.

Returns Default padding callback.

_create_base_network(*self*)
Apply conv and maxpooling operation towards to each letter-ngram.

The input shape is *fixed_text_length‘*‘number of letter-ngram*, as described in the paper, *n* is 3, *number of letter-trigram* is about 30,000 according to their observation.

Returns A `nn.Module` of CDSSM network, tensor in tensor out.

build(*self*)
Build model structure.

CDSSM use Siamese architecture.

forward(*self*, *inputs*)
Forward.

guess_and_fill_missing_params(*self*, *verbose: int = 1*)
Guess and fill missing parameters in `params`.

Use this method to automatically fill-in hyper parameters. This involves some guessing so the parameter it fills could be wrong. For example, the default task is *Ranking*, and if we do not set it to *Classification* manually for data packs prepared for classification, then the shape of the model output and the data will mismatch.

Parameters **verbose** – Verbosity.

class matchzoo.models.cdssm.**Squeeze**
Bases: `torch.nn.Module`

Squeeze.

forward(*self*, *x*)
Forward.

matchzoo.models.conv_knrm

An implementation of ConvKNRM Model.

Module Contents

class matchzoo.models.conv_knrm.**ConvKNRM**
Bases: *matchzoo.engine.base_model.BaseModel*

ConvKNRM Model.

Examples

```
>>> model = ConvKNRM()
>>> model.params['filters'] = 128
>>> model.params['conv_activation_func'] = 'tanh'
>>> model.params['max_ngram'] = 3
>>> model.params['use_crossmatch'] = True
>>> model.params['kernel_num'] = 11
>>> model.params['sigma'] = 0.1
>>> model.params['exact_sigma'] = 0.001
```

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```
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

build(*self*)
Build model structure.

forward(*self*, *inputs*)
Forward.

matchzoo.models.dense_baseline

A simple densely connected baseline model.

Module Contents

class matchzoo.models.dense_baseline.**DenseBaseline**
Bases: *matchzoo.engine.base_model.BaseModel*

A simple densely connected baseline model.

Examples

```
>>> model = DenseBaseline()
>>> model.params['mlp_num_layers'] = 2
>>> model.params['mlp_num_units'] = 300
>>> model.params['mlp_num_fan_out'] = 128
>>> model.params['mlp_activation_func'] = 'relu'
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

build(*self*)
Build.

forward(*self*, *inputs*)
Forward.

matchzoo.models.diin

An implementation of DIIN Model.

Module Contents

class matchzoo.models.diin.**DIIN**
Bases: *matchzoo.engine.base_model.BaseModel*

DIIN model.

Examples

```
>>> model = DIIN()
>>> model.params['embedding_input_dim'] = 10000
>>> model.params['embedding_output_dim'] = 300
>>> model.params['mask_value'] = 0
>>> model.params['char_embedding_input_dim'] = 100
>>> model.params['char_embedding_output_dim'] = 8
>>> model.params['char_conv_filters'] = 100
>>> model.params['char_conv_kernel_size'] = 5
>>> model.params['first_scale_down_ratio'] = 0.3
>>> model.params['nb_dense_blocks'] = 3
>>> model.params['layers_per_dense_block'] = 8
>>> model.params['growth_rate'] = 20
>>> model.params['transition_scale_down_ratio'] = 0.5
>>> model.params['conv_kernel_size'] = (3, 3)
>>> model.params['pool_kernel_size'] = (2, 2)
>>> model.params['dropout_rate'] = 0.2
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

classmethod get_default_preprocessor(*cls*, *truncated_mode: str = 'pre'*, *truncated_length_left: typing.Optional[int] = None*, *truncated_length_right: typing.Optional[int] = None*, *filter_mode: str = 'df'*, *filter_low_freq: float = 1*, *filter_high_freq: float = float('inf')*, *remove_stop_words: bool = False*, *ngram_size: typing.Optional[int] = 1*)

Model default preprocessor.

The preprocessor's transform should produce a correctly shaped data pack that can be used for training.

Returns Default preprocessor.

classmethod get_default_padding_callback(*cls*, *fixed_length_left: int = 10*, *fixed_length_right: int = 30*, *pad_word_value: typing.Union[int, str] = 0*, *pad_word_mode: str = 'pre'*, *with_ngram: bool = True*, *fixed_ngram_length: int = None*, *pad_ngram_value: typing.Union[int, str] = 0*, *pad_ngram_mode: str = 'pre'*)

Model default padding callback.

The padding callback's on_batch_unpacked would pad a batch of data to a fixed length.

Returns Default padding callback.

build(*self*)

Build model structure.

forward(*self*, *inputs*)

Forward.

matchzoo.models.drmm

An implementation of DRMM Model.

Module Contents

class matchzoo.models.drmm.**DRMM**
Bases: *matchzoo.engine.base_model.BaseModel*

DRMM Model.

Examples

```
>>> model = DRMM()
>>> model.params['mlp_num_layers'] = 1
>>> model.params['mlp_num_units'] = 5
>>> model.params['mlp_num_fan_out'] = 1
>>> model.params['mlp_activation_func'] = 'tanh'
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

classmethod get_default_padding_callback(*cls*, *fixed_length_left: int = None*, *fixed_length_right: int = None*, *pad_value: typing.Union[int, str] = 0*, *pad_mode: str = 'pre'*)

Returns Default padding callback.

build(*self*)
Build model structure.

forward(*self*, *inputs*)
Forward.

matchzoo.models.drmmtks

An implementation of DRMMTKS Model.

Module Contents

class matchzoo.models.drmmtks.**DRMMTKS**
Bases: *matchzoo.engine.base_model.BaseModel*

DRMMTKS Model.

Examples

```
>>> model = DRMMTKS()
>>> model.params['top_k'] = 10
>>> model.params['mlp_num_layers'] = 1
>>> model.params['mlp_num_units'] = 5
>>> model.params['mlp_num_fan_out'] = 1
>>> model.params['mlp_activation_func'] = 'tanh'
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

classmethod get_default_padding_callback(*cls*, *fixed_length_left: int = 10*, *fixed_length_right: int = 100*, *pad_word_value: typing.Union[int, str] = 0*, *pad_word_mode: str = 'pre'*, *with_ngram: bool = False*, *fixed_ngram_length: int = None*, *pad_ngram_value: typing.Union[int, str] = 0*, *pad_ngram_mode: str = 'pre'*)

Model default padding callback.

The padding callback's on_batch_unpacked would pad a batch of data to a fixed length.

Returns Default padding callback.

build(*self*)

Build model structure.

forward(*self*, *inputs*)

Forward.

matchzoo.models.dssm

An implementation of DSSM, Deep Structured Semantic Model.

Module Contents

class matchzoo.models.dssm.**DSSM**

Bases: *matchzoo.engine.base_model.BaseModel*

Deep structured semantic model.

Examples

```
>>> model = DSSM()
>>> model.params['mlp_num_layers'] = 3
>>> model.params['mlp_num_units'] = 300
>>> model.params['mlp_num_fan_out'] = 128
>>> model.params['mlp_activation_func'] = 'relu'
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

classmethod get_default_preprocessor(*cls*, *truncated_mode: str = 'pre'*, *truncated_length_left: typing.Optional[int] = None*, *truncated_length_right: typing.Optional[int] = None*, *filter_mode: str = 'df'*, *filter_low_freq: float = 1*, *filter_high_freq: float = float('inf')*, *remove_stop_words: bool = False*, *ngram_size: typing.Optional[int] = 3*)

Model default preprocessor.

The preprocessor's transform should produce a correctly shaped data pack that can be used for training.

Returns Default preprocessor.

classmethod get_default_padding_callback(*cls*)

Returns Default padding callback.

build(*self*)

Build model structure.

DSSM use Siamese arthitecture.

forward(*self*, *inputs*)

Forward.

matchzoo.models.duet

An implementation of DUET Model.

Module Contents

class matchzoo.models.duet.**DUET**

Bases: *matchzoo.engine.base_model.BaseModel*

Duet Model.

Examples

```
>>> model = DUET()
>>> model.params['left_length'] = 10
>>> model.params['right_length'] = 40
>>> model.params['lm_filters'] = 300
>>> model.params['mlp_num_layers'] = 2
>>> model.params['mlp_num_units'] = 300
>>> model.params['mlp_num_fan_out'] = 300
>>> model.params['mlp_activation_func'] = 'relu'
>>> model.params['vocab_size'] = 2000
>>> model.params['dm_filters'] = 300
>>> model.params['dm_conv_activation_func'] = 'relu'
>>> model.params['dm_kernel_size'] = 3
>>> model.params['dm_right_pool_size'] = 8
>>> model.params['dropout_rate'] = 0.5
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

classmethod get_default_preprocessor(*cls*, *truncated_mode: str = 'pre'*, *truncated_length_left: int = 10*, *truncated_length_right: int = 40*, *filter_mode: str = 'df'*, *filter_low_freq: float = 1*, *filter_high_freq: float = float('inf')*, *remove_stop_words: bool = False*, *ngram_size: int = 3*)

Returns Default preprocessor.

classmethod get_default_padding_callback(*cls*, *fixed_length_left: int = 10*, *fixed_length_right: int = 40*, *pad_word_value: typing.Union[int, str] = 0*, *pad_word_mode: str = 'pre'*, *with_ngram: bool = True*, *fixed_ngram_length: int = None*, *pad_ngram_value: typing.Union[int, str] = 0*, *pad_ngram_mode: str = 'pre'*)

Model default padding callback.

The padding callback's on_batch_unpacked would pad a batch of data to a fixed length.

Returns Default padding callback.

classmethod _xor_match(*cls*, *x*, *y*)

Xor match of two inputs.

build(*self*)

Build model structure.

forward(*self*, *inputs*)

Forward.

matchzoo.models.esim

An implementation of ESIM Model.

Module Contents

class matchzoo.models.esim.**ESIM**

Bases: *matchzoo.engine.base_model.BaseModel*

ESIM Model.

Examples

```
>>> model = ESIM()
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

build(*self*)
Instantiating layers.

forward(*self*, *inputs*)
Forward.

matchzoo.models.hbmp

An implementation of HBMP Model.

Module Contents

class matchzoo.models.hbmp.**HBMP**
Bases: *matchzoo.engine.base_model.BaseModel*

HBMP model.

Examples

```
>>> model = HBMP()
>>> model.params['embedding_input_dim'] = 200
>>> model.params['embedding_output_dim'] = 100
>>> model.params['mlp_num_layers'] = 1
>>> model.params['mlp_num_units'] = 10
>>> model.params['mlp_num_fan_out'] = 10
>>> model.params['mlp_activation_func'] = nn.LeakyReLU(0.1)
>>> model.params['lstm_hidden_size'] = 5
>>> model.params['lstm_num'] = 3
>>> model.params['num_layers'] = 3
>>> model.params['dropout_rate'] = 0.1
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

build(*self*)
Build model structure.

HBMP use Siamese arthitecture.

forward(*self*, *inputs*)
Forward.

matchzoo.models.knrm

An implementation of KNRM Model.

Module Contents

class matchzoo.models.knrm.**KNRM**
Bases: *matchzoo.engine.base_model.BaseModel*

KNRM Model.

Examples

```
>>> model = KNRM()
>>> model.params['kernel_num'] = 11
>>> model.params['sigma'] = 0.1
>>> model.params['exact_sigma'] = 0.001
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

build(*self*)
Build model structure.

forward(*self*, *inputs*)
Forward.

matchzoo.models.match_pyramid

An implementation of MatchPyramid Model.

Module Contents

class matchzoo.models.match_pyramid.**MatchPyramid**
Bases: *matchzoo.engine.base_model.BaseModel*

MatchPyramid Model.

Examples

```
>>> model = MatchPyramid()
>>> model.params['embedding_output_dim'] = 300
>>> model.params['kernel_count'] = [16, 32]
>>> model.params['kernel_size'] = [[3, 3], [3, 3]]
>>> model.params['dpool_size'] = [3, 10]
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

build(*self*)
Build model structure.

MatchPyramid text matching as image recognition.

forward(*self*, *inputs*)
Forward.

classmethod _make_conv_pool_block(*cls*, *in_channels: int*, *out_channels: int*, *kernel_size: tuple*, *activation: nn.Module*)

Make conv pool block.

matchzoo.models.match_srnn

An implementation of Match-SRNN Model.

Module Contents

class matchzoo.models.match_srnn.**MatchSRNN**

Bases: *matchzoo.engine.base_model.BaseModel*

Match-SRNN Model.

Examples

```
>>> model = MatchSRNN()
>>> model.params['channels'] = 4
>>> model.params['units'] = 10
>>> model.params['dropout'] = 0.2
>>> model.params['direction'] = 'lt'
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

build(*self*)

Build model structure.

forward(*self*, *inputs*)

Forward.

matchzoo.models.matchlstm

An implementation of Match LSTM Model.

Module Contents

class matchzoo.models.matchlstm.**MatchLSTM**

Bases: *matchzoo.engine.base_model.BaseModel*

MatchLSTM Model.

https://github.com/shuohangwang/mprc/blob/master/qa/rankerReader.lua.

Examples

```
>>> model = MatchLSTM()
>>> model.params['dropout'] = 0.2
>>> model.params['hidden_size'] = 200
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

build(*self*)
Instantiating layers.

forward(*self*, *inputs*)
Forward.

matchzoo.models.mvlstm

An implementation of MVLSTM Model.

Module Contents

class matchzoo.models.mvlstm.**MVLSTM**
Bases: *matchzoo.engine.base_model.BaseModel*

MVLSTM Model.

Examples

```
>>> model = MVLSTM()
>>> model.params['hidden_size'] = 32
>>> model.params['top_k'] = 50
>>> model.params['mlp_num_layers'] = 2
>>> model.params['mlp_num_units'] = 20
>>> model.params['mlp_num_fan_out'] = 10
>>> model.params['mlp_activation_func'] = 'relu'
>>> model.params['dropout_rate'] = 0.0
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

classmethod get_default_padding_callback(*cls*, *fixed_length_left: int = 10*, *fixed_length_right: int = 40*, *pad_word_value: typing.Union[int, str] = 0*, *pad_word_mode: str = 'pre'*, *with_ngram: bool = False*, *fixed_ngram_length: int = None*, *pad_ngram_value: typing.Union[int, str] = 0*, *pad_ngram_mode: str = 'pre'*)

Model default padding callback.

The padding callback's on_batch_unpacked would pad a batch of data to a fixed length.

Returns Default padding callback.

build(*self*)
Build model structure.

forward(*self*, *inputs*)
Forward.

matchzoo.models.parameter_readme_generator

matchzoo/models/README.md generater.

Module Contents

matchzoo.models.parameter_readme_generator.**_generate**()

matchzoo.models.parameter_readme_generator.**_make_title**()

matchzoo.models.parameter_readme_generator.**_make_model_class_subtitle**(*model_class*)

matchzoo.models.parameter_readme_generator.**_make_doc_section_subsubtitle**()

matchzoo.models.parameter_readme_generator.**_make_params_section_subsubtitle**()

matchzoo.models.parameter_readme_generator.**_make_model_doc**(*model_class*)

matchzoo.models.parameter_readme_generator.**_make_model_params_table**(*model*)

matchzoo.models.parameter_readme_generator.**_write_to_files**(*full*)

Package Contents

class matchzoo.models.**DenseBaseline**
Bases: *matchzoo.engine.base_model.BaseModel*

A simple densely connected baseline model.

Examples

```
>>> model = DenseBaseline()
>>> model.params['mlp_num_layers'] = 2
>>> model.params['mlp_num_units'] = 300
>>> model.params['mlp_num_fan_out'] = 128
>>> model.params['mlp_activation_func'] = 'relu'
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

build(*self*)
Build.

forward(*self*, *inputs*)
Forward.

class matchzoo.models.**DSSM**

Bases: *matchzoo.engine.base_model.BaseModel*

Deep structured semantic model.

Examples

```
>>> model = DSSM()
>>> model.params['mlp_num_layers'] = 3
>>> model.params['mlp_num_units'] = 300
>>> model.params['mlp_num_fan_out'] = 128
>>> model.params['mlp_activation_func'] = 'relu'
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

classmethod get_default_preprocessor(*cls*, *truncated_mode: str = 'pre'*, *truncated_length_left: typing.Optional[int] = None*, *truncated_length_right: typing.Optional[int] = None*, *filter_mode: str = 'df'*, *filter_low_freq: float = 1*, *filter_high_freq: float = float('inf')*, *remove_stop_words: bool = False*, *ngram_size: typing.Optional[int] = 3*)

Model default preprocessor.

The preprocessor's transform should produce a correctly shaped data pack that can be used for training.

Returns Default preprocessor.

classmethod get_default_padding_callback(*cls*)

Returns Default padding callback.

build(*self*)

Build model structure.

DSSM use Siamese arthitecture.

forward(*self*, *inputs*)

Forward.

class matchzoo.models.**CDSSM**

Bases: *matchzoo.engine.base_model.BaseModel*

CDSSM Model implementation.

Learning Semantic Representations Using Convolutional Neural Networks for Web Search. (2014a) A Latent Semantic Model with Convolutional-Pooling Structure for Information Retrieval. (2014b)

Examples

```
>>> import matchzoo as mz
>>> model = CDSSM()
>>> model.params['task'] = mz.tasks.Ranking()
>>> model.params['vocab_size'] = 4
>>> model.params['filters'] =  32
```

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```
>>> model.params['kernel_size'] = 3
>>> model.params['conv_activation_func'] = 'relu'
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

classmethod get_default_preprocessor(*cls*, *truncated_mode: str = 'pre'*, *truncated_length_left: typing.Optional[int] = None*, *truncated_length_right: typing.Optional[int] = None*, *filter_mode: str = 'df'*, *filter_low_freq: float = 1*, *filter_high_freq: float = float('inf')*, *remove_stop_words: bool = False*, *ngram_size: typing.Optional[int] = 3*)

Model default preprocessor.

The preprocessor's transform should produce a correctly shaped data pack that can be used for training.

Returns Default preprocessor.

classmethod get_default_padding_callback(*cls*, *fixed_length_left: int = None*, *fixed_length_right: int = None*, *pad_word_value: typing.Union[int, str] = 0*, *pad_word_mode: str = 'pre'*, *with_ngram: bool = True*, *fixed_ngram_length: int = None*, *pad_ngram_value: typing.Union[int, str] = 0*, *pad_ngram_mode: str = 'pre'*)

Model default padding callback.

The padding callback's on_batch_unpacked would pad a batch of data to a fixed length.

Returns Default padding callback.

_create_base_network(*self*)

Apply conv and maxpooling operation towards to each letter-ngram.

The input shape is *fixed_text_length*'*'*number of letter-ngram*, as described in the paper, *n* is 3, *number of letter-trigram* is about 30,000 according to their observation.

Returns A `nn.Module` of CDSSM network, tensor in tensor out.

build(*self*)

Build model structure.

CDSSM use Siamese architecture.

forward(*self*, *inputs*)

Forward.

guess_and_fill_missing_params(*self*, *verbose: int = 1*)

Guess and fill missing parameters in `params`.

Use this method to automatically fill-in hyper parameters. This involves some guessing so the parameter it fills could be wrong. For example, the default task is *Ranking*, and if we do not set it to *Classification* manually for data packs prepared for classification, then the shape of the model output and the data will mismatch.

Parameters **verbose** – Verbosity.

class matchzoo.models.**DRMM**

Bases: *matchzoo.engine.base_model.BaseModel*

DRMM Model.

Examples

```
>>> model = DRMM()
>>> model.params['mlp_num_layers'] = 1
>>> model.params['mlp_num_units'] = 5
>>> model.params['mlp_num_fan_out'] = 1
>>> model.params['mlp_activation_func'] = 'tanh'
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

classmethod get_default_padding_callback(*cls*, *fixed_length_left: int = None*, *fixed_length_right: int = None*, *pad_value: typing.Union[int, str] = 0*, *pad_mode: str = 'pre'*)

Returns Default padding callback.

build(*self*)

Build model structure.

forward(*self*, *inputs*)

Forward.

class matchzoo.models.**DRMMTKS**

Bases: *matchzoo.engine.base_model.BaseModel*

DRMMTKS Model.

Examples

```
>>> model = DRMMTKS()
>>> model.params['top_k'] = 10
>>> model.params['mlp_num_layers'] = 1
>>> model.params['mlp_num_units'] = 5
>>> model.params['mlp_num_fan_out'] = 1
>>> model.params['mlp_activation_func'] = 'tanh'
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

classmethod get_default_padding_callback(*cls*, *fixed_length_left: int = 10*, *fixed_length_right: int = 100*, *pad_word_value: typing.Union[int, str] = 0*, *pad_word_mode: str = 'pre'*, *with_ngram: bool = False*, *fixed_ngram_length: int = None*, *pad_ngram_value: typing.Union[int, str] = 0*, *pad_ngram_mode: str = 'pre'*)

Model default padding callback.

The padding callback's on_batch_unpacked would pad a batch of data to a fixed length.

Returns Default padding callback.

build(*self*)

Build model structure.

forward(*self*, *inputs*)

Forward.

class matchzoo.models.**ESIM**

Bases: *matchzoo.engine.base_model.BaseModel*

ESIM Model.

Examples

```
>>> model = ESIM()
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

build(*self*)

Instantiating layers.

forward(*self*, *inputs*)

Forward.

class matchzoo.models.**KNRM**

Bases: *matchzoo.engine.base_model.BaseModel*

KNRM Model.

Examples

```
>>> model = KNRM()
>>> model.params['kernel_num'] = 11
>>> model.params['sigma'] = 0.1
>>> model.params['exact_sigma'] = 0.001
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

build(*self*)
Build model structure.

forward(*self*, *inputs*)
Forward.

class matchzoo.models.**ConvKNRM**
Bases: *matchzoo.engine.base_model.BaseModel*

ConvKNRM Model.

Examples

```
>>> model = ConvKNRM()
>>> model.params['filters'] = 128
>>> model.params['conv_activation_func'] = 'tanh'
>>> model.params['max_ngram'] = 3
>>> model.params['use_crossmatch'] = True
>>> model.params['kernel_num'] = 11
>>> model.params['sigma'] = 0.1
>>> model.params['exact_sigma'] = 0.001
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

build(*self*)
Build model structure.

forward(*self*, *inputs*)
Forward.

class matchzoo.models.**BiMPM**
Bases: *matchzoo.engine.base_model.BaseModel*

BiMPM Model.

Reference: - https://github.com/galsang/BIMPM-pytorch/blob/master/model/BIMPM.py

Examples

```
>>> model = BiMPM()
>>> model.params['num_perspective'] = 4
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

build(*self*)
Make function layers.

forward(*self*, *inputs*)
Forward.

reset_parameters(*self*)
Init Parameters.

dropout (*self*, *v*)
Dropout Layer.

class matchzoo.models.**MatchLSTM**
Bases: *matchzoo.engine.base_model.BaseModel*

MatchLSTM Model.

https://github.com/shuohangwang/mprc/blob/master/qa/rankerReader.lua.

Examples

```
>>> model = MatchLSTM()
>>> model.params['dropout'] = 0.2
>>> model.params['hidden_size'] = 200
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params (*cls*)

Returns model default parameters.

build (*self*)
Instantiating layers.

forward (*self*, *inputs*)
Forward.

class matchzoo.models.**ArcI**
Bases: *matchzoo.engine.base_model.BaseModel*

ArcI Model.

Examples

```
>>> model = ArcI()
>>> model.params['left_filters'] = [32]
>>> model.params['right_filters'] = [32]
>>> model.params['left_kernel_sizes'] = [3]
>>> model.params['right_kernel_sizes'] = [3]
>>> model.params['left_pool_sizes'] = [2]
>>> model.params['right_pool_sizes'] = [4]
>>> model.params['conv_activation_func'] = 'relu'
>>> model.params['mlp_num_layers'] = 1
>>> model.params['mlp_num_units'] = 64
>>> model.params['mlp_num_fan_out'] = 32
>>> model.params['mlp_activation_func'] = 'relu'
>>> model.params['dropout_rate'] = 0.5
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params (*cls*)

Returns model default parameters.

classmethod get_default_padding_callback(*cls*, *fixed_length_left: int = 10*, *fixed_length_right: int = 100*, *pad_word_value: typing.Union[int, str] = 0*, *pad_word_mode: str = 'pre'*, *with_ngram: bool = False*, *fixed_ngram_length: int = None*, *pad_ngram_value: typing.Union[int, str] = 0*, *pad_ngram_mode: str = 'pre'*)

Model default padding callback.

The padding callback's on_batch_unpacked would pad a batch of data to a fixed length.

Returns Default padding callback.

build(*self*)

Build model structure.

ArcI use Siamese arthitecture.

forward(*self*, *inputs*)

Forward.

classmethod _make_conv_pool_block(*cls*, *in_channels: int*, *out_channels: int*, *kernel_size: int*, *activation: nn.Module*, *pool_size: int*)

Make conv pool block.

class matchzoo.models.**ArcII**

Bases: *matchzoo.engine.base_model.BaseModel*

ArcII Model.

Examples

```
>>> model = ArcII()
>>> model.params['embedding_output_dim'] = 300
>>> model.params['kernel_1d_count'] = 32
>>> model.params['kernel_1d_size'] = 3
>>> model.params['kernel_2d_count'] = [16, 32]
>>> model.params['kernel_2d_size'] = [[3, 3], [3, 3]]
>>> model.params['pool_2d_size'] = [[2, 2], [2, 2]]
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

classmethod get_default_padding_callback(*cls*, *fixed_length_left: int = 10*, *fixed_length_right: int = 100*, *pad_word_value: typing.Union[int, str] = 0*, *pad_word_mode: str = 'pre'*, *with_ngram: bool = False*, *fixed_ngram_length: int = None*, *pad_ngram_value: typing.Union[int, str] = 0*, *pad_ngram_mode: str = 'pre'*)

Model default padding callback.

The padding callback's on_batch_unpacked would pad a batch of data to a fixed length.

Returns Default padding callback.

build(*self*)
Build model structure.

ArcII has the desirable property of letting two sentences meet before their own high-level representations mature.

forward(*self*, *inputs*)
Forward.

classmethod _make_conv_pool_block(*cls*, *in_channels: int*, *out_channels: int*, *kernel_size: tuple*, *activation: nn.Module*, *pool_size: tuple*)
Make conv pool block.

class matchzoo.models.**Bert**
Bases: *matchzoo.engine.base_model.BaseModel*

Bert Model.

classmethod get_default_params(*cls*)

Returns model default parameters.

classmethod get_default_preprocessor(*cls*, *mode: str = 'bert-base-uncased'*)

Returns Default preprocessor.

classmethod get_default_padding_callback(*cls*, *fixed_length_left: int = None*, *fixed_length_right: int = None*, *pad_value: typing.Union[int, str] = 0*, *pad_mode: str = 'pre'*)

Returns Default padding callback.

build(*self*)
Build model structure.

forward(*self*, *inputs*)
Forward.

class matchzoo.models.**MVLSTM**
Bases: *matchzoo.engine.base_model.BaseModel*

MVLSTM Model.

Examples

```
>>> model = MVLSTM()
>>> model.params['hidden_size'] = 32
>>> model.params['top_k'] = 50
>>> model.params['mlp_num_layers'] = 2
>>> model.params['mlp_num_units'] = 20
>>> model.params['mlp_num_fan_out'] = 10
>>> model.params['mlp_activation_func'] = 'relu'
>>> model.params['dropout_rate'] = 0.0
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

classmethod get_default_padding_callback(*cls*, *fixed_length_left: int = 10*, *fixed_length_right: int = 40*, *pad_word_value: typing.Union[int, str] = 0*, *pad_word_mode: str = 'pre'*, *with_ngram: bool = False*, *fixed_ngram_length: int = None*, *pad_ngram_value: typing.Union[int, str] = 0*, *pad_ngram_mode: str = 'pre'*)

Model default padding callback.

The padding callback's on_batch_unpacked would pad a batch of data to a fixed length.

Returns Default padding callback.

build(*self*)

Build model structure.

forward(*self*, *inputs*)

Forward.

class matchzoo.models.**MatchPyramid**

Bases: *matchzoo.engine.base_model.BaseModel*

MatchPyramid Model.

Examples

```
>>> model = MatchPyramid()
>>> model.params['embedding_output_dim'] = 300
>>> model.params['kernel_count'] = [16, 32]
>>> model.params['kernel_size'] = [[3, 3], [3, 3]]
>>> model.params['dpool_size'] = [3, 10]
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

build(*self*)

Build model structure.

MatchPyramid text matching as image recognition.

forward(*self*, *inputs*)

Forward.

classmethod _make_conv_pool_block(*cls*, *in_channels: int*, *out_channels: int*, *kernel_size: tuple*, *activation: nn.Module*)

Make conv pool block.

class matchzoo.models.**aNMM**

Bases: *matchzoo.engine.base_model.BaseModel*

aNMM: Ranking Short Answer Texts with Attention-Based Neural Matching Model.

Examples

```
>>> model = aNMM()
>>> model.params['embedding_output_dim'] = 300
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

build(*self*)

Build model structure.

aNMM: Ranking Short Answer Texts with Attention-Based Neural Matching Model.

forward(*self*, *inputs*)

Forward.

class matchzoo.models.**HBMP**

Bases: *matchzoo.engine.base_model.BaseModel*

HBMP model.

Examples

```
>>> model = HBMP()
>>> model.params['embedding_input_dim'] = 200
>>> model.params['embedding_output_dim'] = 100
>>> model.params['mlp_num_layers'] = 1
>>> model.params['mlp_num_units'] = 10
>>> model.params['mlp_num_fan_out'] = 10
>>> model.params['mlp_activation_func'] = nn.LeakyReLU(0.1)
>>> model.params['lstm_hidden_size'] = 5
>>> model.params['lstm_num'] = 3
>>> model.params['num_layers'] = 3
>>> model.params['dropout_rate'] = 0.1
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

build(*self*)

Build model structure.

HBMP use Siamese arthitecture.

forward(*self*, *inputs*)

Forward.

class matchzoo.models.**DUET**

Bases: *matchzoo.engine.base_model.BaseModel*

Duet Model.

Examples

```
>>> model = DUET()
>>> model.params['left_length'] = 10
>>> model.params['right_length'] = 40
>>> model.params['lm_filters'] = 300
>>> model.params['mlp_num_layers'] = 2
>>> model.params['mlp_num_units'] = 300
>>> model.params['mlp_num_fan_out'] = 300
>>> model.params['mlp_activation_func'] = 'relu'
>>> model.params['vocab_size'] = 2000
>>> model.params['dm_filters'] = 300
>>> model.params['dm_conv_activation_func'] = 'relu'
>>> model.params['dm_kernel_size'] = 3
>>> model.params['dm_right_pool_size'] = 8
>>> model.params['dropout_rate'] = 0.5
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

classmethod get_default_preprocessor(*cls*, *truncated_mode: str = 'pre'*, *truncated_length_left: int = 10*, *truncated_length_right: int = 40*, *filter_mode: str = 'df'*, *filter_low_freq: float = 1*, *filter_high_freq: float = float('inf')*, *remove_stop_words: bool = False*, *ngram_size: int = 3*)

Returns Default preprocessor.

classmethod get_default_padding_callback(*cls*, *fixed_length_left: int = 10*, *fixed_length_right: int = 40*, *pad_word_value: typing.Union[int, str] = 0*, *pad_word_mode: str = 'pre'*, *with_ngram: bool = True*, *fixed_ngram_length: int = None*, *pad_ngram_value: typing.Union[int, str] = 0*, *pad_ngram_mode: str = 'pre'*)

Model default padding callback.

The padding callback's on_batch_unpacked would pad a batch of data to a fixed length.

Returns Default padding callback.

classmethod _xor_match(*cls*, *x*, *y*)

Xor match of two inputs.

build(*self*)

Build model structure.

forward(*self*, *inputs*)

Forward.

class matchzoo.models.**DIIN**

Bases: *matchzoo.engine.base_model.BaseModel*

DIIN model.

Examples

```
>>> model = DIIN()
>>> model.params['embedding_input_dim'] = 10000
>>> model.params['embedding_output_dim'] = 300
>>> model.params['mask_value'] = 0
>>> model.params['char_embedding_input_dim'] = 100
>>> model.params['char_embedding_output_dim'] = 8
>>> model.params['char_conv_filters'] = 100
>>> model.params['char_conv_kernel_size'] = 5
>>> model.params['first_scale_down_ratio'] = 0.3
>>> model.params['nb_dense_blocks'] = 3
>>> model.params['layers_per_dense_block'] = 8
>>> model.params['growth_rate'] = 20
>>> model.params['transition_scale_down_ratio'] = 0.5
>>> model.params['conv_kernel_size'] = (3, 3)
>>> model.params['pool_kernel_size'] = (2, 2)
>>> model.params['dropout_rate'] = 0.2
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

classmethod get_default_preprocessor(*cls*, *truncated_mode: str = 'pre'*, *truncated_length_left: typing.Optional[int] = None*, *truncated_length_right: typing.Optional[int] = None*, *filter_mode: str = 'df'*, *filter_low_freq: float = 1*, *filter_high_freq: float = float('inf')*, *remove_stop_words: bool = False*, *ngram_size: typing.Optional[int] = 1*)

Model default preprocessor.

The preprocessor's transform should produce a correctly shaped data pack that can be used for training.

Returns Default preprocessor.

classmethod get_default_padding_callback(*cls*, *fixed_length_left: int = 10*, *fixed_length_right: int = 30*, *pad_word_value: typing.Union[int, str] = 0*, *pad_word_mode: str = 'pre'*, *with_ngram: bool = True*, *fixed_ngram_length: int = None*, *pad_ngram_value: typing.Union[int, str] = 0*, *pad_ngram_mode: str = 'pre'*)

Model default padding callback.

The padding callback's on_batch_unpacked would pad a batch of data to a fixed length.

Returns Default padding callback.

build(*self*)

Build model structure.

forward(*self*, *inputs*)

Forward.

class matchzoo.models.**MatchSRNN**

Bases: *matchzoo.engine.base_model.BaseModel*

Match-SRNN Model.

Examples

```
>>> model = MatchSRNN()
>>> model.params['channels'] = 4
>>> model.params['units'] = 10
>>> model.params['dropout'] = 0.2
>>> model.params['direction'] = 'lt'
>>> model.guess_and_fill_missing_params(verbose=0)
>>> model.build()
```

classmethod get_default_params(*cls*)

Returns model default parameters.

build(*self*)
Build model structure.

forward(*self*, *inputs*)
Forward.

matchzoo.models.**list_available**() → list

matchzoo.modules

Submodules

matchzoo.modules.attention

Attention module.

Module Contents

class matchzoo.modules.attention.**Attention**(*input_size: int = 100*)
Bases: torch.nn.Module

Attention module.

Parameters

- **input_size** – Size of input.
- **mask** – An integer to mask the invalid values. Defaults to 0.

Examples

```
>>> import torch
>>> attention = Attention(input_size=10)
>>> x = torch.randn(4, 5, 10)
>>> x.shape
torch.Size([4, 5, 10])
>>> x_mask = torch.BoolTensor(4, 5)
>>> attention(x, x_mask).shape
torch.Size([4, 5])
```

forward(*self*, *x*, *x_mask*)
Perform attention on the input.

class matchzoo.modules.attention.**BidirectionalAttention**
Bases: torch.nn.Module

Computing the soft attention between two sequence.

forward(*self*, *v1*, *v1_mask*, *v2*, *v2_mask*)
Forward.

class matchzoo.modules.attention.**MatchModule**(*hidden_size*, *dropout_rate=0*)
Bases: torch.nn.Module

Computing the match representation for Match LSTM.

Parameters

- **hidden_size** – Size of hidden vectors.
- **dropout_rate** – Dropout rate of the projection layer. Defaults to 0.

Examples

```
>>> import torch
>>> attention = MatchModule(hidden_size=10)
>>> v1 = torch.randn(4, 5, 10)
>>> v1.shape
torch.Size([4, 5, 10])
>>> v2 = torch.randn(4, 5, 10)
>>> v2_mask = torch.ones(4, 5).to(dtype=torch.uint8)
>>> attention(v1, v2, v2_mask).shape
torch.Size([4, 5, 20])
```

forward(*self*, *v1*, *v2*, *v2_mask*)
Computing attention vectors and projection vectors.

matchzoo.modules.bert_module

Bert module.

Module Contents

class matchzoo.modules.bert_module.**BertModule**(*mode: str = 'bert-base-uncased'*)
Bases: torch.nn.Module

Bert module.

BERT (from Google) released with the paper BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding by Jacob Devlin, Ming-Wei Chang, Kenton Lee and Kristina Toutanova.

Parameters **mode** – String, supported mode can be referred https://huggingface.co/pytorch-transformers/pretrained_models.html.

forward(*self*, *x*, *y*)
Forward.

matchzoo.modules.character_embedding

Character embedding module.

Module Contents

class matchzoo.modules.character_embedding.**CharacterEmbedding**(*char_embedding_input_dim: int = 100, char_embedding_output_dim: int = 8, char_conv_filters: int = 100, char_conv_kernel_size: int = 5*)

Bases: torch.nn.Module

Character embedding module.

Parameters

- **char_embedding_input_dim** – The input dimension of character embedding layer.
- **char_embedding_output_dim** – The output dimension of character embedding layer.
- **char_conv_filters** – The filter size of character convolution layer.
- **char_conv_kernel_size** – The kernel size of character convolution layer.

Examples

```
>>> import torch
>>> character_embedding = CharacterEmbedding()
>>> x = torch.ones(10, 32, 16, dtype=torch.long)
>>> x.shape
torch.Size([10, 32, 16])
>>> character_embedding(x).shape
torch.Size([10, 32, 100])
```

forward(*self*, *x*)

Forward.

matchzoo.modules.dense_net

DenseNet module.

Module Contents

class matchzoo.modules.dense_net.**DenseBlock**(*in_channels, growth_rate: int = 20, kernel_size: tuple = (2, 2), layers_per_dense_block: int = 3*)

Bases: torch.nn.Module

Dense block of DenseNet.

forward(*self*, *x*)
Forward.

classmethod _make_conv_block(*cls*, *in_channels: int*, *out_channels: int*, *kernel_size: tuple*)
Make conv block.

class matchzoo.modules.dense_net.**DenseNet**(*in_channels*, *nb_dense_blocks: int = 3*, *layers_per_dense_block: int = 3*, *growth_rate: int = 10*, *transition_scale_down_ratio: float = 0.5*, *conv_kernel_size: tuple = (2, 2)*, *pool_kernel_size: tuple = (2, 2)*)
Bases: torch.nn.Module

DenseNet module.

Parameters

- **in_channels** – Feature size of input.
- **nb_dense_blocks** – The number of blocks in densenet.
- **layers_per_dense_block** – The number of convolution layers in dense block.
- **growth_rate** – The filter size of each convolution layer in dense block.
- **transition_scale_down_ratio** – The channel scale down ratio of the convolution layer in transition block.
- **conv_kernel_size** – The kernel size of convolution layer in dense block.
- **pool_kernel_size** – The kernel size of pooling layer in transition block.

out_channels :int
out_channels getter.

forward(*self*, *x*)
Forward.

classmethod _make_transition_block(*cls*, *in_channels: int*, *transition_scale_down_ratio: float*, *pool_kernel_size: tuple*)

matchzoo.modules.dropout

Module Contents

class matchzoo.modules.dropout.**RNNDropout**
Bases: torch.nn.Dropout

Dropout for RNN.

forward(*self*, *sequences_batch*)
Masking whole hidden vector for tokens.

matchzoo.modules.gaussian_kernel

Gaussian kernel module.

Module Contents

class matchzoo.modules.gaussian_kernel.**GaussianKernel**(*mu: float = 1.0*, *sigma: float = 1.0*)

Bases: torch.nn.Module

Gaussian kernel module.

Parameters

- **mu** – Float, mean of the kernel.
- **sigma** – Float, sigma of the kernel.

Examples

```
>>> import torch
>>> kernel = GaussianKernel()
>>> x = torch.randn(4, 5, 10)
>>> x.shape
torch.Size([4, 5, 10])
>>> kernel(x).shape
torch.Size([4, 5, 10])
```

forward(*self*, *x*)

Forward.

matchzoo.modules.matching

Matching module.

Module Contents

class matchzoo.modules.matching.**Matching**(*normalize: bool = False*, *matching_type: str = 'dot'*)

Bases: torch.nn.Module

Module that computes a matching matrix between samples in two tensors.

Parameters

- **normalize** – Whether to L2-normalize samples along the dot product axis before taking the dot product. If set to *True*, then the output of the dot product is the cosine proximity between the two samples.
- **matching_type** – the similarity function for matching

Examples

```
>>> import torch
>>> matching = Matching(matching_type='dot', normalize=True)
>>> x = torch.randn(2, 3, 2)
>>> y = torch.randn(2, 4, 2)
>>> matching(x, y).shape
torch.Size([2, 3, 4])
```

classmethod _validate_matching_type(*cls*, *matching_type: str = 'dot'*)

forward(*self*, *x*, *y*)
Perform attention on the input.

matchzoo.modules.matching_tensor

Matching Tensor module.

Module Contents

class matchzoo.modules.matching_tensor.**MatchingTensor**(*matching_dim: int*, *channels: int = 4*, *normalize: bool = True*, *init_diag: bool = True*)

Bases: `torch.nn.Module`

Module that captures the basic interactions between two tensors.

Parameters

- **matching_dims** – Word dimension of two interaction texts.
- **channels** – Number of word interaction tensor channels.
- **normalize** – Whether to L2-normalize samples along the dot product axis before taking the dot product. If set to True, then the output of the dot product is the cosine proximity between the two samples.
- **init_diag** – Whether to initialize the diagonal elements of the matrix.

Examples

```
>>> import matchzoo as mz
>>> matching_dim = 5
>>> matching_tensor = mz.modules.MatchingTensor(
...     matching_dim,
...     channels=4,
...     normalize=True,
...     init_diag=True
... )
```

forward(*self*, *x*, *y*)
The computation logic of MatchingTensor.

Parameters **inputs** – two input tensors.

matchzoo.modules.semantic_composite

Semantic composite module for DIIN model.

Module Contents

class matchzoo.modules.semantic_composite.**SemanticComposite**(*in_features*, *dropout_rate: float = 0.0*)

Bases: torch.nn.Module

SemanticComposite module.

Apply a self-attention layer and a semantic composite fuse gate to compute the encoding result of one tensor.

Parameters

- **in_features** – Feature size of input.
- **dropout_rate** – The dropout rate.

Examples

```
>>> import torch
>>> module = SemanticComposite(in_features=10)
>>> x = torch.randn(4, 5, 10)
>>> x.shape
torch.Size([4, 5, 10])
>>> module(x).shape
torch.Size([4, 5, 10])
```

forward(*self*, *x*)

Forward.

matchzoo.modules.spatial_gru

Spatial GRU module.

Module Contents

class matchzoo.modules.spatial_gru.**SpatialGRU**(*channels: int = 4, units: int = 10, activation: typing.Union[str, typing.Type[nn.Module], nn.Module] = 'tanh', recurrent_activation: typing.Union[str, typing.Type[nn.Module], nn.Module] = 'sigmoid', direction: str = 'lt'*)

Bases: torch.nn.Module

Spatial GRU Module.

Parameters

- **channels** – Number of word interaction tensor channels.
- **units** – Number of SpatialGRU units.
- **activation** – Activation function to use, one of: - String: name of an activation - Torch Modele subclass - Torch Module instance Default: hyperbolic tangent (*tanh*).
- **recurrent_activation** – Activation function to use for the recurrent step, one of:

- String: name of an activation
- Torch Modele subclass
- Torch Module instance

Default: sigmoid activation (*sigmoid*).

- **direction** – Scanning direction. *lt* (i.e., left top) indicates the scanning from left top to right bottom, and *rb* (i.e., right bottom) indicates the scanning from right bottom to left top.

Examples

```
>>> import matchzoo as mz
>>> channels, units= 4, 10
>>> spatial_gru = mz.modules.SpatialGRU(channels, units)
```

reset_parameters(*self*)
Initialize parameters.

softmax_by_row(*self*, *z: torch.tensor*)
Conduct softmax on each dimension across the four gates.

calculate_recurrent_unit(*self*, *inputs: torch.tensor*, *states: list*, *i: int*, *j: int*)
Calculate recurrent unit.

Parameters

- **inputs** – A tensor which contains interaction between left text and right text.
- **states** – An array of tensors which stores the hidden state of every step.
- **i** – Recurrent row index.
- **j** – Recurrent column index.

forward(*self*, *inputs*)
Perform SpatialGRU on word interation matrix.

Parameters **inputs** – input tensors.

matchzoo.modules.stacked_brnn

Module Contents

class matchzoo.modules.stacked_brnn.**StackedBRNN**(*input_size*, *hidden_size*, *num_layers*, *dropout_rate=0*, *dropout_output=False*, *rnn_type=nn.LSTM*, *concat_layers=False*)

Bases: torch.nn.Module

Stacked Bi-directional RNNs.

Differs from standard PyTorch library in that it has the option to save and concat the hidden states between layers. (i.e. the output hidden size for each sequence input is num_layers * hidden_size).

Examples

```
>>> import torch
>>> rnn = StackedBRNN(
...     input_size=10,
...     hidden_size=10,
...     num_layers=2,
...     dropout_rate=0.2,
...     dropout_output=True,
...     concat_layers=False
... )
>>> x = torch.randn(2, 5, 10)
>>> x.size()
torch.Size([2, 5, 10])
>>> x_mask = (torch.ones(2, 5) == 1)
>>> rnn(x, x_mask).shape
torch.Size([2, 5, 20])
```

forward(*self*, *x*, *x_mask*)
Encode either padded or non-padded sequences.

_forward_unpadded(*self*, *x*, *x_mask*)
Faster encoding that ignores any padding.

Package Contents

class matchzoo.modules.**Attention**(*input_size: int = 100*)
Bases: torch.nn.Module

Attention module.

Parameters

- **input_size** – Size of input.
- **mask** – An integer to mask the invalid values. Defaults to 0.

Examples

```
>>> import torch
>>> attention = Attention(input_size=10)
>>> x = torch.randn(4, 5, 10)
>>> x.shape
torch.Size([4, 5, 10])
>>> x_mask = torch.BoolTensor(4, 5)
>>> attention(x, x_mask).shape
torch.Size([4, 5])
```

forward(*self*, *x*, *x_mask*)
Perform attention on the input.

class matchzoo.modules.**BidirectionalAttention**
Bases: torch.nn.Module

Computing the soft attention between two sequence.

forward(*self*, *v1*, *v1_mask*, *v2*, *v2_mask*)
Forward.

class matchzoo.modules.**MatchModule**(*hidden_size*, *dropout_rate=0*)
Bases: torch.nn.Module

Computing the match representation for Match LSTM.

Parameters

- **hidden_size** – Size of hidden vectors.
- **dropout_rate** – Dropout rate of the projection layer. Defaults to 0.

Examples

```
>>> import torch
>>> attention = MatchModule(hidden_size=10)
>>> v1 = torch.randn(4, 5, 10)
>>> v1.shape
torch.Size([4, 5, 10])
>>> v2 = torch.randn(4, 5, 10)
>>> v2_mask = torch.ones(4, 5).to(dtype=torch.uint8)
>>> attention(v1, v2, v2_mask).shape
torch.Size([4, 5, 20])
```

forward(*self*, *v1*, *v2*, *v2_mask*)
Computing attention vectors and projection vectors.

class matchzoo.modules.**RNNDropout**
Bases: torch.nn.Dropout

Dropout for RNN.

forward(*self*, *sequences_batch*)
Masking whole hidden vector for tokens.

class matchzoo.modules.**StackedBRNN**(*input_size*, *hidden_size*, *num_layers*, *dropout_rate=0*, *dropout_output=False*, *rnn_type=nn.LSTM*, *concat_layers=False*)
Bases: torch.nn.Module

Stacked Bi-directional RNNs.

Differs from standard PyTorch library in that it has the option to save and concat the hidden states between layers. (i.e. the output hidden size for each sequence input is num_layers * hidden_size).

Examples

```
>>> import torch
>>> rnn = StackedBRNN(
...     input_size=10,
...     hidden_size=10,
...     num_layers=2,
...     dropout_rate=0.2,
...     dropout_output=True,
...     concat_layers=False
... )
>>> x = torch.randn(2, 5, 10)
>>> x.size()
torch.Size([2, 5, 10])
```

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```
>>> x_mask = (torch.ones(2, 5) == 1)
>>> rnn(x, x_mask).shape
torch.Size([2, 5, 20])
```

forward (*self*, *x*, *x_mask*)
Encode either padded or non-padded sequences.

_forward_unpadded (*self*, *x*, *x_mask*)
Faster encoding that ignores any padding.

class matchzoo.modules.**GaussianKernel** (*mu: float = 1.0*, *sigma: float = 1.0*)
Bases: torch.nn.Module

Gaussian kernel module.

Parameters

- **mu** – Float, mean of the kernel.
- **sigma** – Float, sigma of the kernel.

Examples

```
>>> import torch
>>> kernel = GaussianKernel()
>>> x = torch.randn(4, 5, 10)
>>> x.shape
torch.Size([4, 5, 10])
>>> kernel(x).shape
torch.Size([4, 5, 10])
```

forward (*self*, *x*)
Forward.

class matchzoo.modules.**Matching** (*normalize: bool = False*, *matching_type: str = 'dot'*)
Bases: torch.nn.Module

Module that computes a matching matrix between samples in two tensors.

Parameters

- **normalize** – Whether to L2-normalize samples along the dot product axis before taking the dot product. If set to *True*, then the output of the dot product is the cosine proximity between the two samples.
- **matching_type** – the similarity function for matching

Examples

```
>>> import torch
>>> matching = Matching(matching_type='dot', normalize=True)
>>> x = torch.randn(2, 3, 2)
>>> y = torch.randn(2, 4, 2)
>>> matching(x, y).shape
torch.Size([2, 3, 4])
```

classmethod _validate_matching_type (*cls*, *matching_type: str = 'dot'*)

forward(*self*, *x*, *y*)
Perform attention on the input.

class matchzoo.modules.**BertModule**(*mode: str = 'bert-base-uncased'*)
Bases: torch.nn.Module

Bert module.

BERT (from Google) released with the paper BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding by Jacob Devlin, Ming-Wei Chang, Kenton Lee and Kristina Toutanova.

Parameters **mode** – String, supported mode can be referred https://huggingface.co/pytorch-transformers/pretrained_models.html.

forward(*self*, *x*, *y*)
Forward.

class matchzoo.modules.**CharacterEmbedding**(*char_embedding_input_dim: int = 100*, *char_embedding_output_dim: int = 8*, *char_conv_filters: int = 100*, *char_conv_kernel_size: int = 5*)
Bases: torch.nn.Module

Character embedding module.

Parameters

- **char_embedding_input_dim** – The input dimension of character embedding layer.
- **char_embedding_output_dim** – The output dimension of character embedding layer.
- **char_conv_filters** – The filter size of character convolution layer.
- **char_conv_kernel_size** – The kernel size of character convolution layer.

Examples

```
>>> import torch
>>> character_embedding = CharacterEmbedding()
>>> x = torch.ones(10, 32, 16, dtype=torch.long)
>>> x.shape
torch.Size([10, 32, 16])
>>> character_embedding(x).shape
torch.Size([10, 32, 100])
```

forward(*self*, *x*)
Forward.

class matchzoo.modules.**SemanticComposite**(*in_features*, *dropout_rate: float = 0.0*)
Bases: torch.nn.Module

SemanticComposite module.

Apply a self-attention layer and a semantic composite fuse gate to compute the encoding result of one tensor.

Parameters

- **in_features** – Feature size of input.
- **dropout_rate** – The dropout rate.

Examples

```
>>> import torch
>>> module = SemanticComposite(in_features=10)
>>> x = torch.randn(4, 5, 10)
>>> x.shape
torch.Size([4, 5, 10])
>>> module(x).shape
torch.Size([4, 5, 10])
```

forward(*self*, *x*)
Forward.

class matchzoo.modules.**DenseNet**(*in_channels*, *nb_dense_blocks: int = 3*, *layers_per_dense_block: int = 3*, *growth_rate: int = 10*, *transition_scale_down_ratio: float = 0.5*, *conv_kernel_size: tuple = (2, 2)*, *pool_kernel_size: tuple = (2, 2)*)

Bases: torch.nn.Module

DenseNet module.

Parameters

- **in_channels** – Feature size of input.
- **nb_dense_blocks** – The number of blocks in densenet.
- **layers_per_dense_block** – The number of convolution layers in dense block.
- **growth_rate** – The filter size of each convolution layer in dense block.
- **transition_scale_down_ratio** – The channel scale down ratio of the convolution layer in transition block.
- **conv_kernel_size** – The kernel size of convolution layer in dense block.
- **pool_kernel_size** – The kernel size of pooling layer in transition block.

out_channels :int
out_channels getter.

forward(*self*, *x*)
Forward.

classmethod _make_transition_block(*cls*, *in_channels: int*, *transition_scale_down_ratio: float*, *pool_kernel_size: tuple*)

class matchzoo.modules.**MatchingTensor**(*matching_dim: int*, *channels: int = 4*, *normalize: bool = True*, *init_diag: bool = True*)

Bases: torch.nn.Module

Module that captures the basic interactions between two tensors.

Parameters

- **matching_dims** – Word dimension of two interaction texts.
- **channels** – Number of word interaction tensor channels.
- **normalize** – Whether to L2-normalize samples along the dot product axis before taking the dot product. If set to True, then the output of the dot product is the cosine proximity between the two samples.
- **init_diag** – Whether to initialize the diagonal elements of the matrix.

Examples

```
>>> import matchzoo as mz
>>> matching_dim = 5
>>> matching_tensor = mz.modules.MatchingTensor(
...     matching_dim,
...     channels=4,
...     normalize=True,
...     init_diag=True
... )
```

forward(*self*, *x*, *y*)

The computation logic of MatchingTensor.

Parameters **inputs** – two input tensors.

class matchzoo.modules.**SpatialGRU**(*channels: int = 4, units: int = 10, activation: typing.Union[str, typing.Type[nn.Module], nn.Module] = 'tanh', recurrent_activation: typing.Union[str, typing.Type[nn.Module], nn.Module] = 'sigmoid', direction: str = 'lt'*)

Bases: torch.nn.Module

Spatial GRU Module.

Parameters

- **channels** – Number of word interaction tensor channels.
- **units** – Number of SpatialGRU units.
- **activation** – Activation function to use, one of: - String: name of an activation - Torch Modele subclass - Torch Module instance Default: hyperbolic tangent (*tanh*).
- **recurrent_activation** – Activation function to use for the recurrent step, one of:
  - String: name of an activation
  - Torch Modele subclass
  - Torch Module instance

  Default: sigmoid activation (*sigmoid*).
- **direction** – Scanning direction. *lt* (i.e., left top) indicates the scanning from left top to right bottom, and *rb* (i.e., right bottom) indicates the scanning from right bottom to left top.

Examples

```
>>> import matchzoo as mz
>>> channels, units= 4, 10
>>> spatial_gru = mz.modules.SpatialGRU(channels, units)
```

reset_parameters(*self*)

Initialize parameters.

softmax_by_row(*self*, *z: torch.tensor*)

Conduct softmax on each dimension across the four gates.

calculate_recurrent_unit(*self*, *inputs: torch.tensor*, *states: list*, *i: int*, *j: int*)

Calculate recurrent unit.

Parameters

- **inputs** – A tensor which contains interaction between left text and right text.
- **states** – An array of tensors which stores the hidden state of every step.
- **i** – Recurrent row index.
- **j** – Recurrent column index.

forward (*self*, *inputs*)

Perform SpatialGRU on word interation matrix.

Parameters **inputs** – input tensors.

matchzoo.preprocessors

Subpackages

matchzoo.preprocessors.units

Submodules

matchzoo.preprocessors.units.character_index

Module Contents

class matchzoo.preprocessors.units.character_index.**CharacterIndex**(*char_index: dict*)

Bases: *matchzoo.preprocessors.units.unit.Unit*

CharacterIndexUnit for DIIN model.

The input of :class:'CharacterIndexUnit' should be a list of word character list extracted from a text. The output is the character index representation of this text.

`NgramLetterUnit` and `VocabularyUnit` are two essential prerequisite of `CharacterIndexUnit`.

Examples

```
>>> input_ = [['#', 'a', '#'],['#', 'o', 'n', 'e', '#']]
>>> character_index = CharacterIndex(
...     char_index={
...      '<PAD>': 0, '<OOV>': 1, 'a': 2, 'n': 3, 'e':4, '#':5})
>>> index = character_index.transform(input_)
>>> index
[[5, 2, 5], [5, 1, 3, 4, 5]]
```

transform (*self*, *input_: list*)

Transform list of characters to corresponding indices.

Parameters **input** – list of characters generated by :class:'NgramLetterUnit'.

Returns character index representation of a text.

matchzoo.preprocessors.units.digit_removal

Module Contents

class matchzoo.preprocessors.units.digit_removal.**DigitRemoval**
Bases: *matchzoo.preprocessors.units.unit.Unit*

Process unit to remove digits.

transform(*self*, *input_: list*)
Remove digits from list of tokens.

Parameters **input** – list of tokens to be filtered.

Return tokens tokens of tokens without digits.

matchzoo.preprocessors.units.frequency_filter

Module Contents

class matchzoo.preprocessors.units.frequency_filter.**FrequencyFilter**(*low: float = 0, high: float = float('inf'), mode: str = 'df'*)
Bases: *matchzoo.preprocessors.units.stateful_unit.StatefulUnit*

Frequency filter unit.

Parameters

- **low** – Lower bound, inclusive.
- **high** – Upper bound, exclusive.
- **mode** – One of *tf* (term frequency), *df* (document frequency), and *idf* (inverse document frequency).

Examples::

```
>>> import matchzoo as mz
```

To filter based on term frequency (tf):

```
>>> tf_filter = mz.preprocessors.units.FrequencyFilter(
...     low=2, mode='tf')
>>> tf_filter.fit([['A', 'B', 'B'], ['C', 'C', 'C']])
>>> tf_filter.transform(['A', 'B', 'C'])
['B', 'C']
```

To filter based on document frequency (df):

```
>>> tf_filter = mz.preprocessors.units.FrequencyFilter(
...     low=2, mode='df')
>>> tf_filter.fit([['A', 'B'], ['B', 'C']])
>>> tf_filter.transform(['A', 'B', 'C'])
['B']
```

To filter based on inverse document frequency (idf):

```
>>> idf_filter = mz.preprocessors.units.FrequencyFilter(
...     low=1.2, mode='idf')
>>> idf_filter.fit([['A', 'B'], ['B', 'C', 'D']])
>>> idf_filter.transform(['A', 'B', 'C'])
['A', 'C']
```

fit (*self, list_of_tokens: typing.List[typing.List[str]]*)
Fit *list_of_tokens* by calculating *mode* states.

transform (*self*, *input_: list*)
Transform a list of tokens by filtering out unwanted words.

classmethod _tf (*cls*, *list_of_tokens: list*)

classmethod _df (*cls*, *list_of_tokens: list*)

classmethod _idf (*cls*, *list_of_tokens: list*)

matchzoo.preprocessors.units.lemmatization

Module Contents

class matchzoo.preprocessors.units.lemmatization.**Lemmatization**
Bases: *matchzoo.preprocessors.units.unit.Unit*

Process unit for token lemmatization.

transform (*self*, *input_: list*)
Lemmatization a sequence of tokens.

Parameters **input** – list of tokens to be lemmatized.

Return tokens list of lemmatizd tokens.

matchzoo.preprocessors.units.lowercase

Module Contents

class matchzoo.preprocessors.units.lowercase.**Lowercase**
Bases: *matchzoo.preprocessors.units.unit.Unit*

Process unit for text lower case.

transform (*self*, *input_: list*)
Convert list of tokens to lower case.

Parameters **input** – list of tokens.

Return tokens lower-cased list of tokens.

matchzoo.preprocessors.units.matching_histogram

Module Contents

class matchzoo.preprocessors.units.matching_histogram.**MatchingHistogram**(*bin_size: int = 30, embedding_matrix=None, normalize=True, mode: str = 'LCH'*)

Bases: *matchzoo.preprocessors.units.unit.Unit*

MatchingHistogramUnit Class.

Parameters

- **bin_size** – The number of bins of the matching histogram.
- **embedding_matrix** – The word embedding matrix applied to calculate the matching histogram.
- **normalize** – Boolean, normalize the embedding or not.
- **mode** – The type of the historgram, it should be one of 'CH', 'NG', or 'LCH'.

Examples

```
>>> embedding_matrix = np.array([[1.0, -1.0], [1.0, 2.0], [1.0, 3.0]])
>>> text_left = [0, 1]
>>> text_right = [1, 2]
>>> histogram = MatchingHistogram(3, embedding_matrix, True, 'CH')
>>> histogram.transform([text_left, text_right])
[[3.0, 1.0, 1.0], [1.0, 2.0, 2.0]]
```

_normalize_embedding(*self*)
Normalize the embedding matrix.

transform(*self*, *input_: list*)
Transform the input text.

matchzoo.preprocessors.units.ngram_letter

Module Contents

class matchzoo.preprocessors.units.ngram_letter.**NgramLetter**(*ngram: int = 3, reduce_dim: bool = True*)

Bases: *matchzoo.preprocessors.units.unit.Unit*

Process unit for n-letter generation.

Triletter is used in `DSSMModel`. This processor is expected to execute before *Vocab* has been created.

Examples

```
>>> triletter = NgramLetter()
>>> rv = triletter.transform(['hello', 'word'])
>>> len(rv)
9
>>> rv
['#he', 'hel', 'ell', 'llo', 'lo#', '#wo', 'wor', 'ord', 'rd#']
>>> triletter = NgramLetter(reduce_dim=False)
>>> rv = triletter.transform(['hello', 'word'])
>>> len(rv)
2
>>> rv
[['#he', 'hel', 'ell', 'llo', 'lo#'], ['#wo', 'wor', 'ord', 'rd#']]
```

transform(*self*, *input_: list*)

Transform token into tri-letter.

For example, *word* should be represented as *#wo*, *wor*, *ord* and *rd#*.

Parameters **input** – list of tokens to be transformed.

Return n_letters generated n_letters.

matchzoo.preprocessors.units.punc_removal

Module Contents

class matchzoo.preprocessors.units.punc_removal.**PuncRemoval**

Bases: *matchzoo.preprocessors.units.unit.Unit*

Process unit for remove punctuations.

_MATCH_PUNC

transform(*self*, *input_: list*)

Remove punctuations from list of tokens.

Parameters **input** – list of toekns.

Return rv tokens without punctuation.

matchzoo.preprocessors.units.stateful_unit

Module Contents

class matchzoo.preprocessors.units.stateful_unit.**StatefulUnit**

Bases: *matchzoo.preprocessors.units.unit.Unit*

Unit with inner state.

Usually need to be fit before transforming. All information gathered in the fit phrase will be stored into its *context*.

state
Get current context. Same as *unit.context*.

Deprecated since v2.2.0, and will be removed in the future. Used *unit.context* instead.

context
Get current context. Same as *unit.state*.

fit(*self*, *input_: typing.Any*)
Abstract base method, need to be implemented in subclass.

matchzoo.preprocessors.units.stemming

Module Contents

class matchzoo.preprocessors.units.stemming.**Stemming**(*stemmer='porter'*)
Bases: *matchzoo.preprocessors.units.unit.Unit*

Process unit for token stemming.

Parameters **stemmer** – stemmer to use, *porter* or *lancaster*.

transform(*self*, *input_: list*)
Reducing inflected words to their word stem, base or root form.

Parameters **input** – list of string to be stemmed.

matchzoo.preprocessors.units.stop_removal

Module Contents

class matchzoo.preprocessors.units.stop_removal.**StopRemoval**(*lang: str = 'english'*)
Bases: *matchzoo.preprocessors.units.unit.Unit*

Process unit to remove stop words.

Example

```
>>> unit = StopRemoval()
>>> unit.transform(['a', 'the', 'test'])
['test']
>>> type(unit.stopwords)
<class 'list'>
```

stopwords :list
Get stopwords based on language.

Params lang language code.

Returns list of stop words.

transform(*self*, *input_: list*)
Remove stopwords from list of tokenized tokens.

Parameters

- **input** – list of tokenized tokens.
- **lang** – language code for stopwords.

Return tokens list of tokenized tokens without stopwords.

matchzoo.preprocessors.units.tokenize

Module Contents

class matchzoo.preprocessors.units.tokenize.**Tokenize**

Bases: *matchzoo.preprocessors.units.unit.Unit*

Process unit for text tokenization.

transform(*self*, *input_: str*)

Process input data from raw terms to list of tokens.

Parameters **input** – raw textual input.

Return tokens tokenized tokens as a list.

matchzoo.preprocessors.units.truncated_length

Module Contents

class matchzoo.preprocessors.units.truncated_length.**TruncatedLength**(*text_length: int*, *truncate_mode: str = 'pre'*)

Bases: *matchzoo.preprocessors.units.unit.Unit*

TruncatedLengthUnit Class.

Process unit to truncate the text that exceeds the set length.

Examples

```
>>> from matchzoo.preprocessors.units import TruncatedLength
>>> truncatedlen = TruncatedLength(3)
>>> truncatedlen.transform(list(range(1, 6))) == [3, 4, 5]
True
>>> truncatedlen.transform(list(range(2))) == [0, 1]
True
```

transform(*self*, *input_: list*)

Truncate the text that exceeds the specified maximum length.

Parameters **input** – list of tokenized tokens.

Return tokens list of tokenized tokens in fixed length if its origin length larger than text_length.

matchzoo.preprocessors.units.unit

Module Contents

class matchzoo.preprocessors.units.unit.**Unit**
Process unit do not persive state (i.e. do not need fit).

transform(*self*, *input_: typing.Any*)
Abstract base method, need to be implemented in subclass.

matchzoo.preprocessors.units.vocabulary

Module Contents

class matchzoo.preprocessors.units.vocabulary.**Vocabulary**(*pad_value: str = '<PAD>'*, *oov_value: str = '<OOV>'*)
Bases: *matchzoo.preprocessors.units.stateful_unit.StatefulUnit*

Vocabulary class.

Parameters

- **pad_value** – The string value for the padding position.
- **oov_value** – The string value for the out-of-vocabulary terms.

Examples

```
>>> vocab = Vocabulary(pad_value='[PAD]', oov_value='[OOV]')
>>> vocab.fit(['A', 'B', 'C', 'D', 'E'])
>>> term_index = vocab.state['term_index']
>>> term_index  # doctest: +SKIP
{'[PAD]': 0, '[OOV]': 1, 'D': 2, 'A': 3, 'B': 4, 'C': 5, 'E': 6}
>>> index_term = vocab.state['index_term']
>>> index_term  # doctest: +SKIP
{0: '[PAD]', 1: '[OOV]', 2: 'D', 3: 'A', 4: 'B', 5: 'C', 6: 'E'}
```

```
>>> term_index['out-of-vocabulary-term']
1
>>> index_term[0]
'[PAD]'
>>> index_term[42]
Traceback (most recent call last):
    ...
KeyError: 42
>>> a_index = term_index['A']
>>> c_index = term_index['C']
>>> vocab.transform(['C', 'A', 'C']) == [c_index, a_index, c_index]
True
>>> vocab.transform(['C', 'A', '[OOV]']) == [c_index, a_index, 1]
True
>>> indices = vocab.transform(list('ABCDDZZZ'))
>>> ' '.join(vocab.state['index_term'][i] for i in indices)
'A B C D D [OOV] [OOV] [OOV]'
```

class TermIndex
Bases: dict

Map term to index.

__missing__(*self*, *key*)
Map out-of-vocabulary terms to index 1.

fit(*self*, *tokens: list*)
Build a *TermIndex* and a IndexTerm.

transform(*self*, *input_: list*)
Transform a list of tokens to corresponding indices.

matchzoo.preprocessors.units.word_exact_match

Module Contents

class matchzoo.preprocessors.units.word_exact_match.**WordExactMatch**(*match: str*, *to_match: str*)

Bases: *matchzoo.preprocessors.units.unit.Unit*

WordExactUnit Class.

Process unit to get a binary match list of two word index lists. The word index list is the word representation of a text.

Examples

```
>>> import pandas
>>> input_ = pandas.DataFrame({
...  'text_left':[[1, 2, 3],[4, 5, 7, 9]],
...  'text_right':[[5, 3, 2, 7],[2, 3, 5]]}
... )
>>> left_word_exact_match = WordExactMatch(
...     match='text_left', to_match='text_right'
... )
>>> left_out = input_.apply(left_word_exact_match.transform, axis=1)
>>> left_out[0]
[0, 1, 1]
>>> left_out[1]
[0, 1, 0, 0]
>>> right_word_exact_match = WordExactMatch(
...     match='text_right', to_match='text_left'
... )
>>> right_out = input_.apply(right_word_exact_match.transform, axis=1)
>>> right_out[0]
[0, 1, 1, 0]
>>> right_out[1]
[0, 0, 1]
```

transform(*self*, *input_*)
Transform two word index lists into a binary match list.

Parameters **input** – a dataframe include 'match' column and 'to_match' column.

Returns a binary match result list of two word index lists.

matchzoo.preprocessors.units.word_hashing

Module Contents

class matchzoo.preprocessors.units.word_hashing.**WordHashing**(*term_index: dict*)
Bases: *matchzoo.preprocessors.units.unit.Unit*

Word-hashing layer for DSSM-based models.

The input of `WordHashingUnit` should be a list of word sub-letter list extracted from one document. The output of is the word-hashing representation of this document.

`NgramLetterUnit` and `VocabularyUnit` are two essential prerequisite of `WordHashingUnit`.

Examples

```
>>> letters = [['#te', 'tes','est', 'st#'], ['oov']]
>>> word_hashing = WordHashing(
...     term_index={
...      '_PAD': 0, 'OOV': 1, 'st#': 2, '#te': 3, 'est': 4, 'tes': 5
...      })
>>> hashing = word_hashing.transform(letters)
>>> hashing[0]
[0.0, 0.0, 1.0, 1.0, 1.0, 1.0]
>>> hashing[1]
[0.0, 1.0, 0.0, 0.0, 0.0, 0.0]
```

transform(*self*, *input_: list*)
Transform list of `letters` into word hashing layer.

Parameters **input** – list of *tri_letters* generated by `NgramLetterUnit`.

Returns Word hashing representation of *tri-letters*.

Package Contents

class matchzoo.preprocessors.units.**Unit**
Process unit do not persive state (i.e. do not need fit).

transform(*self*, *input_: typing.Any*)
Abstract base method, need to be implemented in subclass.

class matchzoo.preprocessors.units.**DigitRemoval**
Bases: *matchzoo.preprocessors.units.unit.Unit*

Process unit to remove digits.

transform(*self*, *input_: list*)
Remove digits from list of tokens.

Parameters **input** – list of tokens to be filtered.

Return tokens tokens of tokens without digits.

class matchzoo.preprocessors.units.**FrequencyFilter**(*low: float = 0, high: float = float('inf'), mode: str = 'df'*)

Bases: *matchzoo.preprocessors.units.stateful_unit.StatefulUnit*

Frequency filter unit.

Parameters

- **low** – Lower bound, inclusive.
- **high** – Upper bound, exclusive.
- **mode** – One of *tf* (term frequency), *df* (document frequency), and *idf* (inverse document frequency).

Examples::

```
>>> import matchzoo as mz
```

To filter based on term frequency (tf):

```
>>> tf_filter = mz.preprocessors.units.FrequencyFilter(
...     low=2, mode='tf')
>>> tf_filter.fit([['A', 'B', 'B'], ['C', 'C', 'C']])
>>> tf_filter.transform(['A', 'B', 'C'])
['B', 'C']
```

To filter based on document frequency (df):

```
>>> tf_filter = mz.preprocessors.units.FrequencyFilter(
...     low=2, mode='df')
>>> tf_filter.fit([['A', 'B'], ['B', 'C']])
>>> tf_filter.transform(['A', 'B', 'C'])
['B']
```

To filter based on inverse document frequency (idf):

```
>>> idf_filter = mz.preprocessors.units.FrequencyFilter(
...     low=1.2, mode='idf')
>>> idf_filter.fit([['A', 'B'], ['B', 'C', 'D']])
>>> idf_filter.transform(['A', 'B', 'C'])
['A', 'C']
```

fit(*self, list_of_tokens: typing.List[typing.List[str]]*)
Fit *list_of_tokens* by calculating *mode* states.

transform(*self*, *input_: list*)
Transform a list of tokens by filtering out unwanted words.

classmethod _tf(*cls*, *list_of_tokens: list*)

classmethod _df(*cls*, *list_of_tokens: list*)

classmethod _idf(*cls*, *list_of_tokens: list*)

class matchzoo.preprocessors.units.**Lemmatization**

Bases: *matchzoo.preprocessors.units.unit.Unit*

Process unit for token lemmatization.

transform(*self*, *input_: list*)
Lemmatization a sequence of tokens.

Parameters **input** – list of tokens to be lemmatized.

Return tokens list of lemmatizd tokens.

class matchzoo.preprocessors.units.**Lowercase**
Bases: *matchzoo.preprocessors.units.unit.Unit*

Process unit for text lower case.

transform(*self*, *input_: list*)
Convert list of tokens to lower case.

Parameters **input** – list of tokens.

Return tokens lower-cased list of tokens.

class matchzoo.preprocessors.units.**MatchingHistogram**(*bin_size: int = 30*, *embedding_matrix=None*, *normalize=True*, *mode: str = 'LCH'*)
Bases: *matchzoo.preprocessors.units.unit.Unit*

MatchingHistogramUnit Class.

Parameters

- **bin_size** – The number of bins of the matching histogram.
- **embedding_matrix** – The word embedding matrix applied to calculate the matching histogram.
- **normalize** – Boolean, normalize the embedding or not.
- **mode** – The type of the historgram, it should be one of 'CH', 'NG', or 'LCH'.

Examples

```
>>> embedding_matrix = np.array([[1.0, -1.0], [1.0, 2.0], [1.0, 3.0]])
>>> text_left = [0, 1]
>>> text_right = [1, 2]
>>> histogram = MatchingHistogram(3, embedding_matrix, True, 'CH')
>>> histogram.transform([text_left, text_right])
[[3.0, 1.0, 1.0], [1.0, 2.0, 2.0]]
```

_normalize_embedding(*self*)
Normalize the embedding matrix.

transform(*self*, *input_: list*)
Transform the input text.

class matchzoo.preprocessors.units.**NgramLetter**(*ngram: int = 3*, *reduce_dim: bool = True*)
Bases: *matchzoo.preprocessors.units.unit.Unit*

Process unit for n-letter generation.

Triletter is used in `DSSMModel`. This processor is expected to execute before *Vocab* has been created.

Examples

```
>>> triletter = NgramLetter()
>>> rv = triletter.transform(['hello', 'word'])
>>> len(rv)
9
>>> rv
['#he', 'hel', 'ell', 'llo', 'lo#', '#wo', 'wor', 'ord', 'rd#']
>>> triletter = NgramLetter(reduce_dim=False)
>>> rv = triletter.transform(['hello', 'word'])
>>> len(rv)
2
>>> rv
[['#he', 'hel', 'ell', 'llo', 'lo#'], ['#wo', 'wor', 'ord', 'rd#']]
```

transform(*self*, *input_: list*)
Transform token into tri-letter.

For example, *word* should be represented as *#wo*, *wor*, *ord* and *rd#*.

Parameters **input** – list of tokens to be transformed.

Return n_letters generated n_letters.

class matchzoo.preprocessors.units.**PuncRemoval**
Bases: *matchzoo.preprocessors.units.unit.Unit*

Process unit for remove punctuations.

_MATCH_PUNC

transform(*self*, *input_: list*)
Remove punctuations from list of tokens.

Parameters **input** – list of toekns.

Return rv tokens without punctuation.

class matchzoo.preprocessors.units.**StatefulUnit**
Bases: *matchzoo.preprocessors.units.unit.Unit*

Unit with inner state.

Usually need to be fit before transforming. All information gathered in the fit phrase will be stored into its *context*.

state
Get current context. Same as *unit.context*.

Deprecated since v2.2.0, and will be removed in the future. Used *unit.context* instead.

context
Get current context. Same as *unit.state*.

fit(*self*, *input_: typing.Any*)
Abstract base method, need to be implemented in subclass.

class matchzoo.preprocessors.units.**Stemming**(*stemmer='porter'*)
Bases: *matchzoo.preprocessors.units.unit.Unit*

Process unit for token stemming.

Parameters **stemmer** – stemmer to use, *porter* or *lancaster*.

transform(*self*, *input_: list*)
Reducing inflected words to their word stem, base or root form.

Parameters **input** – list of string to be stemmed.

class matchzoo.preprocessors.units.**StopRemoval**(*lang: str = 'english'*)

Bases: *matchzoo.preprocessors.units.unit.Unit*

Process unit to remove stop words.

Example

```
>>> unit = StopRemoval()
>>> unit.transform(['a', 'the', 'test'])
['test']
>>> type(unit.stopwords)
<class 'list'>
```

stopwords :**list**

Get stopwords based on language.

Params lang language code.

Returns list of stop words.

transform(*self*, *input_: list*)

Remove stopwords from list of tokenized tokens.

Parameters

- **input** – list of tokenized tokens.
- **lang** – language code for stopwords.

Return tokens list of tokenized tokens without stopwords.

class matchzoo.preprocessors.units.**Tokenize**

Bases: *matchzoo.preprocessors.units.unit.Unit*

Process unit for text tokenization.

transform(*self*, *input_: str*)

Process input data from raw terms to list of tokens.

Parameters **input** – raw textual input.

Return tokens tokenized tokens as a list.

class matchzoo.preprocessors.units.**Vocabulary**(*pad_value: str = '<PAD>'*, *oov_value: str = '<OOV>'*)

Bases: *matchzoo.preprocessors.units.stateful_unit.StatefulUnit*

Vocabulary class.

Parameters

- **pad_value** – The string value for the padding position.
- **oov_value** – The string value for the out-of-vocabulary terms.

Examples

```
>>> vocab = Vocabulary(pad_value='[PAD]', oov_value='[OOV]')
>>> vocab.fit(['A', 'B', 'C', 'D', 'E'])
>>> term_index = vocab.state['term_index']
>>> term_index  # doctest: +SKIP
{'[PAD]': 0, '[OOV]': 1, 'D': 2, 'A': 3, 'B': 4, 'C': 5, 'E': 6}
>>> index_term = vocab.state['index_term']
>>> index_term  # doctest: +SKIP
{0: '[PAD]', 1: '[OOV]', 2: 'D', 3: 'A', 4: 'B', 5: 'C', 6: 'E'}
```

```
>>> term_index['out-of-vocabulary-term']
1
>>> index_term[0]
'[PAD]'
>>> index_term[42]
Traceback (most recent call last):
    ...
KeyError: 42
>>> a_index = term_index['A']
>>> c_index = term_index['C']
>>> vocab.transform(['C', 'A', 'C']) == [c_index, a_index, c_index]
True
>>> vocab.transform(['C', 'A', '[OOV]']) == [c_index, a_index, 1]
True
>>> indices = vocab.transform(list('ABCDDZZZ'))
>>> ' '.join(vocab.state['index_term'][i] for i in indices)
'A B C D D [OOV] [OOV] [OOV]'
```

class TermIndex

Bases: dict

Map term to index.

__missing__(*self*, *key*)

Map out-of-vocabulary terms to index 1.

fit(*self*, *tokens: list*)

Build a *TermIndex* and a IndexTerm.

transform(*self*, *input_: list*)

Transform a list of tokens to corresponding indices.

class matchzoo.preprocessors.units.**WordHashing**(*term_index: dict*)

Bases: *matchzoo.preprocessors.units.unit.Unit*

Word-hashing layer for DSSM-based models.

The input of WordHashingUnit should be a list of word sub-letter list extracted from one document. The output of is the word-hashing representation of this document.

NgramLetterUnit and VocabularyUnit are two essential prerequisite of WordHashingUnit.

Examples

```
>>> letters = [['#te', 'tes','est', 'st#'], ['oov']]
>>> word_hashing = WordHashing(
...     term_index={
...      '_PAD': 0, 'OOV': 1, 'st#': 2, '#te': 3, 'est': 4, 'tes': 5
...      })
```

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```
>>> hashing = word_hashing.transform(letters)
>>> hashing[0]
[0.0, 0.0, 1.0, 1.0, 1.0, 1.0]
>>> hashing[1]
[0.0, 1.0, 0.0, 0.0, 0.0, 0.0]
```

transform(*self*, *input_: list*)

Transform list of `letters` into word hashing layer.

Parameters **input** – list of *tri_letters* generated by `NgramLetterUnit`.

Returns Word hashing representation of *tri-letters*.

class matchzoo.preprocessors.units.**CharacterIndex**(*char_index: dict*)

Bases: *matchzoo.preprocessors.units.unit.Unit*

CharacterIndexUnit for DIIN model.

The input of :class:'CharacterIndexUnit' should be a list of word character list extracted from a text. The output is the character index representation of this text.

`NgramLetterUnit` and `VocabularyUnit` are two essential prerequisite of `CharacterIndexUnit`.

Examples

```
>>> input_ = [['#', 'a', '#'],['#', 'o', 'n', 'e', '#']]
>>> character_index = CharacterIndex(
...     char_index={
...      '<PAD>': 0, '<OOV>': 1, 'a': 2, 'n': 3, 'e':4, '#':5})
>>> index = character_index.transform(input_)
>>> index
[[5, 2, 5], [5, 1, 3, 4, 5]]
```

transform(*self*, *input_: list*)

Transform list of characters to corresponding indices.

Parameters **input** – list of characters generated by :class:'NgramLetterUnit'.

Returns character index representation of a text.

class matchzoo.preprocessors.units.**WordExactMatch**(*match: str*, *to_match: str*)

Bases: *matchzoo.preprocessors.units.unit.Unit*

WordExactUnit Class.

Process unit to get a binary match list of two word index lists. The word index list is the word representation of a text.

Examples

```
>>> import pandas
>>> input_ = pandas.DataFrame({
...  'text_left':[[1, 2, 3],[4, 5, 7, 9]],
...  'text_right':[[5, 3, 2, 7],[2, 3, 5]]}
... )
>>> left_word_exact_match = WordExactMatch(
...     match='text_left', to_match='text_right'
```

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```
... )
>>> left_out = input_.apply(left_word_exact_match.transform, axis=1)
>>> left_out[0]
[0, 1, 1]
>>> left_out[1]
[0, 1, 0, 0]
>>> right_word_exact_match = WordExactMatch(
...     match='text_right', to_match='text_left'
... )
>>> right_out = input_.apply(right_word_exact_match.transform, axis=1)
>>> right_out[0]
[0, 1, 1, 0]
>>> right_out[1]
[0, 0, 1]
```

transform(*self*, *input_*)

Transform two word index lists into a binary match list.

Parameters **input** – a dataframe include 'match' column and 'to_match' column.

Returns a binary match result list of two word index lists.

class matchzoo.preprocessors.units.**TruncatedLength**(*text_length: int*, *truncate_mode: str = 'pre'*)

Bases: *matchzoo.preprocessors.units.unit.Unit*

TruncatedLengthUnit Class.

Process unit to truncate the text that exceeds the set length.

Examples

```
>>> from matchzoo.preprocessors.units import TruncatedLength
>>> truncatedlen = TruncatedLength(3)
>>> truncatedlen.transform(list(range(1, 6))) == [3, 4, 5]
True
>>> truncatedlen.transform(list(range(2))) == [0, 1]
True
```

transform(*self*, *input_: list*)

Truncate the text that exceeds the specified maximum length.

Parameters **input** – list of tokenized tokens.

Return tokens list of tokenized tokens in fixed length if its origin length larger than text_length.

matchzoo.preprocessors.units.**list_available**() → list

Submodules

matchzoo.preprocessors.basic_preprocessor

Basic Preprocessor.

Module Contents

class matchzoo.preprocessors.basic_preprocessor.**BasicPreprocessor**(*truncated_mode: str = 'pre', truncated_length_left: int = None, truncated_length_right: int = None, filter_mode: str = 'df', filter_low_freq: float = 1, filter_high_freq: float = float('inf'), remove_stop_words: bool = False, ngram_size: typing.Optional[int] = None*)

Bases: *matchzoo.engine.base_preprocessor.BasePreprocessor*

Baisc preprocessor helper.

Parameters

- **truncated_mode** – String, mode used by `TruncatedLength`. Can be 'pre' or 'post'.
- **truncated_length_left** – Integer, maximize length of `left` in the data_pack.
- **truncated_length_right** – Integer, maximize length of `right` in the data_pack.
- **filter_mode** – String, mode used by `FrequenceFilterUnit`. Can be 'df', 'cf', and 'idf'.
- **filter_low_freq** – Float, lower bound value used by `FrequenceFilterUnit`.
- **filter_high_freq** – Float, upper bound value used by `FrequenceFilterUnit`.
- **remove_stop_words** – Bool, use `StopRemovalUnit` unit or not.

Example

```
>>> import matchzoo as mz
>>> train_data = mz.datasets.toy.load_data('train')
>>> test_data = mz.datasets.toy.load_data('test')
>>> preprocessor = mz.preprocessors.BasicPreprocessor(
...     truncated_length_left=10,
...     truncated_length_right=20,
```

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```
...     filter_mode='df',
...     filter_low_freq=2,
...     filter_high_freq=1000,
...     remove_stop_words=True
... )
>>> preprocessor = preprocessor.fit(train_data, verbose=0)
>>> preprocessor.context['vocab_size']
226
>>> processed_train_data = preprocessor.transform(train_data,
...                                               verbose=0)
>>> type(processed_train_data)
<class 'matchzoo.data_pack.data_pack.DataPack'>
>>> test_data_transformed = preprocessor.transform(test_data,
...                                                verbose=0)
>>> type(test_data_transformed)
<class 'matchzoo.data_pack.data_pack.DataPack'>
```

fit(*self*, *data_pack: DataPack*, *verbose: int = 1*)
Fit pre-processing context for transformation.

Parameters

- **data_pack** – data_pack to be preprocessed.
- **verbose** – Verbosity.

Returns class:*BasicPreprocessor* instance.

transform(*self*, *data_pack: DataPack*, *verbose: int = 1*)
Apply transformation on data, create truncated length representation.

Parameters

- **data_pack** – Inputs to be preprocessed.
- **verbose** – Verbosity.

Returns Transformed data as `DataPack` object.

matchzoo.preprocessors.bert_preprocessor

Bert Preprocessor.

Module Contents

class matchzoo.preprocessors.bert_preprocessor.**BertPreprocessor**(*mode: str = 'bert-base-uncased'*)

Bases: *matchzoo.engine.base_preprocessor.BasePreprocessor*

Baisc preprocessor helper.

Parameters **mode** – String, supported mode can be referred https://huggingface.co/pytorch-transformers/pretrained_models.html.

fit(*self*, *data_pack: DataPack*, *verbose: int = 1*)
Tokenizer is all BertPreprocessor's need.

transform(*self*, *data_pack: DataPack*, *verbose: int = 1*)
Apply transformation on data.

Parameters

- **data_pack** – Inputs to be preprocessed.
- **verbose** – Verbosity.

Returns Transformed data as `DataPack` object.

matchzoo.preprocessors.build_unit_from_data_pack

Build unit from data pack.

Module Contents

matchzoo.preprocessors.build_unit_from_data_pack.**build_unit_from_data_pack**(*unit: StatefulUnit*, *data_pack: mz.DataPack*, *mode: str = 'both'*, *flatten: bool = True*, *verbose: int = 1*) → StatefulUnit

Build a `StatefulUnit` from a `DataPack` object.

Parameters

- **unit** – `StatefulUnit` object to be built.
- **data_pack** – The input `DataPack` object.
- **mode** – One of 'left', 'right', and 'both', to determine the source data for building the `VocabularyUnit`.
- **flatten** – Flatten the datapack or not. *True* to organize the `DataPack` text as a list, and *False* to organize `DataPack` text as a list of list.

- **verbose** – Verbosity.

Returns A built `StatefulUnit` object.

matchzoo.preprocessors.build_vocab_unit

Module Contents

matchzoo.preprocessors.build_vocab_unit.**build_vocab_unit**(*data_pack: DataPack*, *mode: str = 'both'*, *verbose: int = 1*) → Vocabulary

Build a `preprocessor.units.Vocabulary` given *data_pack*.

The *data_pack* should be preprocessed forehand, and each item in *text_left* and *text_right* columns of the *data_pack* should be a list of tokens.

Parameters

- **data_pack** – The `DataPack` to build vocabulary upon.
- **mode** – One of 'left', 'right', and 'both', to determine the source

data for building the `VocabularyUnit`. :param verbose: Verbosity. :return: A built vocabulary unit.

matchzoo.preprocessors.chain_transform

Wrapper function organizes a number of transform functions.

Module Contents

matchzoo.preprocessors.chain_transform.**chain_transform**(*units: typing.List[Unit]*) → typing.Callable

Compose unit transformations into a single function.

Parameters **units** – List of `matchzoo.StatelessUnit`.

matchzoo.preprocessors.naive_preprocessor

Naive Preprocessor.

Module Contents

class matchzoo.preprocessors.naive_preprocessor.**NaivePreprocessor**

Bases: *matchzoo.engine.base_preprocessor.BasePreprocessor*

Naive preprocessor.

Example

```
>>> import matchzoo as mz
>>> train_data = mz.datasets.toy.load_data()
>>> test_data = mz.datasets.toy.load_data(stage='test')
>>> preprocessor = mz.preprocessors.NaivePreprocessor()
>>> train_data_processed = preprocessor.fit_transform(train_data,
...                                                   verbose=0)
>>> type(train_data_processed)
<class 'matchzoo.data_pack.data_pack.DataPack'>
>>> test_data_transformed = preprocessor.transform(test_data,
...                                                verbose=0)
>>> type(test_data_transformed)
<class 'matchzoo.data_pack.data_pack.DataPack'>
```

fit(*self*, *data_pack: DataPack*, *verbose: int = 1*)
Fit pre-processing context for transformation.

Parameters

- **data_pack** – data_pack to be preprocessed.
- **verbose** – Verbosity.

Returns class:*NaivePreprocessor* instance.

transform(*self*, *data_pack: DataPack*, *verbose: int = 1*)
Apply transformation on data, create truncated length representation.

Parameters

- **data_pack** – Inputs to be preprocessed.
- **verbose** – Verbosity.

Returns Transformed data as `DataPack` object.

Package Contents

class matchzoo.preprocessors.**NaivePreprocessor**
Bases: *matchzoo.engine.base_preprocessor.BasePreprocessor*

Naive preprocessor.

Example

```
>>> import matchzoo as mz
>>> train_data = mz.datasets.toy.load_data()
>>> test_data = mz.datasets.toy.load_data(stage='test')
>>> preprocessor = mz.preprocessors.NaivePreprocessor()
>>> train_data_processed = preprocessor.fit_transform(train_data,
...                                                   verbose=0)
>>> type(train_data_processed)
<class 'matchzoo.data_pack.data_pack.DataPack'>
>>> test_data_transformed = preprocessor.transform(test_data,
...                                                verbose=0)
>>> type(test_data_transformed)
<class 'matchzoo.data_pack.data_pack.DataPack'>
```

fit (*self*, *data_pack: DataPack*, *verbose: int = 1*)
Fit pre-processing context for transformation.

Parameters

- **data_pack** – data_pack to be preprocessed.
- **verbose** – Verbosity.

Returns class:*NaivePreprocessor* instance.

transform (*self*, *data_pack: DataPack*, *verbose: int = 1*)
Apply transformation on data, create truncated length representation.

Parameters

- **data_pack** – Inputs to be preprocessed.
- **verbose** – Verbosity.

Returns Transformed data as `DataPack` object.

class matchzoo.preprocessors.**BasicPreprocessor** (*truncated_mode: str = 'pre'*, *truncated_length_left: int = None*, *truncated_length_right: int = None*, *filter_mode: str = 'df'*, *filter_low_freq: float = 1*, *filter_high_freq: float = float('inf')*, *remove_stop_words: bool = False*, *ngram_size: typing.Optional[int] = None*)
Bases: *matchzoo.engine.base_preprocessor.BasePreprocessor*

Baisc preprocessor helper.

Parameters

- **truncated_mode** – String, mode used by `TruncatedLength`. Can be 'pre' or 'post'.
- **truncated_length_left** – Integer, maximize length of `left` in the data_pack.
- **truncated_length_right** – Integer, maximize length of `right` in the data_pack.
- **filter_mode** – String, mode used by `FrequenceFilterUnit`. Can be 'df', 'cf', and 'idf'.
- **filter_low_freq** – Float, lower bound value used by `FrequenceFilterUnit`.
- **filter_high_freq** – Float, upper bound value used by `FrequenceFilterUnit`.
- **remove_stop_words** – Bool, use `StopRemovalUnit` unit or not.

Example

```
>>> import matchzoo as mz
>>> train_data = mz.datasets.toy.load_data('train')
>>> test_data = mz.datasets.toy.load_data('test')
>>> preprocessor = mz.preprocessors.BasicPreprocessor(
...     truncated_length_left=10,
...     truncated_length_right=20,
...     filter_mode='df',
...     filter_low_freq=2,
...     filter_high_freq=1000,
...     remove_stop_words=True
```

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```
... )
>>> preprocessor = preprocessor.fit(train_data, verbose=0)
>>> preprocessor.context['vocab_size']
226
>>> processed_train_data = preprocessor.transform(train_data,
...                                               verbose=0)
>>> type(processed_train_data)
<class 'matchzoo.data_pack.data_pack.DataPack'>
>>> test_data_transformed = preprocessor.transform(test_data,
...                                                verbose=0)
>>> type(test_data_transformed)
<class 'matchzoo.data_pack.data_pack.DataPack'>
```

fit(*self*, *data_pack: DataPack*, *verbose: int = 1*)
Fit pre-processing context for transformation.

Parameters

- **data_pack** – data_pack to be preprocessed.
- **verbose** – Verbosity.

Returns class:*BasicPreprocessor* instance.

transform(*self*, *data_pack: DataPack*, *verbose: int = 1*)
Apply transformation on data, create truncated length representation.

Parameters

- **data_pack** – Inputs to be preprocessed.
- **verbose** – Verbosity.

Returns Transformed data as `DataPack` object.

class matchzoo.preprocessors.**BertPreprocessor**(*mode: str = 'bert-base-uncased'*)
Bases: *matchzoo.engine.base_preprocessor.BasePreprocessor*

Baisc preprocessor helper.

Parameters **mode** – String, supported mode can be referred https://huggingface.co/pytorch-transformers/pretrained_models.html.

fit(*self*, *data_pack: DataPack*, *verbose: int = 1*)
Tokenizer is all BertPreprocessor's need.

transform(*self*, *data_pack: DataPack*, *verbose: int = 1*)
Apply transformation on data.

Parameters

- **data_pack** – Inputs to be preprocessed.
- **verbose** – Verbosity.

Returns Transformed data as `DataPack` object.

matchzoo.preprocessors.**list_available**() → list

matchzoo.tasks

Submodules

matchzoo.tasks.classification

Classification task.

Module Contents

class matchzoo.tasks.classification.**Classification**(*num_classes: int = 2*, ***kwargs*)

Bases: *matchzoo.engine.base_task.BaseTask*

Classification task.

Examples

```
>>> classification_task = Classification(num_classes=2)
>>> classification_task.metrics = ['acc']
>>> classification_task.num_classes
2
>>> classification_task.output_shape
(2,)
>>> classification_task.output_dtype
<class 'int'>
>>> print(classification_task)
Classification Task with 2 classes
```

TYPE = classification

num_classes :int

number of classes to classify.

Type return

output_shape :tuple

output shape of a single sample of the task.

Type return

output_dtype

target data type, expect *int* as output.

Type return

classmethod list_available_losses(*cls*)

Returns a list of available losses.

classmethod list_available_metrics(*cls*)

Returns a list of available metrics.

__str__(*self*)

Returns Task name as string.

matchzoo.tasks.ranking

Ranking task.

Module Contents

class matchzoo.tasks.ranking.**Ranking**
Bases: *matchzoo.engine.base_task.BaseTask*

Ranking Task.

Examples

```
>>> ranking_task = Ranking()
>>> ranking_task.metrics = ['map', 'ndcg']
>>> ranking_task.output_shape
(1,)
>>> ranking_task.output_dtype
<class 'float'>
>>> print(ranking_task)
Ranking Task
```

TYPE = ranking

output_shape :tuple
output shape of a single sample of the task.

Type return

output_dtype
target data type, expect *float* as output.

Type return

classmethod list_available_losses(*cls*)

Returns a list of available losses.

classmethod list_available_metrics(*cls*)

Returns a list of available metrics.

__str__(*self*)

Returns Task name as string.

Package Contents

class matchzoo.tasks.**Classification**(*num_classes: int = 2*, ***kwargs*)
Bases: *matchzoo.engine.base_task.BaseTask*

Classification task.

Examples

```
>>> classification_task = Classification(num_classes=2)
>>> classification_task.metrics = ['acc']
>>> classification_task.num_classes
2
>>> classification_task.output_shape
(2,)
```

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```
>>> classification_task.output_dtype
<class 'int'>
>>> print(classification_task)
Classification Task with 2 classes
```

TYPE = classification

num_classes :int
number of classes to classify.

Type return

output_shape :tuple
output shape of a single sample of the task.

Type return

output_dtype
target data type, expect *int* as output.

Type return

classmethod list_available_losses(*cls*)

Returns a list of available losses.

classmethod list_available_metrics(*cls*)

Returns a list of available metrics.

__str__(*self*)

Returns Task name as string.

class matchzoo.tasks.**Ranking**
Bases: *matchzoo.engine.base_task.BaseTask*

Ranking Task.

Examples

```
>>> ranking_task = Ranking()
>>> ranking_task.metrics = ['map', 'ndcg']
>>> ranking_task.output_shape
(1,)
>>> ranking_task.output_dtype
<class 'float'>
>>> print(ranking_task)
Ranking Task
```

TYPE = ranking

output_shape :tuple
output shape of a single sample of the task.

Type return

output_dtype
target data type, expect *float* as output.

Type return

classmethod list_available_losses(*cls*)

Returns a list of available losses.

classmethod list_available_metrics(*cls*)

Returns a list of available metrics.

__str__(*self*)

Returns Task name as string.

matchzoo.trainers

Submodules

matchzoo.trainers.trainer

Base Trainer.

Module Contents

class matchzoo.trainers.trainer.**Trainer**(*model: BaseModel*, *optimizer: optim.Optimizer*, *trainloader: DataLoader*, *validloader: DataLoader*, *device: typing.Union[torch.device, int, list, None] = None*, *start_epoch: int = 1*, *epochs: int = 10*, *validate_interval: typing.Optional[int] = None*, *scheduler: typing.Any = None*, *clip_norm: typing.Union[float, int] = None*, *patience: typing.Optional[int] = None*, *key: typing.Any = None*, *checkpoint: typing.Union[str, Path] = None*, *save_dir: typing.Union[str, Path] = None*, *save_all: bool = False*, *verbose: int = 1*, ***kwargs*)

MatchZoo tranier.

Parameters

- **model** – A `BaseModel` instance.
- **optimizer** – A `optim.Optimizer` instance.
- **trainloader** – A :class‘DataLoader‘ instance. The dataloader is used for training the model.
- **validloader** – A :class‘DataLoader‘ instance. The dataloader is used for validating the model.
- **device** – The desired device of returned tensor. Default: if None, use the current device. If *torch.device* or int, use device specified by user. If list, use data parallel.
- **start_epoch** – Int. Number of starting epoch.
- **epochs** – The maximum number of epochs for training. Defaults to 10.
- **validate_interval** – Int. Interval of validation.
- **scheduler** – LR scheduler used to adjust the learning rate based on the number of epochs.
- **clip_norm** – Max norm of the gradients to be clipped.

- **patience** – Number fo events to wait if no improvement and then stop the training.
- **key** – Key of metric to be compared.
- **checkpoint** – A checkpoint from which to continue training. If None, training starts from scratch. Defaults to None. Should be a file-like object (has to implement read, readline, tell, and seek), or a string containing a file name.
- **save_dir** – Directory to save trainer.
- **save_all** – Bool. If True, save *Trainer* instance; If False, only save model. Defaults to False.
- **verbose** – 0, 1, or 2. Verbosity mode. 0 = silent, 1 = verbose, 2 = one log line per epoch.

_load_dataloader(*self*, *trainloader: DataLoader*, *validloader: DataLoader*, *validate_interval: typing.Optional[int] = None*)

Load trainloader and determine validate interval.

Parameters

- **trainloader** – A :class‘DataLoader‘ instance. The dataloader is used to train the model.
- **validloader** – A :class‘DataLoader‘ instance. The dataloader is used to validate the model.
- **validate_interval** – int. Interval of validation.

_load_model(*self*, *model: BaseModel*, *device: typing.Union[torch.device*, *int*, *list*, *None] = None*)

Load model.

Parameters

- **model** – `BaseModel` instance.
- **device** – The desired device of returned tensor. Default: if None, use the current device. If *torch.device* or int, use device specified by user. If list, use data parallel.

_load_path(*self, checkpoint: typing.Union[str, Path], save_dir: typing.Union[str, Path]*)

Load save_dir and Restore from checkpoint.

Parameters

- **checkpoint** – A checkpoint from which to continue training. If None, training starts from scratch. Defaults to None. Should be a file-like object (has to implement read, readline, tell, and seek), or a string containing a file name.
- **save_dir** – Directory to save trainer.

_backward(*self*, *loss*)

Computes the gradient of current *loss* graph leaves.

Parameters **loss** – Tensor. Loss of model.

_run_scheduler(*self*)

Run scheduler.

run(*self*)

Train model.

The processes: Run each epoch -> Run scheduler -> Should stop early?

_run_epoch(*self*)

Run each epoch.

The training steps:

- Get batch and feed them into model
- Get outputs. Caculate all losses and sum them up
- Loss backwards and optimizer steps
- Evaluation
- Update and output result

evaluate (*self*, *dataloader: DataLoader*)
Evaluate the model.

Parameters **dataloader** – A DataLoader object to iterate over the data.

classmethod _eval_metric_on_data_frame (*cls, metric: BaseMetric, id_left: typing.Any, y_true: typing.Union[list, np.array], y_pred: typing.Union[list, np.array]*)
Eval metric on data frame.

This function is used to eval metrics for *Ranking* task.

Parameters

- **metric** – Metric for *Ranking* task.
- **id_left** – id of input left. Samples with same id_left should be grouped for evaluation.
- **y_true** – Labels of dataset.
- **y_pred** – Outputs of model.

Returns Evaluation result.

predict (*self*, *dataloader: DataLoader*)
Generate output predictions for the input samples.

Parameters **dataloader** – input DataLoader

Returns predictions

_save (*self*)
Save.

save_model (*self*)
Save the model.

save (*self*)
Save the trainer.

Trainer parameters like epoch, best_so_far, model, optimizer and early_stopping will be savad to specific file path.

Parameters **path** – Path to save trainer.

restore_model (*self, checkpoint: typing.Union[str, Path]*)
Restore model.

Parameters **checkpoint** – A checkpoint from which to continue training.

restore (*self*, *checkpoint: typing.Union[str*, *Path] = None*)
Restore trainer.

Parameters **checkpoint** – A checkpoint from which to continue training.

Package Contents

class matchzoo.trainers.**Trainer**(*model: BaseModel*, *optimizer: optim.Optimizer*, *trainloader: DataLoader*, *validloader: DataLoader*, *device: typing.Union[torch.device, int, list, None] = None*, *start_epoch: int = 1*, *epochs: int = 10*, *validate_interval: typing.Optional[int] = None*, *scheduler: typing.Any = None*, *clip_norm: typing.Union[float, int] = None*, *patience: typing.Optional[int] = None*, *key: typing.Any = None*, *checkpoint: typing.Union[str, Path] = None*, *save_dir: typing.Union[str, Path] = None*, *save_all: bool = False*, *verbose: int = 1*, ***kwargs*)

MatchZoo tranier.

Parameters

- **model** – A `BaseModel` instance.
- **optimizer** – A `optim.Optimizer` instance.
- **trainloader** – A :class‘DataLoader‘ instance. The dataloader is used for training the model.
- **validloader** – A :class‘DataLoader‘ instance. The dataloader is used for validating the model.
- **device** – The desired device of returned tensor. Default: if None, use the current device. If *torch.device* or int, use device specified by user. If list, use data parallel.
- **start_epoch** – Int. Number of starting epoch.
- **epochs** – The maximum number of epochs for training. Defaults to 10.
- **validate_interval** – Int. Interval of validation.
- **scheduler** – LR scheduler used to adjust the learning rate based on the number of epochs.
- **clip_norm** – Max norm of the gradients to be clipped.
- **patience** – Number fo events to wait if no improvement and then stop the training.
- **key** – Key of metric to be compared.
- **checkpoint** – A checkpoint from which to continue training. If None, training starts from scratch. Defaults to None. Should be a file-like object (has to implement read, readline, tell, and seek), or a string containing a file name.
- **save_dir** – Directory to save trainer.
- **save_all** – Bool. If True, save *Trainer* instance; If False, only save model. Defaults to False.
- **verbose** – 0, 1, or 2. Verbosity mode. 0 = silent, 1 = verbose, 2 = one log line per epoch.

_load_dataloader(*self*, *trainloader: DataLoader*, *validloader: DataLoader*, *validate_interval: typing.Optional[int] = None*)

Load trainloader and determine validate interval.

Parameters

- **trainloader** – A :class‘DataLoader‘ instance. The dataloader is used to train the model.

- **validloader** – A :class‘DataLoader‘ instance. The dataloader is used to validate the model.
- **validate_interval** – int. Interval of validation.

_load_model(*self*, *model: BaseModel*, *device: typing.Union[torch.device*, *int*, *list*, *None] = None*)
Load model.

Parameters

- **model** – `BaseModel` instance.
- **device** – The desired device of returned tensor. Default: if None, use the current device. If *torch.device* or int, use device specified by user. If list, use data parallel.

_load_path(*self, checkpoint: typing.Union[str, Path], save_dir: typing.Union[str, Path]*)
Load save_dir and Restore from checkpoint.

Parameters

- **checkpoint** – A checkpoint from which to continue training. If None, training starts from scratch. Defaults to None. Should be a file-like object (has to implement read, readline, tell, and seek), or a string containing a file name.
- **save_dir** – Directory to save trainer.

_backward(*self*, *loss*)
Computes the gradient of current *loss* graph leaves.

Parameters **loss** – Tensor. Loss of model.

_run_scheduler(*self*)
Run scheduler.

run(*self*)
Train model.

The processes: Run each epoch -> Run scheduler -> Should stop early?

_run_epoch(*self*)
Run each epoch.

The training steps:

- Get batch and feed them into model
- Get outputs. Caculate all losses and sum them up
- Loss backwards and optimizer steps
- Evaluation
- Update and output result

evaluate(*self*, *dataloader: DataLoader*)
Evaluate the model.

Parameters **dataloader** – A DataLoader object to iterate over the data.

classmethod _eval_metric_on_data_frame(*cls, metric: BaseMetric, id_left: typing.Any, y_true: typing.Union[list, np.array], y_pred: typing.Union[list, np.array]*)
Eval metric on data frame.

This function is used to eval metrics for *Ranking* task.

Parameters

- **metric** – Metric for *Ranking* task.
- **id_left** – id of input left. Samples with same id_left should be grouped for evaluation.
- **y_true** – Labels of dataset.
- **y_pred** – Outputs of model.

Returns Evaluation result.

predict (*self*, *dataloader: DataLoader*)
Generate output predictions for the input samples.

Parameters **dataloader** – input DataLoader

Returns predictions

_save (*self*)
Save.

save_model (*self*)
Save the model.

save (*self*)
Save the trainer.

Trainer parameters like epoch, best_so_far, model, optimizer and early_stopping will be savad to specific file path.

Parameters **path** – Path to save trainer.

restore_model (*self, checkpoint: typing.Union[str, Path]*)
Restore model.

Parameters **checkpoint** – A checkpoint from which to continue training.

restore (*self*, *checkpoint: typing.Union[str*, *Path] = None*)
Restore trainer.

Parameters **checkpoint** – A checkpoint from which to continue training.

matchzoo.utils

Submodules

matchzoo.utils.average_meter

Average meter.

Module Contents

class matchzoo.utils.average_meter.**AverageMeter**
Bases: object

Computes and stores the average and current value.

Examples

```
>>> am = AverageMeter()
>>> am.update(1)
>>> am.avg
1.0
>>> am.update(val=2.5, n=2)
>>> am.avg
2.0
```

avg
Get avg.

reset (*self*)
Reset AverageMeter.

update (*self*, *val*, *n=1*)
Update value.

matchzoo.utils.early_stopping

Early stopping.

Module Contents

class matchzoo.utils.early_stopping.**EarlyStopping**(*patience: typing.Optional[int] = None*, *should_decrease: bool = None*, *key: typing.Any = None*)
EarlyStopping stops training if no improvement after a given patience.

Parameters

- **patience** – Number fo events to wait if no improvement and then stop the training.
- **should_decrease** – The way to judge the best so far.
- **key** – Key of metric to be compared.

best_so_far :bool
Returns best so far.

is_best_so_far :bool
Returns true if it is the best so far.

should_stop_early :bool
Returns true if improvement has stopped for long enough.

state_dict (*self*)
A *Trainer* can use this to serialize the state.

load_state_dict (*self, state_dict: typing.Dict[str, typing.Any]*)
Hydrate a early stopping from a serialized state.

update (*self*, *result: list*)
Call function.

matchzoo.utils.get_file

Download file.

Module Contents

class matchzoo.utils.get_file.**Progbar**(*target*, *width=30*, *verbose=1*, *interval=0.05*)
Bases: object

Displays a progress bar.

Parameters

- **target** – Total number of steps expected, None if unknown.
- **width** – Progress bar width on screen.
- **verbose** – Verbosity mode, 0 (silent), 1 (verbose), 2 (semi-verbose)
- **stateful_metrics** – Iterable of string names of metrics that should *not* be averaged over time. Metrics in this list will be displayed as-is. All others will be averaged by the progbar before display.
- **interval** – Minimum visual progress update interval (in seconds).

update(*self*, *current*)
Updates the progress bar.

matchzoo.utils.get_file.**_extract_archive**(*file_path*, *path='.'*, *archive_format='auto'*)
Extracts an archive if it matches tar, tar.gz, tar.bz, or zip formats.

Parameters

- **file_path** – path to the archive file
- **path** – path to extract the archive file
- **archive_format** – Archive format to try for extracting the file. Options are 'auto', 'tar', 'zip', and None. 'tar' includes tar, tar.gz, and tar.bz files. The default 'auto' is ['tar', 'zip']. None or an empty list will return no matches found.

Returns True if a match was found and an archive extraction was completed, False otherwise.

matchzoo.utils.get_file.**get_file**(*fname: str = None*, *origin: str = None*, *untar: bool = False*, *extract: bool = False*, *md5_hash: typing.Any = None*, *file_hash: typing.Any = None*, *hash_algorithm: str = 'auto'*, *archive_format: str = 'auto'*, *cache_subdir: typing.Union[Path, str] = 'data'*, *cache_dir: typing.Union[Path, str] = matchzoo.USER_DATA_DIR*, *verbose: int = 1*) → str
Downloads a file from a URL if it not already in the cache.

By default the file at the url *origin* is downloaded to the cache_dir *~/.matchzoo/datasets*, placed in the cache_subdir *data*, and given the filename *fname*. The final location of a file *example.txt* would therefore be *~/.matchzoo/datasets/data/example.txt*.

Files in tar, tar.gz, tar.bz, and zip formats can also be extracted. Passing a hash will verify the file after download. The command line programs *shasum* and *sha256sum* can compute the hash.

Parameters

- **fname** – Name of the file. If an absolute path */path/to/file.txt* is specified the file will be saved at that location.

- **origin** – Original URL of the file.
- **untar** – Deprecated in favor of 'extract'. Boolean, whether the file should be decompressed.
- **md5_hash** – Deprecated in favor of 'file_hash'. md5 hash of the file for verification.
- **file_hash** – The expected hash string of the file after download. The sha256 and md5 hash algorithms are both supported.
- **cache_subdir** – Subdirectory under the cache dir where the file is saved. If an absolute path */path/to/folder* is specified the file will be saved at that location.
- **hash_algorithm** – Select the hash algorithm to verify the file. options are 'md5', 'sha256', and 'auto'. The default 'auto' detects the hash algorithm in use.
- **archive_format** – Archive format to try for extracting the file. Options are 'auto', 'tar', 'zip', and None. 'tar' includes tar, tar.gz, and tar.bz files. The default 'auto' is ['tar', 'zip']. None or an empty list will return no matches found.
- **cache_dir** – Location to store cached files, when None it defaults to the [matchzoo.USER_DATA_DIR](~/.matchzoo/datasets).
- **verbose** – Verbosity mode, 0 (silent), 1 (verbose), 2 (semi-verbose)

Papram extract True tries extracting the file as an Archive, like tar or zip.

Returns Path to the downloaded file.

matchzoo.utils.get_file.**validate_file**(*fpath*, *file_hash*, *algorithm='auto'*, *chunk_size=65535*)

Validates a file against a sha256 or md5 hash.

Parameters

- **fpath** – path to the file being validated
- **file_hash** – The expected hash string of the file. The sha256 and md5 hash algorithms are both supported.
- **algorithm** – Hash algorithm, one of 'auto', 'sha256', or 'md5'. The default 'auto' detects the hash algorithm in use.
- **chunk_size** – Bytes to read at a time, important for large files.

Returns Whether the file is valid.

matchzoo.utils.get_file.**_hash_file**(*fpath*, *algorithm='sha256'*, *chunk_size=65535*)

Calculates a file sha256 or md5 hash.

Parameters

- **fpath** – path to the file being validated
- **algorithm** – hash algorithm, one of 'auto', 'sha256', or 'md5'. The default 'auto' detects the hash algorithm in use.
- **chunk_size** – Bytes to read at a time, important for large files.

Returns The file hash.

matchzoo.utils.list_recursive_subclasses

Module Contents

matchzoo.utils.list_recursive_subclasses.**list_recursive_concrete_subclasses**(*base*)
List all concrete subclasses of *base* recursively.

matchzoo.utils.list_recursive_subclasses.**_filter_concrete**(*classes*)

matchzoo.utils.list_recursive_subclasses.**_bfs**(*base*)

matchzoo.utils.one_hot

One hot vectors.

Module Contents

matchzoo.utils.one_hot.**one_hot**(*indices: int*, *num_classes: int*) → np.ndarray

Returns A one-hot encoded vector.

matchzoo.utils.parse

Module Contents

matchzoo.utils.parse.**activation**

matchzoo.utils.parse.**loss**

matchzoo.utils.parse.**optimizer**

matchzoo.utils.parse.**_parse**(*identifier: typing.Union[str, typing.Type[nn.Module], nn.Module], dictionary: nn.ModuleDict, target: str*) → nn.Module
Parse loss and activation.

Parameters

- **identifier** – activation identifier, one of - String: name of a activation - Torch Modele subclass - Torch Module instance (it will be returned unchanged).
- **dictionary** – nn.ModuleDict instance. Map string identifier to nn.Module instance.

Returns A `nn.Module` instance

matchzoo.utils.parse.**parse_activation**(*identifier: typing.Union[str, typing.Type[nn.Module], nn.Module]*) → nn.Module
Retrieves a torch Module instance.

Parameters **identifier** – activation identifier, one of - String: name of a activation - Torch Modele subclass - Torch Module instance (it will be returned unchanged).

Returns A `nn.Module` instance

Examples::

```
>>> from torch import nn
>>> from matchzoo.utils import parse_activation
```

Use *str* as activation:

```
>>> activation = parse_activation('relu')
>>> type(activation)
<class 'torch.nn.modules.activation.ReLU'>
```

Use `torch.nn.Module` subclasses as activation:

```
>>> type(parse_activation(nn.ReLU))
<class 'torch.nn.modules.activation.ReLU'>
```

Use `torch.nn.Module` instances as activation:

```
>>> type(parse_activation(nn.ReLU()))
<class 'torch.nn.modules.activation.ReLU'>
```

matchzoo.utils.parse.**parse_loss**(*identifier: typing.Union[str, typing.Type[nn.Module], nn.Module], task: typing.Optional[str] = None*) → nn.Module

Retrieves a torch Module instance.

Parameters

- **identifier** – loss identifier, one of - String: name of a loss - Torch Module subclass - Torch Module instance (it will be returned unchanged).
- **task** – Task type for determining specific loss.

Returns A `nn.Module` instance

Examples::

```
>>> from torch import nn
>>> from matchzoo.utils import parse_loss
```

Use *str* as loss:

```
>>> loss = parse_loss('mse')
>>> type(loss)
<class 'torch.nn.modules.loss.MSELoss'>
```

Use `torch.nn.Module` subclasses as loss:

```
>>> type(parse_loss(nn.MSELoss))
<class 'torch.nn.modules.loss.MSELoss'>
```

Use `torch.nn.Module` instances as loss:

```
>>> type(parse_loss(nn.MSELoss()))
<class 'torch.nn.modules.loss.MSELoss'>
```

matchzoo.utils.parse.**_parse_metric**(*metric: typing.Union[str, typing.Type[BaseMetric], BaseMetric], Metrix: typing.Type[BaseMetric]*) → BaseMetric

Parse metric.

Parameters

- **metrc** – Input metric in any form.
- **Metrix** – Base Metric class. Either *matchzoo.engine.base_metric.RankingMetric* or *matchzoo.engine.base_metric.ClassificationMetric*.

Returns A `BaseMetric` instance

matchzoo.utils.parse.**parse_metric**(*metric: typing.Union[str, typing.Type[BaseMetric], BaseMetric], task: str*) → BaseMetric

Parse input metric in any form into a `BaseMetric` instance.

Parameters

- **metric** – Input metric in any form.
- **task** – Task type for determining specific metric.

Returns A `BaseMetric` instance

Examples::

```
>>> from matchzoo import metrics
>>> from matchzoo.utils import parse_metric
```

Use *str* as MatchZoo metrics:

```
>>> mz_metric = parse_metric('map', 'ranking')
>>> type(mz_metric)
<class 'matchzoo.metrics.mean_average_precision.MeanAveragePrecision'>
```

Use `matchzoo.engine.BaseMetric` subclasses as MatchZoo metrics:

```
>>> type(parse_metric(metrics.AveragePrecision, 'ranking'))
<class 'matchzoo.metrics.average_precision.AveragePrecision'>
```

Use `matchzoo.engine.BaseMetric` instances as MatchZoo metrics:

```
>>> type(parse_metric(metrics.AveragePrecision(), 'ranking'))
<class 'matchzoo.metrics.average_precision.AveragePrecision'>
```

matchzoo.utils.parse.**parse_optimizer**(*identifier: typing.Union[str, typing.Type[optim.Optimizer]]*) → optim.Optimizer

Parse input metric in any form into a `Optimizer` class.

Parameters **optimizer** – Input optimizer in any form.

Returns A `Optimizer` class

Examples::

```
>>> from torch import optim
>>> from matchzoo.utils import parse_optimizer
```

Use *str* as optimizer:

```
>>> parse_optimizer('adam')
<class 'torch.optim.adam.Adam'>
```

Use `torch.optim.Optimizer` subclasses as optimizer:

```
>>> parse_optimizer(optim.Adam)
<class 'torch.optim.adam.Adam'>
```

matchzoo.utils.tensor_type

Define Keras tensor type.

Module Contents

matchzoo.utils.tensor_type.**TensorType**

matchzoo.utils.timer

Timer.

Module Contents

class matchzoo.utils.timer.**Timer**
Bases: object

Computes elapsed time.

time
Return time.

reset(*self*)
Reset timer.

resume(*self*)
Resume.

stop(*self*)
Stop.

Package Contents

matchzoo.utils.**one_hot**(*indices: int*, *num_classes: int*) → np.ndarray

Returns A one-hot encoded vector.

matchzoo.utils.**TensorType**

matchzoo.utils.**list_recursive_concrete_subclasses**(*base*)
List all concrete subclasses of *base* recursively.

matchzoo.utils.**parse_loss**(*identifier: typing.Union[str, typing.Type[nn.Module], nn.Module], task: typing.Optional[str] = None*) → nn.Module
Retrieves a torch Module instance.

Parameters

- **identifier** – loss identifier, one of - String: name of a loss - Torch Module subclass - Torch Module instance (it will be returned unchanged).
- **task** – Task type for determining specific loss.

Returns A nn.Module instance

Examples::

```
>>> from torch import nn
>>> from matchzoo.utils import parse_loss
```

Use *str* as loss:

```
>>> loss = parse_loss('mse')
>>> type(loss)
<class 'torch.nn.modules.loss.MSELoss'>
```

Use `torch.nn.Module` subclasses as loss:

```
>>> type(parse_loss(nn.MSELoss))
<class 'torch.nn.modules.loss.MSELoss'>
```

Use `torch.nn.Module` instances as loss:

```
>>> type(parse_loss(nn.MSELoss()))
<class 'torch.nn.modules.loss.MSELoss'>
```

matchzoo.utils.**parse_activation**(*identifier: typing.Union[str, typing.Type[nn.Module], nn.Module]*) → nn.Module

Retrieves a torch Module instance.

Parameters **identifier** – activation identifier, one of - String: name of a activation - Torch Modele subclass - Torch Module instance (it will be returned unchanged).

Returns A `nn.Module` instance

Examples::

```
>>> from torch import nn
>>> from matchzoo.utils import parse_activation
```

Use *str* as activation:

```
>>> activation = parse_activation('relu')
>>> type(activation)
<class 'torch.nn.modules.activation.ReLU'>
```

Use `torch.nn.Module` subclasses as activation:

```
>>> type(parse_activation(nn.ReLU))
<class 'torch.nn.modules.activation.ReLU'>
```

Use `torch.nn.Module` instances as activation:

```
>>> type(parse_activation(nn.ReLU()))
<class 'torch.nn.modules.activation.ReLU'>
```

matchzoo.utils.**parse_metric**(*metric: typing.Union[str, typing.Type[BaseMetric], BaseMetric], task: str*) → BaseMetric

Parse input metric in any form into a `BaseMetric` instance.

Parameters

- **metric** – Input metric in any form.
- **task** – Task type for determining specific metric.

Returns A `BaseMetric` instance

Examples::

```
>>> from matchzoo import metrics
>>> from matchzoo.utils import parse_metric
```

Use *str* as MatchZoo metrics:

```
>>> mz_metric = parse_metric('map', 'ranking')
>>> type(mz_metric)
<class 'matchzoo.metrics.mean_average_precision.MeanAveragePrecision'>
```

Use `matchzoo.engine.BaseMetric` subclasses as MatchZoo metrics:

```
>>> type(parse_metric(metrics.AveragePrecision, 'ranking'))
<class 'matchzoo.metrics.average_precision.AveragePrecision'>
```

Use `matchzoo.engine.BaseMetric` instances as MatchZoo metrics:

```
>>> type(parse_metric(metrics.AveragePrecision(), 'ranking'))
<class 'matchzoo.metrics.average_precision.AveragePrecision'>
```

matchzoo.utils.**parse_optimizer**(*identifier: typing.Union[str, typing.Type[optim.Optimizer]]*) → optim.Optimizer

Parse input metric in any form into a `Optimizer` class.

Parameters **optimizer** – Input optimizer in any form.

Returns A `Optimizer` class

Examples::

```
>>> from torch import optim
>>> from matchzoo.utils import parse_optimizer
```

Use *str* as optimizer:

```
>>> parse_optimizer('adam')
<class 'torch.optim.adam.Adam'>
```

Use `torch.optim.Optimizer` subclasses as optimizer:

```
>>> parse_optimizer(optim.Adam)
<class 'torch.optim.adam.Adam'>
```

class matchzoo.utils.**AverageMeter**

Bases: `object`

Computes and stores the average and current value.

Examples

```
>>> am = AverageMeter()
>>> am.update(1)
>>> am.avg
1.0
>>> am.update(val=2.5, n=2)
>>> am.avg
2.0
```

avg
Get avg.

reset(*self*)
Reset AverageMeter.

update(*self*, *val*, *n=1*)
Update value.

class matchzoo.utils.**Timer**
Bases: object

Computes elapsed time.

time
Return time.

reset(*self*)
Reset timer.

resume(*self*)
Resume.

stop(*self*)
Stop.

class matchzoo.utils.**EarlyStopping**(*patience: typing.Optional[int] = None*, *should_decrease: bool = None*, *key: typing.Any = None*)
EarlyStopping stops training if no improvement after a given patience.

Parameters

- **patience** – Number fo events to wait if no improvement and then stop the training.
- **should_decrease** – The way to judge the best so far.
- **key** – Key of metric to be compared.

best_so_far :bool
Returns best so far.

is_best_so_far :bool
Returns true if it is the best so far.

should_stop_early :bool
Returns true if improvement has stopped for long enough.

state_dict(*self*)
A *Trainer* can use this to serialize the state.

load_state_dict(*self*, *state_dict: typing.Dict[str, typing.Any]*)
Hydrate a early stopping from a serialized state.

update(*self*, *result: list*)
Call function.

matchzoo.utils.**get_file**(*fname: str = None*, *origin: str = None*, *untar: bool = False*, *extract: bool = False*, *md5_hash: typing.Any = None*, *file_hash: typing.Any = None*, *hash_algorithm: str = 'auto'*, *archive_format: str = 'auto'*, *cache_subdir: typing.Union[Path, str] = 'data'*, *cache_dir: typing.Union[Path, str] = matchzoo.USER_DATA_DIR*, *verbose: int = 1*) → str

Downloads a file from a URL if it not already in the cache.

By default the file at the url *origin* is downloaded to the cache_dir *~/.matchzoo/datasets*, placed in the cache_subdir *data*, and given the filename *fname*. The final location of a file *example.txt* would therefore be *~/.matchzoo/datasets/data/example.txt*.

Files in tar, tar.gz, tar.bz, and zip formats can also be extracted. Passing a hash will verify the file after download. The command line programs *shasum* and *sha256sum* can compute the hash.

Parameters

- **fname** – Name of the file. If an absolute path */path/to/file.txt* is specified the file will be saved at that location.
- **origin** – Original URL of the file.
- **untar** – Deprecated in favor of 'extract'. Boolean, whether the file should be decompressed.
- **md5_hash** – Deprecated in favor of 'file_hash'. md5 hash of the file for verification.
- **file_hash** – The expected hash string of the file after download. The sha256 and md5 hash algorithms are both supported.
- **cache_subdir** – Subdirectory under the cache dir where the file is saved. If an absolute path */path/to/folder* is specified the file will be saved at that location.
- **hash_algorithm** – Select the hash algorithm to verify the file. options are 'md5', 'sha256', and 'auto'. The default 'auto' detects the hash algorithm in use.
- **archive_format** – Archive format to try for extracting the file. Options are 'auto', 'tar', 'zip', and None. 'tar' includes tar, tar.gz, and tar.bz files. The default 'auto' is ['tar', 'zip']. None or an empty list will return no matches found.
- **cache_dir** – Location to store cached files, when None it defaults to the [matchzoo.USER_DATA_DIR](~/.matchzoo/datasets).
- **verbose** – Verbosity mode, 0 (silent), 1 (verbose), 2 (semi-verbose)

Papram extract True tries extracting the file as an Archive, like tar or zip.

Returns Path to the downloaded file.

matchzoo.utils.**_hash_file**(*fpath*, *algorithm='sha256'*, *chunk_size=65535*)

Calculates a file sha256 or md5 hash.

Parameters

- **fpath** – path to the file being validated
- **algorithm** – hash algorithm, one of 'auto', 'sha256', or 'md5'. The default 'auto' detects the hash algorithm in use.
- **chunk_size** – Bytes to read at a time, important for large files.

Returns The file hash.

3.1.2 Submodules

matchzoo.version

Matchzoo version file.

Module Contents

matchzoo.version.**__version__ = 1.1.1**

3.1.3 Package Contents

matchzoo.**USER_DIR**

matchzoo.**USER_DATA_DIR**

matchzoo.**USER_TUNED_MODELS_DIR**

matchzoo.**__version__ = 1.1.1**

class matchzoo.**DataPack**(*relation: pd.DataFrame*, *left: pd.DataFrame*, *right: pd.DataFrame*)

Bases: object

Matchzoo *DataPack* data structure, store dataframe and context.

DataPack is a MatchZoo native data structure that most MatchZoo data handling processes build upon. A *DataPack* consists of three parts: *left*, *right* and *relation*, each one of is a *pandas.DataFrame*.

Parameters

- **relation** – Store the relation between left document and right document use ids.
- **left** – Store the content or features for id_left.
- **right** – Store the content or features for id_right.

Example

```
>>> left = [
...     ['qid1', 'query 1'],
...     ['qid2', 'query 2']
... ]
>>> right = [
...     ['did1', 'document 1'],
...     ['did2', 'document 2']
... ]
>>> relation = [['qid1', 'did1', 1], ['qid2', 'did2', 1]]
>>> relation_df = pd.DataFrame(relation)
>>> left = pd.DataFrame(left)
>>> right = pd.DataFrame(right)
>>> dp = DataPack(
...     relation=relation_df,
...     left=left,
...     right=right,
... )
>>> len(dp)
2
```

class FrameView(*data_pack: DataPack*)

Bases: `object`

FrameView.

__getitem__(*self, index: typing.Union[int, slice, np.array]*)

Slicer.

__call__(*self*)

Returns A full copy. Equivalant to *frame[:]*.

DATA_FILENAME = data.dill

has_label :bool

True if *label* column exists, *False* other wise.

Type return

frame :'DataPack.FrameView'

View the data pack as a `pandas.DataFrame`.

Returned data frame is created by merging the left data frame, the right dataframe and the relation data frame. Use *[]* to access an item or a slice of items.

Returns A *matchzoo.DataPack.FrameView* instance.

Example

```
>>> import matchzoo as mz
>>> data_pack = mz.datasets.toy.load_data()
>>> type(data_pack.frame)
<class 'matchzoo.data_pack.data_pack.DataPack.FrameView'>
>>> frame_slice = data_pack.frame[0:5]
>>> type(frame_slice)
<class 'pandas.core.frame.DataFrame'>
>>> list(frame_slice.columns)
['id_left', 'text_left', 'id_right', 'text_right', 'label']
>>> full_frame = data_pack.frame()
>>> len(full_frame) == len(data_pack)
True
```

relation

relation getter.

left :pd.DataFrame

Get *left()* of *DataPack*.

right :pd.DataFrame

Get *right()* of *DataPack*.

__len__(*self*)

Get numer of rows in the class:*DataPack* object.

unpack(*self*)

Unpack the data for training.

The return value can be directly feed to *model.fit* or *model.fit_generator*.

Returns A tuple of (X, y). *y* is *None* if *self* has no label.

Example

```
>>> import matchzoo as mz
>>> data_pack = mz.datasets.toy.load_data()
>>> X, y = data_pack.unpack()
>>> type(X)
<class 'dict'>
>>> sorted(X.keys())
['id_left', 'id_right', 'text_left', 'text_right']
>>> type(y)
<class 'numpy.ndarray'>
>>> X, y = data_pack.drop_label().unpack()
>>> type(y)
<class 'NoneType'>
```

__getitem__ (*self, index: typing.Union[int, slice, np.array]*)
Get specific item(s) as a new *DataPack*.

The returned *DataPack* will be a copy of the subset of the original *DataPack*.

Parameters **index** – Index of the item(s) to get.

Returns An instance of *DataPack*.

copy (*self*)

Returns A deep copy.

save (*self, dirpath: typing.Union[str, Path]*)
Save the *DataPack* object.

A saved *DataPack* is represented as a directory with a *DataPack* object (transformed user input as features and context), it will be saved by *pickle*.

Parameters **dirpath** – directory path of the saved *DataPack*.

_optional_inplace (*func*)
Decorator that adds *inplace* key word argument to a method.

Decorate any method that modifies inplace to make that inplace change optional.

drop_empty (*self*)
Process empty data by removing corresponding rows.

Parameters **inplace** – *True* to modify inplace, *False* to return a modified copy. (default: *False*)

shuffle (*self*)
Shuffle the data pack by shuffling the relation column.

Parameters **inplace** – *True* to modify inplace, *False* to return a modified copy. (default: *False*)

Example

```
>>> import matchzoo as mz
>>> import numpy.random
>>> numpy.random.seed(0)
>>> data_pack = mz.datasets.toy.load_data()
>>> orig_ids = data_pack.relation['id_left']
```

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```
>>> shuffled = data_pack.shuffle()
>>> (shuffled.relation['id_left'] != orig_ids).any()
True
```

drop_label (*self*)

Remove *label* column from the data pack.

Parameters **inplace** – *True* to modify inplace, *False* to return a modified copy. (default: *False*)

Example

```
>>> import matchzoo as mz
>>> data_pack = mz.datasets.toy.load_data()
>>> data_pack.has_label
True
>>> data_pack.drop_label(inplace=True)
>>> data_pack.has_label
False
```

append_text_length (*self*, *verbose=1*)

Append *length_left* and *length_right* columns.

Parameters

- **inplace** – *True* to modify inplace, *False* to return a modified copy. (default: *False*)
- **verbose** – Verbosity.

Example

```
>>> import matchzoo as mz
>>> data_pack = mz.datasets.toy.load_data()
>>> 'length_left' in data_pack.frame[0].columns
False
>>> new_data_pack = data_pack.append_text_length(verbose=0)
>>> 'length_left' in new_data_pack.frame[0].columns
True
>>> 'length_left' in data_pack.frame[0].columns
False
>>> data_pack.append_text_length(inplace=True, verbose=0)
>>> 'length_left' in data_pack.frame[0].columns
True
```

apply_on_text (*self*, *func: typing.Callable*, *mode: str = 'both'*, *rename: typing.Optional[str] = None*, *verbose: int = 1*)

Apply *func* to text columns based on *mode*.

Parameters

- **func** – The function to apply.
- **mode** – One of "both", "left" and "right".
- **rename** – If set, use new names for results instead of replacing the original columns. To set *rename* in "both" mode, use a tuple of *str*, e.g. ("text_left_new_name", "text_right_new_name").

- **inplace** – *True* to modify inplace, *False* to return a modified copy. (default: *False*)
- **verbose** – Verbosity.

Examples::

```
>>> import matchzoo as mz
>>> data_pack = mz.datasets.toy.load_data()
>>> frame = data_pack.frame
```

To apply *len* on the left text and add the result as 'length_left':

```
>>> data_pack.apply_on_text(len, mode='left',
...                         rename='length_left',
...                         inplace=True,
...                         verbose=0)
>>> list(frame[0].columns)  # noqa: E501
['id_left', 'text_left', 'length_left', 'id_right', 'text_right', 'label']
```

To do the same to the right text:

```
>>> data_pack.apply_on_text(len, mode='right',
...                         rename='length_right',
...                         inplace=True,
...                         verbose=0)
>>> list(frame[0].columns)  # noqa: E501
['id_left', 'text_left', 'length_left', 'id_right', 'text_right', 'length_
↪right', 'label']
```

To do the same to the both texts at the same time:

```
>>> data_pack.apply_on_text(len, mode='both',
...                         rename=('extra_left', 'extra_right'),
...                         inplace=True,
...                         verbose=0)
>>> list(frame[0].columns)  # noqa: E501
['id_left', 'text_left', 'length_left', 'extra_left', 'id_right', 'text_
↪right', 'length_right', 'extra_right', 'label']
```

To suppress outputs:

```
>>> data_pack.apply_on_text(len, mode='both', verbose=0,
...                         inplace=True)
```

_apply_on_text_right(*self*, *func*, *rename*, *verbose=1*)

_apply_on_text_left(*self*, *func*, *rename*, *verbose=1*)

_apply_on_text_both(*self*, *func*, *rename*, *verbose=1*)

matchzoo.**load_data_pack**(*dirpath: typing.Union[str, Path]*) → DataPack

Load a *DataPack*. The reverse function of `save()`.

Parameters **dirpath** – directory path of the saved model.

Returns a *DataPack* instance.

matchzoo.**chain_transform**(*units: typing.List[Unit]*) → typing.Callable

Compose unit transformations into a single function.

Parameters **units** – List of `matchzoo.StatelessUnit`.

matchzoo.**load_preprocessor**(*dirpath: typing.Union[str, Path]*) → 'mz.DataPack'

Load the fitted *context*. The reverse function of `save()`.

Parameters **dirpath** – directory path of the saved model.

Returns a `DSSMPreprocessor` instance.

class matchzoo.**Param**(*name: str, value: typing.Any = None, hyper_space: typing.Optional[SpaceType] = None, validator: typing.Optional[typing.Callable[[typing.Any], bool]] = None, desc: typing.Optional[str] = None*)

Bases: `object`

Parameter class.

Basic usages with a name and value:

```
>>> param = Param('my_param', 10)
>>> param.name
'my_param'
>>> param.value
10
```

Use with a validator to make sure the parameter always keeps a valid value.

```
>>> param = Param(
...     name='my_param',
...     value=5,
...     validator=lambda x: 0 < x < 20
... )
>>> param.validator  # doctest: +ELLIPSIS
<function <lambda> at 0x...>
>>> param.value
5
>>> param.value = 10
>>> param.value
10
>>> param.value = -1
Traceback (most recent call last):
    ...
ValueError: Validator not satisfied.
The validator's definition is as follows:
validator=lambda x: 0 < x < 20
```

Use with a hyper space. Setting up a hyper space for a parameter makes the parameter tunable in a `matchzoo.engine.Tuner`.

```
>>> from matchzoo.engine.hyper_spaces import quniform
>>> param = Param(
...     name='positive_num',
...     value=1,
...     hyper_space=quniform(low=1, high=5)
... )
>>> param.hyper_space  # doctest: +ELLIPSIS
<matchzoo.engine.hyper_spaces.quniform object at ...>
>>> from hyperopt.pyll.stochastic import sample
>>> hyperopt_space = param.hyper_space.convert(param.name)
>>> samples = [sample(hyperopt_space) for _ in range(64)]
>>> set(samples) == {1, 2, 3, 4, 5}
True
```

The boolean value of a *Param* instance is only *True* when the value is not *None*. This is because some default falsy values like zero or an empty list are valid parameter values. In other words, the boolean value means to be "if the parameter value is filled".

```
>>> param = Param('dropout')
>>> if param:
...     print('OK')
>>> param = Param('dropout', 0)
>>> if param:
...     print('OK')
OK
```

A *_pre_assignment_hook* is initialized as a data type convertor if the value is set as a number to keep data type consistency of the parameter. This conversion supports python built-in numbers, *numpy* numbers, and any number that inherits `numbers.Number`.

```
>>> param = Param('float_param', 0.5)
>>> param.value = 10
>>> param.value
10.0
>>> type(param.value)
<class 'float'>
```

name :str
Name of the parameter.

Type return

value :typing.Any
Value of the parameter.

Type return

hyper_space :SpaceType
Hyper space of the parameter.

Type return

validator :typing.Callable[[typing.Any], bool]
Validator of the parameter.

Type return

desc :str
Parameter description.

Type return

_infer_pre_assignment_hook(*self*)

_validate(*self*, *value*)

__bool__(*self*)

Returns *False* when the value is *None*, *True* otherwise.

set_default(*self*, *val*, *verbose=1*)
Set default value, has no effect if already has a value.

Parameters

- **val** – Default value to set.
- **verbose** – Verbosity.

reset (*self*)

Set the parameter's value to *None*, which means "not set".

This method bypasses validator.

Example

```
>>> import matchzoo as mz
>>> param = mz.Param(
...     name='str', validator=lambda x: isinstance(x, str))
>>> param.value = 'hello'
>>> param.value = None
Traceback (most recent call last):
    ...
ValueError: Validator not satisfised.
The validator's definition is as follows:
name='str', validator=lambda x: isinstance(x, str))
>>> param.reset()
>>> param.value is None
True
```

class matchzoo.**ParamTable**

Bases: object

Parameter table class.

Example

```
>>> params = ParamTable()
>>> params.add(Param('ham', 'Parma Ham'))
>>> params.add(Param('egg', 'Over Easy'))
>>> params['ham']
'Parma Ham'
>>> params['egg']
'Over Easy'
>>> print(params)
ham                             Parma Ham
egg                             Over Easy
>>> params.add(Param('egg', 'Sunny side Up'))
Traceback (most recent call last):
    ...
ValueError: Parameter named egg already exists.
To re-assign parameter egg value, use `params["egg"] = value` instead.
```

hyper_space :dict

Hyper space of the table, a valid *hyperopt* graph.

Type return

add (*self*, *param: Param*)

Parameters **param** – parameter to add.

get (*self*, *key*)

Returns The parameter in the table named *key*.

set (*self*, *key*, *param: Param*)
Set *key* to parameter *param*.

to_frame (*self*)
Convert the parameter table into a pandas data frame.

Returns A *pandas.DataFrame*.

Example

```
>>> import matchzoo as mz
>>> table = mz.ParamTable()
>>> table.add(mz.Param(name='x', value=10, desc='my x'))
>>> table.add(mz.Param(name='y', value=20, desc='my y'))
>>> table.to_frame()
  Name Description  Value Hyper-Space
0    x        my x     10        None
1    y        my y     20        None
```

__getitem__ (*self*, *key: str*)

Returns The value of the parameter in the table named *key*.

__setitem__ (*self*, *key: str*, *value: typing.Any*)
Set the value of the parameter named *key*.

Parameters

- **key** – Name of the parameter.
- **value** – New value of the parameter to set.

__str__ (*self*)

Returns Pretty formatted parameter table.

__iter__ (*self*)

Returns A iterator that iterates over all parameter instances.

completed (*self*, *exclude: typing.Optional[list] = None*)
Check if all params are filled.

Parameters **exclude** – List of names of parameters that was excluded from being computed.

Returns *True* if all params are filled, *False* otherwise.

Example

```
>>> import matchzoo
>>> model = matchzoo.models.DenseBaseline()
>>> model.params.completed(
...     exclude=['task', 'out_activation_func', 'embedding',
...              'embedding_input_dim', 'embedding_output_dim']
... )
True
```

keys (*self*)

Returns Parameter table keys.

__contains__ (*self*, *item*)

Returns *True* if parameter in parameters.

update (*self*, *other: dict*)
Update *self*.

Update *self* with the key/value pairs from other, overwriting existing keys. Notice that this does not add new keys to *self*.

This method is usually used by models to obtain useful information from a preprocessor's context.

Parameters **other** – The dictionary used update.

Example

```
>>> import matchzoo as mz
>>> model = mz.models.DenseBaseline()
>>> prpr = model.get_default_preprocessor()
>>> _ = prpr.fit(mz.datasets.toy.load_data(), verbose=0)
>>> model.params.update(prpr.context)
```

class matchzoo.**Embedding** (*data: dict*, *output_dim: int*)
Bases: object

Embedding class.

Examples::

```
>>> import matchzoo as mz
>>> train_raw = mz.datasets.toy.load_data()
>>> pp = mz.preprocessors.NaivePreprocessor()
>>> train = pp.fit_transform(train_raw, verbose=0)
>>> vocab_unit = mz.build_vocab_unit(train, verbose=0)
>>> term_index = vocab_unit.state['term_index']
>>> embed_path = mz.datasets.embeddings.EMBED_RANK
```

To load from a file:

```
>>> embedding = mz.embedding.load_from_file(embed_path)
>>> matrix = embedding.build_matrix(term_index)
>>> matrix.shape[0] == len(term_index)
True
```

To build your own:

```
>>> data = {'A':[0, 1], 'B':[2, 3]}
>>> embedding = mz.Embedding(data, 2)
>>> matrix = embedding.build_matrix({'A': 2, 'B': 1, '_PAD': 0})
>>> matrix.shape == (3, 2)
True
```

build_matrix (*self, term_index: typing.Union[dict, mz.preprocessors.units.Vocabulary.TermIndex]*)
Build a matrix using *term_index*.

Parameters

- **term_index** – A *dict* or *TermIndex* to build with.

- **initializer** – A callable that returns a default value for missing terms in data. (default: a random uniform distribution in range) *(-0.2, 0.2)*).

Returns A matrix.

matchzoo.**build_unit_from_data_pack**(*unit: StatefulUnit*, *data_pack: mz.DataPack*, *mode: str = 'both'*, *flatten: bool = True*, *verbose: int = 1*) → StatefulUnit

Build a `StatefulUnit` from a *DataPack* object.

Parameters

- **unit** – `StatefulUnit` object to be built.
- **data_pack** – The input *DataPack* object.
- **mode** – One of 'left', 'right', and 'both', to determine the source data for building the `VocabularyUnit`.
- **flatten** – Flatten the datapack or not. *True* to organize the *DataPack* text as a list, and *False* to organize *DataPack* text as a list of list.
- **verbose** – Verbosity.

Returns A built `StatefulUnit` object.

matchzoo.**build_vocab_unit**(*data_pack: DataPack*, *mode: str = 'both'*, *verbose: int = 1*) → Vocabulary

Build a `preprocessor.units.Vocabulary` given *data_pack*.

The *data_pack* should be preprocessed forehand, and each item in *text_left* and *text_right* columns of the *data_pack* should be a list of tokens.

Parameters

- **data_pack** – The *DataPack* to build vocabulary upon.
- **mode** – One of 'left', 'right', and 'both', to determine the source

data for building the `VocabularyUnit`. :param verbose: Verbosity. :return: A built vocabulary unit.

CHAPTER 4

Indices and tables

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