fastNLP Documentation

Release 0.2

xpqiu

Jan 07, 2019

Contents

A Modularized and Extensible Toolkit for Natural Language Processing. Currently still in incubation.

CHAPTER 1

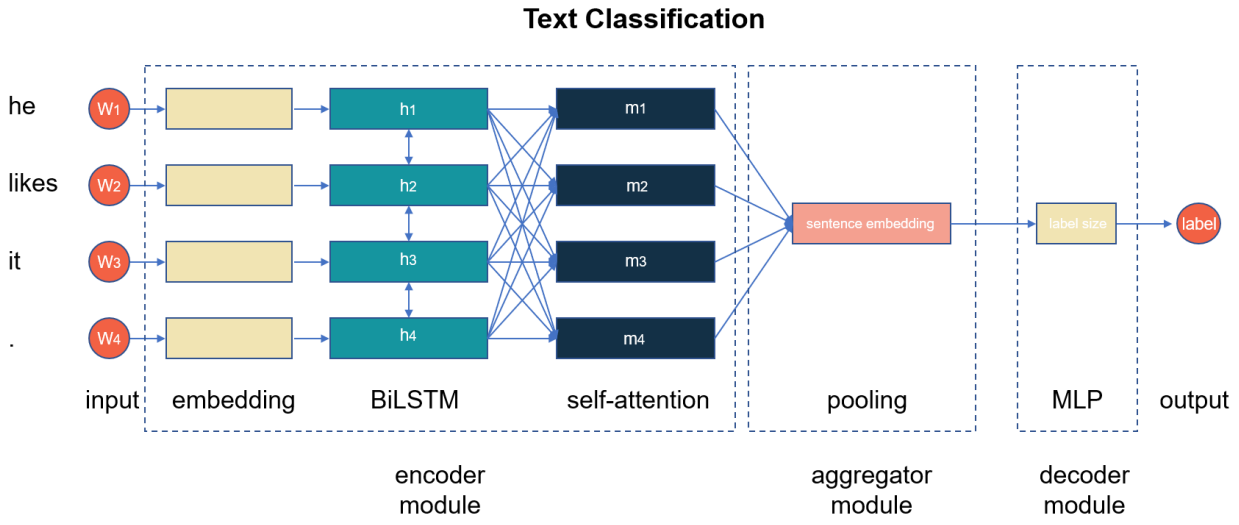
Introduction

FastNLP is a modular Natural Language Processing system based on PyTorch, built for fast development of NLP models.

A deep learning NLP model is the composition of three types of modules:

module type	functionality	example
encoder	encode the input into some abstract representation	embedding, RNN, CNN, transformer
aggregator	aggregate and reduce information	self-attention, max-pooling
decoder	decode the representation into the output	MLP, CRF

For example:



CHAPTER 2

User's Guide

2.1 Installation

Run the following commands to install fastNLP package:

```
pip install fastNLP
```

2.2 Quickstart

2.2.1 FastNLP 1

step 1

```
from fastNLP import DataSet
# linux_path = "../test/data_for_tests/tutorial_sample_dataset.csv"
win_path = "C:\\Users\zyfeng\Desktop\FudanNLP\\fastNLP\\test\\data_for_
↪tests\\tutorial_sample_dataset.csv"
ds = DataSet.read_csv(win_path, headers=('raw_sentence', 'label'), sep='\t')
```

step 2

1. 2. 3.

```
#
ds.apply(lambda x: x['raw_sentence'].lower(), new_field_name='raw_sentence')
# labelint
ds.apply(lambda x: int(x['label']), new_field_name='label_seq', is_target=True)

def split_sent(ins):
```

(continues on next page)

(continued from previous page)

```
    return ins['raw_sentence'].split()
ds.apply(split_sent, new_field_name='words', is_input=True)
```

```
# /
train_data, dev_data = ds.split(0.3)
print("Train size: ", len(train_data))
print("Test size: ", len(dev_data))
```

```
Train size:  54
Test size:  23
```

```
from fastNLP import Vocabulary
vocab = Vocabulary(min_freq=2)
train_data.apply(lambda x: [vocab.add(word) for word in x['words']])

# index, Vocabulary.to_index(word)
train_data.apply(lambda x: [vocab.to_index(word) for word in x['words']], new_field_
↪name='word_seq', is_input=True)
dev_data.apply(lambda x: [vocab.to_index(word) for word in x['words']], new_field_
↪name='word_seq', is_input=True)
```

step 3

```
from fastNLP.models import CNNText
model = CNNText(embed_num=len(vocab), embed_dim=50, num_classes=5, padding=2,␣
↪dropout=0.1)
```

step 4

```
from fastNLP import Trainer, CrossEntropyLoss, AccuracyMetric
trainer = Trainer(model=model,
                  train_data=train_data,
                  dev_data=dev_data,
                  loss=CrossEntropyLoss(),
                  metrics=AccuracyMetric()
                  )
trainer.train()
print('Train finished!')
```

```
training epochs started 2018-12-07 14:03:41
```

```
HBox(children=(IntProgress(value=0, layout=Layout(flex='2'), max=6), HTML(value='')),␣
↪layout=Layout(display='i...
```

```
Epoch 1/3. Step:2/6. AccuracyMetric: acc=0.26087
Epoch 2/3. Step:4/6. AccuracyMetric: acc=0.347826
Epoch 3/3. Step:6/6. AccuracyMetric: acc=0.608696
Train finished!
```

2.2.2 fastNLP

fastNLP

DataSet & Instance

fastNLPDataSetInstanceDataSetInstanceDataSetInstanceInstance

read_*DataSet

```
from fastNLP import DataSet
from fastNLP import Instance

# csvDataSet
win_path = "C:\\Users\zyfeng\Desktop\FudanNLP\\fastNLP\\test\\data_for_
↪tests\\tutorial_sample_dataset.csv"
dataset = DataSet.read_csv(win_path, headers=('raw_sentence', 'label'), sep='\t')
print(dataset[0])
```

```
{'raw_sentence': A series of escapades demonstrating the adage that what is good for␣
↪the goose is also good for the gander , some of which occasionally amuses but none␣
↪of which amounts to much of a story .,
'label': 1}
```

```
# DataSet.append(Instance)

dataset.append(Instance(raw_sentence='fake data', label='0'))
dataset[-1]
```

```
{'raw_sentence': fake data,
'label': 0}
```

```
# DataSet.apply(func, new_field_name)

#
dataset.apply(lambda x: x['raw_sentence'].lower(), new_field_name='raw_sentence')
# labelint
dataset.apply(lambda x: int(x['label']), new_field_name='label_seq', is_target=True)
#
dataset.drop(lambda x: len(x['raw_sentence'].split()) == 0)
def split_sent(ins):
    return ins['raw_sentence'].split()
dataset.apply(split_sent, new_field_name='words', is_input=True)
```

```
# DataSet.drop(func)
#
dataset.drop(lambda x: len(x['words']) <= 3)
```

```
#

test_data, train_data = dataset.split(0.3)
print("Train size: ", len(test_data))
print("Test size: ", len(train_data))
```

```
Train size:  54
Test size:
```

Vocabulary

fastNLPVocabulary

```
from fastNLP import Vocabulary

# , Vocabulary.add(word)
vocab = Vocabulary(min_freq=2)
train_data.apply(lambda x: [vocab.add(word) for word in x['words']])
vocab.build_vocab()

# index, Vocabulary.to_index(word)
train_data.apply(lambda x: [vocab.to_index(word) for word in x['words']], new_field_
↪name='word_seq', is_input=True)
test_data.apply(lambda x: [vocab.to_index(word) for word in x['words']], new_field_
↪name='word_seq', is_input=True)


print(test_data[0])
```

```
{'raw_sentence': the plot is romantic comedy boilerplate from start to finish .,
'label': 2,
'label_seq': 2,
'words': ['the', 'plot', 'is', 'romantic', 'comedy', 'boilerplate', 'from', 'start',
↪'to', 'finish', '.'],
'word_seq': [2, 13, 9, 24, 25, 26, 15, 27, 11, 28, 3]}
```

```
# gandataset
from fastNLP.core.batch import Batch
from fastNLP.core.sampler import RandomSampler

batch_iterator = Batch(dataset=train_data, batch_size=2, sampler=RandomSampler())
for batch_x, batch_y in batch_iterator:
    print("batch_x has: ", batch_x)
    print("batch_y has: ", batch_y)
    break
```

```
batch_x has:  {'words': array([list(['this', 'kind', 'of', 'hands-on', 'storytelling',
↪ 'is', 'ultimately', 'what', 'makes', 'shanghai', 'ghetto', 'move', 'beyond', 'a',
↪'good', ',', 'dry', ',', 'reliable', 'textbook', 'and', 'what', 'allows', 'it', 'to
↪', 'rank', 'with', 'its', 'worthy', 'predecessors', '.']),
       list(['the', 'entire', 'movie', 'is', 'filled', 'with', 'deja', 'vu', 'moments
↪', '.'])],
      dtype=object), 'word_seq': tensor([[  19,  184,    6,    1,  481,    9,  206,
↪50,   91, 1210, 1609, 1330,
          495,    5,   63,    4, 1269,    4,    1, 1184,    7,   50, 1050,   10,
            8, 1611,   16,   21, 1039,    1,    2],
        [   3,  711,   22,    9, 1282,   16, 2482, 2483,  200,    2,    0,    0,
            0,    0,    0,    0,    0,    0,    0,    0,    0,    0,    0,    0,
            0,    0,    0,    0,    0,    0,    0]])}
batch_y has:  {'label_seq': tensor([3, 2])}
```

Model

```
# Pytorch

from fastNLP.models import CNNText
model = CNNText(embed_num=len(vocab), embed_dim=50, num_classes=5, padding=2,␣
↪dropout=0.1)
model
```

```
CNNText(
  (embed): Embedding(
    (embed): Embedding(77, 50, padding_idx=0)
    (dropout): Dropout(p=0.0)
  )
  (conv_pool): ConvMaxpool(
    (convs): ModuleList(
      (0): Conv1d(50, 3, kernel_size=(3,), stride=(1,), padding=(2,))
      (1): Conv1d(50, 4, kernel_size=(4,), stride=(1,), padding=(2,))
      (2): Conv1d(50, 5, kernel_size=(5,), stride=(1,), padding=(2,))
    )
  )
  (dropout): Dropout(p=0.1)
  (fc): Linear(
    (linear): Linear(in_features=12, out_features=5, bias=True)
  )
)
```

Trainer & Tester

fastNLPTrainer

```
from fastNLP import Trainer
from copy import deepcopy
from fastNLP import CrossEntropyLoss
from fastNLP import AccuracyMetric
```

```
# overfitting
copy_model = deepcopy(model)
overfit_trainer = Trainer(model=copy_model,
                          train_data=test_data,
                          dev_data=test_data,
                          loss=CrossEntropyLoss(pred="output", target="label_seq"),
                          metrics=AccuracyMetric(),
                          n_epochs=10,
                          save_path=None)
overfit_trainer.train()
```

```
training epochs started 2018-12-07 14:07:20
```

```
HBox(children=(IntProgress(value=0, layout=Layout(flex='2'), max=20), HTML(value='')),
↪ layout=Layout(display='...
```

```
Epoch 1/10. Step:2/20. AccuracyMetric: acc=0.037037
Epoch 2/10. Step:4/20. AccuracyMetric: acc=0.296296
```

(continues on next page)

(continued from previous page)

```
Epoch 3/10. Step:6/20. AccuracyMetric: acc=0.333333
Epoch 4/10. Step:8/20. AccuracyMetric: acc=0.555556
Epoch 5/10. Step:10/20. AccuracyMetric: acc=0.611111
Epoch 6/10. Step:12/20. AccuracyMetric: acc=0.481481
Epoch 7/10. Step:14/20. AccuracyMetric: acc=0.62963
Epoch 8/10. Step:16/20. AccuracyMetric: acc=0.685185
Epoch 9/10. Step:18/20. AccuracyMetric: acc=0.722222
Epoch 10/10. Step:20/20. AccuracyMetric: acc=0.777778
```

```
# Trainer
trainer = Trainer(model=model,
                  train_data=train_data,
                  dev_data=test_data,
                  loss=CrossEntropyLoss(pred="output", target="label_seq"),
                  metrics=AccuracyMetric(),
                  n_epochs=5)
trainer.train()
print('Train finished!')
```

```
training epochs started 2018-12-07 14:08:10
```

```
HBox(children=(IntProgress(value=0, layout=Layout(flex='2'), max=5), HTML(value='')),␣
↪layout=Layout(display='i...
```

```
Epoch 1/5. Step:1/5. AccuracyMetric: acc=0.037037
Epoch 2/5. Step:2/5. AccuracyMetric: acc=0.037037
Epoch 3/5. Step:3/5. AccuracyMetric: acc=0.037037
Epoch 4/5. Step:4/5. AccuracyMetric: acc=0.185185
Epoch 5/5. Step:5/5. AccuracyMetric: acc=0.240741
Train finished!
```

```
from fastNLP import Tester

tester = Tester(data=test_data, model=model, metrics=AccuracyMetric())
acc = tester.test()
```

```
[tester]
AccuracyMetric: acc=0.240741
```

In summary

fastNLP Trainer

1. DataSetDataSetfields

```
['raw_sentence', 'word_seq1', 'word_seq2', 'raw_label','label']

    DataSet.set_input('word_seq1', word_seq2', flag=True)'word_seq1', 'word_seq2'input

    DataSet.set_target('label', flag=True)'label'target
```

2.

```
class Model(nn.Module):
    def __init__(self):
        xxx
    def forward(self, word_seq1, word_seq2):
        # (1) DataSetinput field,
        # (2) input field
        xxxx
        # dict
```

3. Trainer

```
(1) DataSetbatch_sizebatchModel.forward
(2)  Model.forward  targetfield Losser
       Model.forwardoutputdictkey{'pred':xxx}, {'output': xxx};
       target, label, target
    loss
       CrossEntropyLosser(prediction, target)forwardoutput{'output': xxx}; 'label
↪'target
       losserCrossEntropyLosser(prediction='output', target='label')
 (3) Metric
     Metric forward  targetfield
```

.

1. DataSetinputtarget

```
inputtargettrain
(1.1) inputfieldModel.forward
(1.2) lossermetric:
        (a)Model.forwardoutput
        (b)targetfield
```

2. forwadDataSetfield

```
(1.1)
 :
     DataSetxseq_lensinputforward
     def forward(self, x, seq_lens):
         pass
     field
```

1. DataSet

2. applyDataSet

```
(2.1) fieldinputfieldtarget
```

3.

```
(3.1) forwardDataSetinputfield
:
    DataSetxseq_lensinputforward
    def forward(self, x, seq_lens):
        pass
    field
(3.2) forwardoutputdict
    {"pred": xx}.
```

CHAPTER 3

API Reference

If you are looking for information on a specific function, class or method, this part of the documentation is for you.

3.1 fastNLP

3.1.1 fastNLP.api

fastNLP.api.api

fastNLP.api.converter

fastNLP.api.model_zoo

`fastNLP.api.model_zoo.`**`load_url`**(*url*, *model_dir=None*, *map_location=None*, *progress=True*)

Loads the Torch serialized object at the given URL.

If the object is already present in *model_dir*, it's deserialized and returned. The filename part of the URL should follow the naming convention `filename-<sha256>.ext` where `<sha256>` is the first eight or more digits of the SHA256 hash of the contents of the file. The hash is used to ensure unique names and to verify the contents of the file.

The default value of *model_dir* is `$TORCH_HOME/models` where `$TORCH_HOME` defaults to `~/.torch`. The default directory can be overridden with the `$TORCH_MODEL_ZOO` environment variable.

Args: url (string): URL of the object to download model_dir (string, optional): directory in which to save the object map_location (optional): a function or a dict specifying how to remap storage locations (see torch.load) progress (bool, optional): whether or not to display a progress bar to stderr

Example: # >>> state_dict = model_zoo.load_url('https://s3.amazonaws.com/pytorch/models/resnet18-5c106cde.pth')

fastNLP.api.pipeline

class fastNLP.api.pipeline.**Pipeline**(*processors=None*)
Pipeline takes a DataSet object as input, runs multiple processors sequentially, and outputs a DataSet object.

fastNLP.api.processor

class fastNLP.api.processor.**FullSpaceToHalfSpaceProcessor**(*field_name*, *change_alpha=True*, *change_digit=True*, *change_punctuation=True*, *change_space=True*)

class fastNLP.api.processor.**Index2WordProcessor**(*vocab*, *field_name*, *new_added_field_name*)
DataSetindexfieldvocabstr

class fastNLP.api.processor.**IndexerProcessor**(*vocab*, *field_name*, *new_added_field_name*, *delete_old_field=False*, *is_input=True*)

vocabulary , fieldindexfieldlist [‘’, ‘’, xxx]

class fastNLP.api.processor.**Num2TagProcessor**(*tag*, *field_name*, *new_added_field_name=None*)
tag

class fastNLP.api.processor.**PreAppendProcessor**(*data*, *field_name*, *new_added_field_name=None*)

fielddata(str)fieldlistfield [data] + instance[field_name]

class fastNLP.api.processor.**SeqLenProcessor**(*field_name*, *new_added_field_name='seq_lens'*, *is_input=True*)
fieldsequence lengthfieldfield

class fastNLP.api.processor.**SliceProcessor**(*start*, *end*, *step*, *field_name*, *new_added_field_name=None*)
fieldinstance[field_name][start:end:step]

class fastNLP.api.processor.**VocabProcessor**(*field_name*, *min_freq=1*, *max_size=None*)
DataSetvocabulary

3.1.2 fastNLP.core

fastNLP.core.batch

class fastNLP.core.batch.**Batch**(*dataset*, *batch_size*, *sampler*, *as_numpy=False*)
Batch is an iterable object which iterates over mini-batches.

Example:

```
for batch_x, batch_y in Batch(data_set, batch_size=16,␣
↪sampler=SequentialSampler()):
    # ...
```

Parameters

- **dataset** (DataSet) – a DataSet object

- **batch_size** (*int*) – the size of the batch
- **sampler** (*Sampler*) – a Sampler object
- **as_numpy** (*bool*) – If True, return Numpy array. Otherwise, return torch tensors.

fastNLP.core.dataset

class fastNLP.core.dataset.**DataSet**(*data=None*)

DataSet is the collection of examples. DataSet provides instance-level interface. You can append and access an instance of the DataSet. However, it stores data in a different way: Field-first, Instance-second.

add_field(*name*, *fields*, *padding_val=0*, *is_input=False*, *is_target=False*)

Add a new field to the DataSet.

Parameters

- **name** (*str*) – the name of the field.
- **fields** – a list of int, float, or other objects.
- **padding_val** (*int*) – integer for padding.
- **is_input** (*bool*) – whether this field is model input.
- **is_target** (*bool*) – whether this field is label or target.

append(*ins*)

Add an instance to the DataSet. If the DataSet is not empty, the instance must have the same field names as the rest instances in the DataSet.

Parameters **ins** – an Instance object

apply(*func*, *new_field_name=None*, ***kwargs*)

Apply a function to every instance of the DataSet.

Parameters

- **func** – a function that takes an instance as input.
- **new_field_name** (*str*) – If not None, results of the function will be stored as a new field.
- ****kwargs** – Accept parameters will be (1) is_input: boolean, will be ignored if new_field is None. If True, the new field will be as input. (2) is_target: boolean, will be ignored if new_field is None. If True, the new field will be as target.

Return results if new_field_name is not passed, returned values of the function over all instances.

delete_field(*name*)

Delete a field based on the field name.

Parameters **name** – the name of the field to be deleted.

drop(*func*)

Drop instances if a condition holds.

Parameters **func** – a function that takes an Instance object as input, and returns bool. The instance will be dropped if the function returns True.

get_all_fields()

Return all the fields with their names.

Return field_arrays the internal data structure of DataSet.

get_input_name()
Get all field names with *is_input* as True.

Return field_names a list of str

get_length()
Fetch the length of the dataset.

Return length

get_target_name()
Get all field names with *is_target* as True.

Return field_names a list of str

static load(*path*)
Load a DataSet object from pickle.

Parameters **path** (*str*) – the path to the pickle

Return data_set

classmethod read_csv(*csv_path*, *headers=None*, *sep=', '*, *dropna=True*)
Load data from a CSV file and return a DataSet object.

Parameters

- **csv_path** (*str*) – path to the CSV file
- **or Tuple[str] headers** (*List[str]*) – headers of the CSV file
- **sep** (*str*) – delimiter in CSV file. Default: ","
- **dropna** (*bool*) – If True, drop rows that have less entries than headers.

Return dataset the read data set

rename_field(*old_name*, *new_name*)
Rename a field.

Parameters

- **old_name** (*str*) –
- **new_name** (*str*) –

save(*path*)
Save the DataSet object as pickle.

Parameters **path** (*str*) – the path to the pickle

set_input(**field_name*, *flag=True*)
Set the input flag of these fields.

Parameters

- **field_name** – a sequence of str, indicating field names.
- **flag** (*bool*) – Set these fields as input if True. Unset them if False.

set_target(**field_names*, *flag=True*)
Change the target flag of these fields.

Parameters

- **field_names** – a sequence of str, indicating field names
- **flag** (*bool*) – Set these fields as target if True. Unset them if False.

split(*dev_ratio*)
Split the dataset into training and development(validation) set.

Parameters **dev_ratio** (*float*) – the ratio of test set in all data.

Return (train_set, dev_set) train_set: the training set dev_set: the development set

fastNLP.core.dataset.**construct_dataset**(*sentences*)
Construct a data set from a list of sentences.

Parameters **sentences** – list of list of str

Return dataset a DataSet object

fastNLP.core.fieldarray

class fastNLP.core.fieldarray.**FieldArray**(*name*, *content*, *padding_val=0*, *is_target=None*, *is_input=None*)
`FieldArray` is the collection of `Instance``s of the same field. It is the basic element of ``DataSet` class.

Parameters

- **name** (*str*) – the name of the FieldArray
- **content** (*list*) – a list of int, float, str or np.ndarray, or a list of list of one, or a np.ndarray.
- **padding_val** (*int*) – the integer for padding. Default: 0.
- **is_target** (*bool*) – If True, this FieldArray is used to compute loss.
- **is_input** (*bool*) – If True, this FieldArray is used to the model input.

append(*val*)
Add a new item to the tail of FieldArray.

Parameters **val** – int, float, str, or a list of one.

get(*indices*)
Fetch instances based on indices.

Parameters **indices** – an int, or a list of int.

Returns

fastNLP.core.instance

class fastNLP.core.instance.**Instance**(***fields*)
An Instance is an example of data. Example:

```
ins = Instance(field_1=[1, 1, 1], field_2=[2, 2, 2])
ins["field_1"]
>>[1, 1, 1]
ins.add_field("field_3", [3, 3, 3])
```

Parameters **fields** – a dict of (str: list).

add_field(*field_name*, *field*)
Add a new field to the instance.

Parameters **field_name** – str, the name of the field.

fastNLP.core.losses

class fastNLP.core.losses.**BCELoss**(*pred=None*, *target=None*)

class fastNLP.core.losses.**CrossEntropyLoss**(*pred=None*, *target=None*, *padding_idx=-100*)

class fastNLP.core.losses.**L1Loss**(*pred=None*, *target=None*)

class fastNLP.core.losses.**LossBase**
Base class for all losses.

class fastNLP.core.losses.**LossFunc**(*func*, *key_map=None*, ***kwargs*)
A wrapper of user-provided loss function.

class fastNLP.core.losses.**LossInForward**(*loss_key='loss'*)

class fastNLP.core.losses.**NLLLoss**(*pred=None*, *target=None*)

fastNLP.core.losses.**make_mask**(*lens*, *tar_len*)
To generate a mask over a sequence.

Parameters

- **lens** – list or LongTensor, [batch_size]
- **tar_len** – int

Return mask ByteTensor

fastNLP.core.losses.**mask**(*predict*, *truth*, ***kwargs*)
To select specific elements from Tensor. This method calls `squash()`.

Parameters

- **predict** – Tensor, [batch_size , max_len , tag_size]
- **truth** – Tensor, [batch_size , max_len]
- ****kwargs** – extra arguments, kwargs["mask"]: ByteTensor, [batch_size , max_len], the mask Tensor. The position that is 1 will be selected.

Return predict , truth predict & truth after processing

fastNLP.core.losses.**squash**(*predict*, *truth*, ***kwargs*)
To reshape tensors in order to fit loss functions in PyTorch.

Parameters

- **predict** – Tensor, model output
- **truth** – Tensor, truth from dataset
- ****kwargs** – extra arguments

Return predict , truth predict & truth after processing

fastNLP.core.losses.**unpad**(*predict*, *truth*, ***kwargs*)
To process padded sequence output to get true loss.

Parameters

- **predict** – Tensor, [batch_size , max_len , tag_size]
- **truth** – Tensor, [batch_size , max_len]

- **kwargs** – kwargs["lens"] is a list or LongTensor, with size [batch_size]. The i-th element is true lengths of i-th sequence.

Return predict , truth predict & truth after processing

fastNLP.core.losses.**unpad_mask**(*predict*, *truth*, ***kwargs*)

To process padded sequence output to get true loss.

Parameters

- **predict** – Tensor, [batch_size , max_len , tag_size]
- **truth** – Tensor, [batch_size , max_len]
- **kwargs** – kwargs["lens"] is a list or LongTensor, with size [batch_size]. The i-th element is true lengths of i-th sequence.

Return predict , truth predict & truth after processing

fastNLP.core.metrics

class fastNLP.core.metrics.**AccuracyMetric**(*pred=None*, *target=None*, *seq_lens=None*)

Accuracy Metric

evaluate(*pred*, *target*, *seq_lens=None*)

Parameters

- **pred** – List of (torch.Tensor, or numpy.ndarray). Element's shape can be: torch.Size([B,]), torch.Size([B, n_classes]), torch.Size([B, max_len]), torch.Size([B, max_len, n_classes])
- **target** – List of (torch.Tensor, or numpy.ndarray). Element's can be: torch.Size([B,]), torch.Size([B,]), torch.Size([B, max_len]), torch.Size([B, max_len])
- **seq_lens** – List of (torch.Tensor, or numpy.ndarray). Element's can be: None, None, torch.Size([B], torch.Size([B]). ignored if masks are provided.

get_metric(*reset=True*)

Returns computed metric.

Parameters **reset** (*bool*) – whether to recount next time.

Return evaluate_result {"acc": float}

class fastNLP.core.metrics.**BMESF1PreRecMetric**(*b_idx=0*, *m_idx=1*, *e_idx=2*, *s_idx=3*, *pred=None*, *target=None*, *seq_lens=None*)

BMESf1, precision, recalltag"BS"cur_BtagB next_BtagBcur_B=SpredictBtagSnext_M=B, predictMtagB | | next_B | next_M | next_E | next_S | end | |:——:|:——:|:——:|:——:|:——:|:——:| | start | | next_M=B | next_E=S | | - | | cur_B | cur_B=S | | | cur_B=S | cur_B=S | | cur_M | cur_M=E | | | cur_M=E | cur_M=E | | cur_E | | next_M=B | next_E=S | | | | cur_S | | next_M=B | next_E=S | | |

predictionBSEMSSSSSS.

Metrictargettarget pred(batch_size, max_len) (batch_size, max_len, 4) target (batch_size, max_len) seq_lens (batch_size,)

class fastNLP.core.metrics.**MetricBase**

Base class for all metrics.

`MetricBase` handles validity check of its input dictionaries - `pred_dict` and `target_dict`. `pred_dict` is the output of `forward()` or prediction function of a model. `target_dict` is the ground truth from DataSet where `is_target` is set `True`. `MetricBase` will do the following type checks:

1. whether self.evaluate has varargs, which is not supported.
2. whether params needed by self.evaluate is not included in `pred_dict`, `target_dict`.
3. whether params needed by self.evaluate duplicate in `pred_dict`, `target_dict`.
4. whether params in `pred_dict`, `target_dict` are not used by evaluate.(Might cause warning)

Besides, before passing params into self.evaluate, this function will filter out params from output_dict and target_dict which are not used in self.evaluate. (but if **kwargs presented in self.evaluate, no filtering will be conducted.) However, in some cases where type check is not necessary, `_fast_param_map` will be used.

class fastNLP.core.metrics.**SpanFPreRecMetric**(*tag_vocab*, *pred=None*, *target=None*, *seq_lens=None*, *encoding_type='bio'*, *ignore_labels=None*, *only_gross=True*, *f_type='micro'*, *beta=1*)

spanF, pre, rec. metric {

'f': xxx, # ff_beta 'pre': xxx, 'rec':xxx

} only_gross=False, labelmetric

{ 'f': xxx, 'pre': xxx, 'rec':xxx, 'f-label': xxx, 'pre-label': xxx, 'rec-label':xxx, ...

}

evaluate(*pred*, *target*, *seq_lens*)

A lot of design idea comes from allennlp's measure :param pred: :param target: :param seq_lens: :return:

fastNLP.core.metrics.**accuracy_topk**(*y_true*, *y_prob*, *k=1*)

Compute accuracy of y_true matching top-k probable labels in y_prob.

Parameters

- **y_true** – ndarray, true label, [n_samples]
- **y_prob** – ndarray, label probabilities, [n_samples, n_classes]
- **k** – int, k in top-k

Returns acc accuracy of top-k

fastNLP.core.metrics.**bio_tag_to_spans**(*tags*, *ignore_labels=None*)

Parameters

- **tags** – List[str],
- **ignore_labels** – List[str], listlabel

Returns List[Tuple[str, List[int, int]]]. [(label[start, end])]

fastNLP.core.metrics.**bmes_tag_to_spans**(*tags*, *ignore_labels=None*)

Parameters

- **tags** – List[str],
- **ignore_labels** – List[str], listlabel

Returns List[Tuple[str, List[int, int]]]. [(label[start, end])]

fastNLP.core.metrics.**pred_topk**(*y_prob*, *k=1*)

Return top-k predicted labels and corresponding probabilities.

Parameters

- **y_prob** – ndarray, size [n_samples, n_classes], probabilities on labels
- **k** – int, k of top-k

Returns (y_pred_topk, y_prob_topk) y_pred_topk: ndarray, size [n_samples, k], predicted top-k labels y_prob_topk: ndarray, size [n_samples, k], probabilities for top-k labels

fastNLP.core.optimizer

class fastNLP.core.optimizer.**Adam**(*lr=0.001*, *weight_decay=0*, *betas=(0.9*, *0.999)*, *eps=1e-08*, *amsgrad=False*, *model_params=None*)

Parameters

- **lr** (*float*) – learning rate
- **weight_decay** (*float*) –
- **model_params** – a generator. E.g. `model.parameters()` for PyTorch models.

class fastNLP.core.optimizer.**Optimizer**(*model_params*, ***kwargs*)

Parameters

- **model_params** – a generator. E.g. `model.parameters()` for PyTorch models.
- **kwargs** – additional parameters.

class fastNLP.core.optimizer.**SGD**(*lr=0.001*, *momentum=0*, *model_params=None*)

Parameters

- **lr** (*float*) – learning rate. Default: 0.01
- **momentum** (*float*) – momentum. Default: 0
- **model_params** – a generator. E.g. `model.parameters()` for PyTorch models.

fastNLP.core.predictor

class fastNLP.core.predictor.**Predictor**

An interface for predicting outputs based on trained models.

It does not care about evaluations of the model, which is different from Tester. This is a high-level model wrapper to be called by FastNLP. This class does not share any operations with Trainer and Tester. Currently, Predictor does not support GPU.

data_forward(*network*, *x*)

Forward through network.

predict(*network*, *data*)

Perform inference using the trained model.

Parameters

- **network** – a PyTorch model (cpu)
- **data** – a DataSet object.

Returns list of batch outputs

fastNLP.core.sampler

class fastNLP.core.sampler.**BaseSampler**
The base class of all samplers.

Sub-classes must implement the __call__ method. __call__ takes a DataSet object and returns a list of int - the sampling indices.

class fastNLP.core.sampler.**BucketSampler**(*num_buckets=10*, *batch_size=32*, *seq_lens_field_name='seq_lens'*)

Parameters

- **num_buckets** (*int*) – the number of buckets to use.
- **batch_size** (*int*) – batch size per epoch.
- **seq_lens_field_name** (*str*) – the field name indicating the field about sequence length.

class fastNLP.core.sampler.**RandomSampler**
Sample data in random permutation order.

class fastNLP.core.sampler.**SequentialSampler**
Sample data in the original order.

fastNLP.core.sampler.**convert_to_torch_tensor**(*data_list*, *use_cuda*)
Convert lists into (cuda) Tensors.

Parameters

- **data_list** – 2-level lists
- **use_cuda** – bool, whether to use GPU or not

Return data_list PyTorch Tensor of shape [batch_size, max_seq_len]

fastNLP.core.sampler.**k_means_1d**(*x*, *k*, *max_iter=100*)
Perform k-means on 1-D data.

Parameters

- **x** – list of int, representing points in 1-D.
- **k** – the number of clusters required.
- **max_iter** – maximum iteration

Return centroids numpy array, centroids of the k clusters assignment: numpy array, 1-D, the bucket id assigned to each example.

fastNLP.core.sampler.**k_means_bucketing**(*lengths*, *buckets*)
Assign all instances into possible buckets using k-means, such that instances in the same bucket have similar lengths.

Parameters

- **lengths** – list of int, the length of all samples.
- **buckets** – list of int. The length of the list is the number of buckets. Each integer is the maximum length threshold for each bucket (This is usually None.).

Return data 2-level list

```
[
    [index_11, index_12, ...],  # bucket 1
    [index_21, index_22, ...],  # bucket 2
    ...
]
```

fastNLP.core.sampler.**simple_sort_bucketing**(*lengths*)

Parameters **lengths** – list of int, the lengths of all examples.

Return data 2-level list

```
[
    [index_11, index_12, ...],  # bucket 1
    [index_21, index_22, ...],  # bucket 2
    ...
]
```

fastNLP.core.tester

class fastNLP.core.tester.**Tester**(*data*, *model*, *metrics*, *batch_size=16*, *use_cuda=False*, *verbose=1*)

An collection of model inference and evaluation of performance, used over validation/dev set and test set.

Parameters

- **data** (DataSet) – a validation/development set
- **model** (*torch.nn.modules.module*) – a PyTorch model
- **metrics** (MetricBase) – a metric object or a list of metrics (List[MetricBase])
- **batch_size** (*int*) – batch size for validation
- **use_cuda** (*bool*) – whether to use CUDA in validation.
- **verbose** (*int*) – the number of steps after which an information is printed.

test()

Start test or validation.

Return eval_results a dictionary whose keys are the class name of metrics to use, values are the evaluation results of these metrics.

fastNLP.core.trainer

fastNLP.core.utils

exception fastNLP.core.utils.**CheckError**(*check_res: fastNLP.core.utils.CheckRes*, *func_signature: str*)

CheckError. Used in losses.LossBase, metrics.MetricBase.

class fastNLP.core.utils.**CheckRes**(*missing*, *unused*, *duplicated*, *required*, *all_needed*, *varargs*)

all_needed

Alias for field number 4

duplicated

Alias for field number 2

missing
Alias for field number 0

required
Alias for field number 3

unused
Alias for field number 1

varargs
Alias for field number 5

fastNLP.core.utils.**get_func_signature**(*func*)
Given a function or method, return its signature. For example: (1) function

def func(a, b='a', *args): xxxx

get_func_signature(func) # 'func(a, b='a', *args)'

2. method class Demo:

def __init__(self): xxx

def forward(self, a, b='a', **args)

demo = Demo() get_func_signature(demo.forward) # 'Demo.forward(self, a, b='a', **args)'

Parameters **func** – a function or a method

Returns str or None

fastNLP.core.utils.**load_pickle**(*pickle_path*, *file_name*)
Load an object from a given pickle file.

Parameters

- **pickle_path** – str, the directory where the pickle file is.
- **file_name** – str, the name of the pickle file.

Return obj an object stored in the pickle

fastNLP.core.utils.**pickle_exist**(*pickle_path*, *pickle_name*)
Check if a given pickle file exists in the directory.

Parameters

- **pickle_path** – the directory of target pickle file
- **pickle_name** – the filename of target pickle file

Returns True if file exists else False

fastNLP.core.utils.**save_pickle**(*obj*, *pickle_path*, *file_name*)
Save an object into a pickle file.

Parameters

- **obj** – an object
- **pickle_path** – str, the directory where the pickle file is to be saved
- **file_name** – str, the name of the pickle file. In general, it should be ended by "pkl".

fastNLP.core.utils.**seq_lens_to_masks**(*seq_lens*, *float=False*)
Convert seq_lens to masks. :param seq_lens: list, np.ndarray, or torch.LongTensor, shape should all be (B,) :param float: if True, the return masks is in float type, otherwise it is byte. :return: list, np.ndarray or torch.Tensor, shape will be (B, max_length)

fastNLP.core.utils.**seq_mask**(*seq_len*, *max_len*)
Create sequence mask.

Parameters

- **seq_len** – list or torch.Tensor, the lengths of sequences in a batch.
- **max_len** – int, the maximum sequence length in a batch.

Return mask torch.LongTensor, [batch_size, max_len]

fastNLP.core.vocabulary

class fastNLP.core.vocabulary.**Vocabulary**(*max_size=None*, *min_freq=None*, *unknown='<unk>'*, *padding='<pad>'*)
Use for word and index one to one mapping

Example:

```
vocab = Vocabulary()
word_list = "this is a word list".split()
vocab.update(word_list)
vocab["word"]
vocab.to_word(5)
```

Parameters

- **max_size** (*int*) – set the max number of words in Vocabulary. Default: None
- **min_freq** (*int*) – set the min occur frequency of words in Vocabulary. Default: None

build_reverse_vocab()
Build "index to word" dict based on "word to index" dict.

build_vocab()
Build a mapping from word to index, and filter the word using `max_size` and `min_freq`.

to_index(*w*)
Turn a word to an index. If w is not in Vocabulary, return the unknown label.

Parameters **w** (*str*) – a word

fastNLP.core.vocabulary.**check_build_status**(*func*)
A decorator to check whether the vocabulary updates after the last build.

fastNLP.core.vocabulary.**check_build_vocab**(*func*)
A decorator to make sure the indexing is built before used.

3.1.3 fastNLP.io

fastNLP.io.base_loader

class fastNLP.io.base_loader.**BaseLoader**
Base loader for all loaders.

class fastNLP.io.base_loader.**DataLoaderRegister**
Register for all data sets.

fastNLP.io.config_io

class fastNLP.io.config_io.**ConfigLoader**(*data_path=None*)
Loader for configuration.

Parameters **data_path** (*str*) – path to the config

static load_config(*file_path*, *sections*)
Load section(s) of configuration into the `sections` provided. No returns.

Parameters

- **file_path** (*str*) – the path of config file
- **sections** (*dict*) – the dict of `{section_name(string): ConfigSection object}`

Example:

```
test_args = ConfigSection()
ConfigLoader("config.cfg", "").load_config("./data_for_tests/config", {"POS_
↪test": test_args})
```

class fastNLP.io.config_io.**ConfigSaver**(*file_path*)
ConfigSaver is used to save config file and solve related conflicts.

Parameters **file_path** (*str*) – path to the config file

save_config_file(*section_name*, *section*)
This is the function to be called to change the config file with a single section and its name.

Parameters

- **section_name** (*str*) – The name of section what needs to be changed and saved.
- **section** (ConfigSection) – The section with key and value what needs to be changed and saved.

class fastNLP.io.config_io.**ConfigSection**
ConfigSection is the data structure storing all key-value pairs in one section in a config file.

fastNLP.io.dataset_loader

class fastNLP.io.dataset_loader.**ClassDataSetLoader**
Loader for classification data sets

convert(*data*)
Optional operation to build a DataSet.

Parameters **data** – inner data structure (user-defined) to represent the data.

Returns a DataSet object

load(*data_path*)
Load data from a given file.

Parameters **path** (*str*) – file path

Returns a DataSet object

static parse(*lines*)

Parameters **lines** – lines from dataset

Returns list(list(list())): the three level of lists are words, sentence, and dataset

class fastNLP.io.dataset_loader.**Conll2003Loader**

Self-defined loader of conll2003 dataset

More information about the given dataset cound be found on https://sites.google.com/site/ermasoftware/getting-started/ne-tagging-conll2003-data

convert(*parsed_data*)

Optional operation to build a DataSet.

Parameters **data** – inner data structure (user-defined) to represent the data.

Returns a DataSet object

load(*dataset_path*)

Load data from a given file.

Parameters **path** (*str*) – file path

Returns a DataSet object

class fastNLP.io.dataset_loader.**ConllLoader**

loader for conll format files

convert(*data*)

Optional operation to build a DataSet.

Parameters **data** – inner data structure (user-defined) to represent the data.

Returns a DataSet object

load(*data_path*)

Load data from a given file.

Parameters **path** (*str*) – file path

Returns a DataSet object

static parse(*lines*)

:param list lines:a list containing all lines in a conll file. :return: a 3D list

class fastNLP.io.dataset_loader.**DataSetLoader**

Interface for all DataSetLoaders.

convert(*data*)

Optional operation to build a DataSet.

Parameters **data** – inner data structure (user-defined) to represent the data.

Returns a DataSet object

load(*path*)

Load data from a given file.

Parameters **path** (*str*) – file path

Returns a DataSet object

class fastNLP.io.dataset_loader.**LMDataSetLoader**

Language Model Dataset Loader

This loader produces data for language model training in a supervised way. That means it has X and Y.

convert(*data*)
Optional operation to build a DataSet.

Parameters **data** – inner data structure (user-defined) to represent the data.

Returns a DataSet object

load(*data_path*)
Load data from a given file.

Parameters **path** (*str*) – file path

Returns a DataSet object

class fastNLP.io.dataset_loader.**NativeDataSetLoader**
A simple example of DataSetLoader

load(*path*)
Load data from a given file.

Parameters **path** (*str*) – file path

Returns a DataSet object

class fastNLP.io.dataset_loader.**POSDataSetLoader**
Dataset Loader for a POS Tag dataset.

In these datasets, each line are divided by ” “. The first Col is the vocabulary and the second Col is the label. Different sentence are divided by an empty line.

E.g:

```
Tom label1
and label2
Jerry   label1
.   label3
(separated by an empty line)
Hello   label4
world   label5
!   label3
```

In this example, there are two sentences “Tom and Jerry .” and “Hello world !”. Each word has its own label.

convert(*data*)
Convert lists of strings into Instances with Fields.

load(*data_path*)

Return data three-level list Example:

```
[
    [ [word_11, word_12, ...], [label_1, label_1, ...] ],
    [ [word_21, word_22, ...], [label_2, label_1, ...] ],
    ...
]
```

class fastNLP.io.dataset_loader.**PeopleDailyCorpusLoader**
People Daily Corpus: Chinese word segmentation, POS tag, NER

convert(*data*)
Optional operation to build a DataSet.

Parameters **data** – inner data structure (user-defined) to represent the data.

Returns a DataSet object

load(*data_path*)
Load data from a given file.

Parameters **path** (*str*) – file path

Returns a DataSet object

class fastNLP.io.dataset_loader.**RawDataSetLoader**
A simple example of raw data reader

convert(*data*)
Optional operation to build a DataSet.

Parameters **data** – inner data structure (user-defined) to represent the data.

Returns a DataSet object

load(*data_path*, *split=None*)
Load data from a given file.

Parameters **path** (*str*) – file path

Returns a DataSet object

class fastNLP.io.dataset_loader.**SNLIDataSetLoader**
A data set loader for SNLI data set.

convert(*data*)
Convert a 3D list to a DataSet object.

Parameters **data** – A 3D tensor. Example:

```
[
    [ [premise_word_11, premise_word_12, ...], [hypothesis_word_11,␣
↪hypothesis_word_12, ...], [label_1] ],
    [ [premise_word_21, premise_word_22, ...], [hypothesis_word_21,␣
↪hypothesis_word_22, ...], [label_2] ],
    ...
]
```

Returns A DataSet object.

load(*path_list*)

Parameters **path_list** (*list*) – A list of file name, in the order of premise file, hypothesis file, and label file.

Returns A DataSet object.

class fastNLP.io.dataset_loader.**TokenizeDataSetLoader**
Data set loader for tokenization data sets

convert(*data*)
Optional operation to build a DataSet.

Parameters **data** – inner data structure (user-defined) to represent the data.

Returns a DataSet object

load(*data_path*, *max_seq_len=32*)
Load pku dataset for Chinese word segmentation. CWS (Chinese Word Segmentation) pku training dataset format: 1. Each line is a sentence. 2. Each word in a sentence is separated by space. This function convert

the pku dataset into three-level lists with labels <BMES>. B: beginning of a word M: middle of a word E: ending of a word S: single character

Parameters

- **data_path** (*str*) – path to the data set.
- **max_seq_len** – int, the maximum length of a sequence. If a sequence is longer than it, split it into several sequences.

Returns three-level lists

fastNLP.io.dataset_loader.**convert_seq2seq_dataset**(*data*)
Convert list of data into DataSet.

Parameters **data** – list of list of strings, [num_examples, *]. Example:

```
[
    [ [word_11, word_12, ...], [label_1, label_1, ...] ],
    [ [word_21, word_22, ...], [label_2, label_1, ...] ],
    ...
]
```

Returns a DataSet.

fastNLP.io.dataset_loader.**convert_seq2tag_dataset**(*data*)
Convert list of data into DataSet.

Parameters **data** – list of list of strings, [num_examples, *]. Example:

```
[
    [ [word_11, word_12, ...], label_1 ],
    [ [word_21, word_22, ...], label_2 ],
    ...
]
```

Returns a DataSet.

fastNLP.io.dataset_loader.**convert_seq_dataset**(*data*)
Create an DataSet instance that contains no labels.

Parameters **data** – list of list of strings, [num_examples, *]. Example:

```
[
    [word_11, word_12, ...],
    ...
]
```

Returns a DataSet.

fastNLP.io.embed_loader

class fastNLP.io.embed_loader.**EmbedLoader**
docstring for EmbedLoader

static fast_load_embedding(*emb_dim*, *emb_file*, *vocab*)
Fast load the pre-trained embedding and combine with the given dictionary. This loading method uses line-by-line operation.

Parameters

- **emb_dim** (*int*) – the dimension of the embedding. Should be the same as pre-trained embedding.
- **emb_file** (*str*) – the pre-trained embedding file path.
- **vocab** (Vocabulary) – a mapping from word to index, can be provided by user or built from pre-trained embedding

Return embedding_matrix numpy.ndarray

static load_embedding(*emb_dim*, *emb_file*, *emb_type*, *vocab*)
Load the pre-trained embedding and combine with the given dictionary.

Parameters

- **emb_dim** (*int*) – the dimension of the embedding. Should be the same as pre-trained embedding.
- **emb_file** (*str*) – the pre-trained embedding file path.
- **emb_type** (*str*) – the pre-trained embedding format, support glove now
- **vocab** (Vocabulary) – a mapping from word to index, can be provided by user or built from pre-trained embedding

Return (embedding_tensor, vocab) embedding_tensor - Tensor of shape (len(word_dict), emb_dim); vocab - input vocab or vocab built by pre-train

fastNLP.io.logger

fastNLP.io.logger.**create_logger**(*logger_name*, *log_path*, *log_format=None*, *log_level=20*)
Create a logger.

Parameters

- **logger_name** (*str*) –
- **log_path** (*str*) –
- **log_format** –
- **log_level** –

Returns logger

To use a logger:

```
logger.debug("this is a debug message")
logger.info("this is a info message")
logger.warning("this is a warning message")
logger.error("this is an error message")
```

fastNLP.io.model_io

class fastNLP.io.model_io.**ModelLoader**
Loader for models.

static load_pytorch(*empty_model*, *model_path*)
Load model parameters from ".pkl" files into the empty PyTorch model.

Parameters

- **empty_model** – a PyTorch model with initialized parameters.

- **model_path** (*str*) – the path to the saved model.

static load_pytorch_model(*model_path*)
Load the entire model.

Parameters **model_path** (*str*) – the path to the saved model.

class fastNLP.io.model_io.**ModelSaver**(*save_path*)
Save a model

Parameters **save_path** (*str*) – the path to the saving directory.

Example:

```
saver = ModelSaver("./save/model_ckpt_100.pkl")
saver.save_pytorch(model)
```

save_pytorch(*model*, *param_only=True*)
Save a pytorch model into ".pkl" file.

Parameters

- **model** – a PyTorch model
- **param_only** (*bool*) – whether only to save the model parameters or the entire model.

3.1.4 fastNLP.models

fastNLP.models.base_model

class fastNLP.models.base_model.**BaseModel**
Base PyTorch model for all models.

class fastNLP.models.base_model.**NaiveClassifier**(*in_feature_dim*, *out_feature_dim*)

forward(*x*)
Defines the computation performed at every call.

Should be overridden by all subclasses.

Note: Although the recipe for forward pass needs to be defined within this function, one should call the `Module` instance afterwards instead of this since the former takes care of running the registered hooks while the latter silently ignores them.

---

fastNLP.models.biaffine_parser

class fastNLP.models.biaffine_parser.**ArcBiaffine**(*hidden_size*, *bias=True*)
helper module for Biaffine Dependency Parser predicting arc

forward(*head*, *dep*)
:param head arc-head tensor = [batch, length, emb_dim] :param dep arc-dependent tensor = [batch, length, emb_dim]

:return output tensor = [bacth, length, length]

class fastNLP.models.biaffine_parser.**BiaffineParser**(*word_vocab_size*, *word_emb_dim*, *pos_vocab_size*, *pos_emb_dim*, *word_hid_dim*, *pos_hid_dim*, *rnn_layers*, *rnn_hidden_size*, *arc_mlp_size*, *label_mlp_size*, *num_label*, *dropout*, *use_var_lstm=False*, *use_greedy_infer=False*)

Biaffine Dependency Parser implemantation. refer to ' Deep Biaffine Attention for Neural Dependency Parsing (Dozat and Manning, 2016) <https://arxiv.org/abs/1611.01734>'_ .

forward(*word_seq*, *pos_seq*, *word_seq_origin_len*, *gold_heads=None*, ***_*)

Parameters

- **word_seq** – [batch_size, seq_len] sequence of word's indices
- **pos_seq** – [batch_size, seq_len] sequence of word's indices
- **word_seq_origin_len** – [batch_size, seq_len] sequence of length masks
- **gold_heads** – [batch_size, seq_len] sequence of golden heads

Return dict parsing results arc_pred: [batch_size, seq_len, seq_len] label_pred: [batch_size, seq_len, seq_len] mask: [batch_size, seq_len] head_pred: [batch_size, seq_len] if gold_heads is not provided, predicting the heads

loss(*arc_pred*, *label_pred*, *head_indices*, *head_labels*, *mask*, ***_*)

Compute loss.

Parameters

- **arc_pred** – [batch_size, seq_len, seq_len]
- **label_pred** – [batch_size, seq_len, n_tags]
- **head_indices** – [batch_size, seq_len]
- **head_labels** – [batch_size, seq_len]
- **mask** – [batch_size, seq_len]

Returns loss value

predict(*word_seq*, *pos_seq*, *word_seq_origin_len*)

Parameters

- **word_seq** –
- **pos_seq** –
- **word_seq_origin_len** –

Returns head_pred: [B, L] label_pred: [B, L] seq_len: [B,]

class fastNLP.models.biaffine_parser.**GraphParser**

Graph based Parser helper class, support greedy decoding and MST(Maximum Spanning Tree) decoding

forward(*x*)

Defines the computation performed at every call.

Should be overridden by all subclasses.

> **Note:** Although the recipe for forward pass needs to be defined within this function, one should call the `Module` instance afterwards instead of this since the former takes care of running the registered hooks while the latter silently ignores them.

class fastNLP.models.biaffine_parser.**LabelBilinear**(*in1_features*, *in2_features*, *num_label*, *bias=True*)

helper module for Biaffine Dependency Parser predicting label

forward(*x1*, *x2*)

Defines the computation performed at every call.

Should be overridden by all subclasses.

> **Note:** Although the recipe for forward pass needs to be defined within this function, one should call the `Module` instance afterwards instead of this since the former takes care of running the registered hooks while the latter silently ignores them.

fastNLP.models.biaffine_parser.**mst**(*scores*)

with some modification to support parser output for MST decoding https://github.com/tdozat/Parser/blob/0739216129cd39d69997d28cbc4133b360ea3934/lib/models/nn.py#L692

fastNLP.models.char_language_model

class fastNLP.models.char_language_model.**CharLM**(*char_emb_dim*, *word_emb_dim*, *vocab_size*, *num_char*)

CNN + highway network + LSTM # Input:

4D tensor with shape [batch_size, in_channel, height, width]

 # Output: 2D Tensor with shape [batch_size, vocab_size]

 # Arguments: char_emb_dim: the size of each character's attention word_emb_dim: the size of each word's attention vocab_size: num of unique words num_char: num of characters use_gpu: True or False

forward(*x*)

Defines the computation performed at every call.

Should be overridden by all subclasses.

> **Note:** Although the recipe for forward pass needs to be defined within this function, one should call the `Module` instance afterwards instead of this since the former takes care of running the registered hooks while the latter silently ignores them.

class fastNLP.models.char_language_model.**Highway**(*input_size*)

Highway network

forward(*x*)

Defines the computation performed at every call.

Should be overridden by all subclasses.

> **Note:** Although the recipe for forward pass needs to be defined within this function, one should call the `Module` instance afterwards instead of this since the former takes care of running the registered hooks

while the latter silently ignores them.

fastNLP.models.cnn_text_classification

class fastNLP.models.cnn_text_classification.**CNNText**(*embed_num*, *embed_dim*, *num_classes*, *kernel_nums=(3, 4, 5)*, *kernel_sizes=(3, 4, 5)*, *padding=0*, *dropout=0.5*)

Text classification model by character CNN, the implementation of paper 'Yoon Kim. 2014. Convolution Neural Networks for Sentence Classification.'

forward(*word_seq*)

Parameters **word_seq** – torch.LongTensor, [batch_size, seq_len]

Return output dict of torch.LongTensor, [batch_size, num_classes]

predict(*word_seq*)

Parameters **word_seq** – torch.LongTensor, [batch_size, seq_len]

Return predict dict of torch.LongTensor, [batch_size, seq_len]

fastNLP.models.sequence_modeling

class fastNLP.models.sequence_modeling.**AdvSeqLabel**(*args*, *emb=None*, *id2words=None*)

Advanced Sequence Labeling Model

forward(*word_seq*, *word_seq_origin_len*, *truth=None*)

Parameters

- **word_seq** – LongTensor, [batch_size, mex_len]
- **word_seq_origin_len** – LongTensor, [batch_size,]
- **truth** – LongTensor, [batch_size, max_len]

Return y If truth is None, return list of [decode path(list)]. Used in testing and predicting. If truth is not None, return loss, a scalar. Used in training.

loss(***kwargs*)

Since the loss has been computed in forward(), this function simply returns x.

class fastNLP.models.sequence_modeling.**SeqLabeling**(*args*)

PyTorch Network for sequence labeling

decode(*x*, *pad=True*)

Parameters

- **x** – FloatTensor, [batch_size, max_len, tag_size]
- **pad** – pad the output sequence to equal lengths

Return prediction list of [decode path(list)]

forward(*word_seq*, *word_seq_origin_len*, *truth=None*)

Parameters

- **word_seq** – LongTensor, [batch_size, mex_len]

- **word_seq_origin_len** – LongTensor, [batch_size,], the origin lengths of the sequences.
- **truth** – LongTensor, [batch_size, max_len]

Return y If truth is None, return list of [decode path(list)]. Used in testing and predicting. If truth is not None, return loss, a scalar. Used in training.

loss(*x*, *y*)
Since the loss has been computed in forward(), this function simply returns x.

fastNLP.models.snli

class fastNLP.models.snli.**SNLI**(*args*, *init_embedding=None*)
PyTorch Network for SNLI.

forward(*premise*, *hypothesis*, *premise_len*, *hypothesis_len*)
Forward function

Parameters

- **premise** – A Tensor represents premise: [batch size(B), premise seq len(PL), hidden size(H)].
- **hypothesis** – A Tensor represents hypothesis: [B, hypothesis seq len(HL), H].
- **premise_len** – A Tensor record which is a real word and which is a padding word in premise: [B, PL].
- **hypothesis_len** – A Tensor record which is a real word and which is a padding word in hypothesis: [B, HL].

Returns prediction: A Tensor of classification result: [B, n_labels(N)].

3.1.5 fastNLP.modules

fastNLP.modules.aggregator

fastNLP.modules.aggregator.attention

class fastNLP.modules.aggregator.attention.**Attention**(*normalize=False*)

forward(*query*, *memory*, *mask*)
Defines the computation performed at every call.

Should be overridden by all subclasses.

Note: Although the recipe for forward pass needs to be defined within this function, one should call the `Module` instance afterwards instead of this since the former takes care of running the registered hooks while the latter silently ignores them.

---

class fastNLP.modules.aggregator.attention.**DotAtte**(*key_size*, *value_size*)

forward(*Q*, *K*, *V*, *seq_mask=None*)

Parameters

- **Q** – [batch, seq_len, key_size]
- **K** – [batch, seq_len, key_size]
- **V** – [batch, seq_len, value_size]
- **seq_mask** – [batch, seq_len]

class fastNLP.modules.aggregator.attention.**MultiHeadAtte**(*input_size*, *output_size*, *key_size*, *value_size*, *num_atte*)

forward(*Q*, *K*, *V*, *seq_mask=None*)

Defines the computation performed at every call.

Should be overridden by all subclasses.

Note: Although the recipe for forward pass needs to be defined within this function, one should call the `Module` instance afterwards instead of this since the former takes care of running the registered hooks while the latter silently ignores them.

---

fastNLP.modules.aggregator.avg_pool

class fastNLP.modules.aggregator.avg_pool.**AvgPool**(*stride=None*, *padding=0*)

1-d average pooling module.

forward(*x*)

Defines the computation performed at every call.

Should be overridden by all subclasses.

Note: Although the recipe for forward pass needs to be defined within this function, one should call the `Module` instance afterwards instead of this since the former takes care of running the registered hooks while the latter silently ignores them.

---

fastNLP.modules.aggregator.kmax_pool

class fastNLP.modules.aggregator.kmax_pool.**KMaxPool**(*k=1*)

K max-pooling module.

forward(*x*)

Defines the computation performed at every call.

Should be overridden by all subclasses.

Note: Although the recipe for forward pass needs to be defined within this function, one should call the `Module` instance afterwards instead of this since the former takes care of running the registered hooks while the latter silently ignores them.

---

fastNLP.modules.aggregator.max_pool

class fastNLP.modules.aggregator.max_pool.**MaxPool**(*stride=None*, *padding=0*, *dilation=1*)

1-d max-pooling module.

forward(*x*)

Defines the computation performed at every call.

Should be overridden by all subclasses.

Note: Although the recipe for forward pass needs to be defined within this function, one should call the `Module` instance afterwards instead of this since the former takes care of running the registered hooks while the latter silently ignores them.

---

fastNLP.modules.aggregator.self_attention

class fastNLP.modules.aggregator.self_attention.**SelfAttention**(*input_size*, *attention_unit=350*, *attention_hops=10*, *drop=0.5*, *initial_method=None*, *use_cuda=False*)

Self Attention Module.

Args: input_size: int, the size for the input vector dim: int, the width of weight matrix. num_vec: int, the number of encoded vectors

forward(*input*, *input_origin*)

Parameters

- **input** – the matrix to do attention. [baz, senLen, h_dim]
- **inp** – then token index include pad token(0) [baz , senLen]

Return output1 the input matrix after attention operation [baz, multi-head , h_dim]

Return output2 the attention penalty term, a scalar [1]

penalization(*attention*)

compute the penalization term for attention module

fastNLP.modules.decoder

fastNLP.modules.decoder.CRF

class fastNLP.modules.decoder.CRF.**ConditionalRandomField**(*num_tags*, *include_start_end_trans=False*, *allowed_transitions=None*, *initial_method=None*)

forward(*feats*, *tags*, *mask*)

Calculate the neg log likelihood :param feats:FloatTensor, batch_size x max_len x num_tags :param tags:LongTensor, batch_size x max_len :param mask:ByteTensor batch_size x max_len :return:FloatTensor, batch_size

viterbi_decode(*data*, *mask*, *get_score=False*, *unpad=False*)

Given a feats matrix, return best decode path and best score. :param data:FloatTensor, batch_size x max_len x num_tags :param mask:ByteTensor batch_size x max_len :param get_score: bool, whether to output the decode score. :param unpad: bool, unpad,

False, batch_size x max_lentensor TrueList[List[int]], List[int]sequencelabelunpadding

List[int]sample

Returns

get_scoreFalseunpadding get_scoreTrue, (paths, List[float],)(unpad)List[Float]

seqence

fastNLP.modules.decoder.CRF.**allowed_transitions**(*id2label*, *encoding_type='bio'*)

Parameters

- **id2label** – dict, keylabelindicesvaluestrtagtag-labelvaluetag, "B", "M"; "B-NN", "M-NN", taglabel"-"Vocabulary.get_id2word()id2label
- **encoding_type** – str, "bio", "bmes"

:return:List[Tuple(int, int)]], Tuple(from_tag_id, to_tag_id) startend"BIO"BO I(start_idx, B_idx), (start_idx, O_idx), (start_idx, I_idx). start_idx=len(id2label), end_idx=len(id2label)+1

fastNLP.modules.decoder.CRF.**is_transition_allowed**(*encoding_type*, *from_tag*, *from_label*, *to_tag*, *to_label*)

Parameters

- **encoding_type** – str, "BIO", "BMES"
- **from_tag** – str, "B", "M"tag. start, endtag
- **from_label** – str, "PER", "LOC"label
- **to_tag** – str, "B", "M"tag. start, endtag
- **to_label** – str, "PER", "LOC"label

Returns bool

fastNLP.modules.decoder.MLP

class fastNLP.modules.decoder.MLP.**MLP**(*size_layer*, *activation='relu'*, *initial_method=None*, *dropout=0.0*)

forward(*x*)

Defines the computation performed at every call.

Should be overridden by all subclasses.

Note: Although the recipe for forward pass needs to be defined within this function, one should call the `Module` instance afterwards instead of this since the former takes care of running the registered hooks while the latter silently ignores them.

class fastNLP.modules.decoder.**ConditionalRandomField**(*num_tags*, *include_start_end_trans=False*, *allowed_transitions=None*, *initial_method=None*)

forward(*feats*, *tags*, *mask*)

Calculate the neg log likelihood :param feats:FloatTensor, batch_size x max_len x num_tags :param tags:LongTensor, batch_size x max_len :param mask:ByteTensor batch_size x max_len :return:FloatTensor, batch_size

viterbi_decode(*data*, *mask*, *get_score=False*, *unpad=False*)

Given a feats matrix, return best decode path and best score. :param data:FloatTensor, batch_size x max_len x num_tags :param mask:ByteTensor batch_size x max_len :param get_score: bool, whether to output the decode score. :param unpad: bool, unpad,

False, batch_size x max_lentensor TrueList[List[int]], List[int]sequencelabelunpadding

List[int]sample

Returns

get_scoreFalseunpadding get_scoreTrue, (paths, List[float],)(unpad)List[Float]

seqence

class fastNLP.modules.decoder.**MLP**(*size_layer*, *activation='relu'*, *initial_method=None*, *dropout=0.0*)

forward(*x*)

Defines the computation performed at every call.

Should be overridden by all subclasses.

Note: Although the recipe for forward pass needs to be defined within this function, one should call the `Module` instance afterwards instead of this since the former takes care of running the registered hooks while the latter silently ignores them.

fastNLP.modules.encoder

fastNLP.modules.encoder.char_embedding

class fastNLP.modules.encoder.char_embedding.**ConvCharEmbedding**(*char_emb_size=50*, *feature_maps=(40, 30, 30)*, *kernels=(3, 4, 5)*, *initial_method=None*)

forward(*x*)

Parameters **x** – [batch_size * sent_length, word_length, char_emb_size]

Returns [batch_size * sent_length, sum(feature_maps), 1]

class fastNLP.modules.encoder.char_embedding.**LSTMCharEmbedding**(*char_emb_size=50*, *hidden_size=None*, *initial_method=None*)

Character Level Word Embedding with LSTM with a single layer. :param char_emb_size: int, the size of character level embedding. Default: 50

say 26 characters, each embedded to 50 dim vector, then the input_size is 50.

Parameters **hidden_size** – int, the number of hidden units. Default: equal to char_emb_size.

forward(*x*)

:param x:[n_batch*n_word, word_length, char_emb_size] :return: [n_batch*n_word, char_emb_size]

fastNLP.modules.encoder.conv

class fastNLP.modules.encoder.conv.**Conv**(*in_channels*, *out_channels*, *kernel_size*, *stride=1*, *padding=0*, *dilation=1*, *groups=1*, *bias=True*, *activation='relu'*, *initial_method=None*)

Basic 1-d convolution module. initialize with xavier_uniform

forward(*x*)

Defines the computation performed at every call.

Should be overridden by all subclasses.

Note: Although the recipe for forward pass needs to be defined within this function, one should call the `Module` instance afterwards instead of this since the former takes care of running the registered hooks while the latter silently ignores them.

---

fastNLP.modules.encoder.conv_maxpool

class fastNLP.modules.encoder.conv_maxpool.**ConvMaxpool**(*in_channels*, *out_channels*, *kernel_sizes*, *stride=1*, *padding=0*, *dilation=1*, *groups=1*, *bias=True*, *activation='relu'*, *initial_method=None*)

Convolution and max-pooling module with multiple kernel sizes.

forward(*x*)

Defines the computation performed at every call.

Should be overridden by all subclasses.

Note: Although the recipe for forward pass needs to be defined within this function, one should call the `Module` instance afterwards instead of this since the former takes care of running the registered hooks while the latter silently ignores them.

---

fastNLP.modules.encoder.embedding

class fastNLP.modules.encoder.embedding.**Embedding**(*nums*, *dims*, *padding_idx=0*, *sparse=False*, *init_emb=None*, *dropout=0.0*)

A simple lookup table Args: nums : the size of the lookup table dims : the size of each vector padding_idx : pads the tensor with zeros whenever it encounters this index sparse : If True, gradient matrix will be a sparse tensor. In this case, only optim.SGD(cuda and cpu) and optim.Adagrad(cpu) can be used

forward(*x*)

Defines the computation performed at every call.

Should be overridden by all subclasses.

Note: Although the recipe for forward pass needs to be defined within this function, one should call the `Module` instance afterwards instead of this since the former takes care of running the registered hooks while the latter silently ignores them.

---

fastNLP.modules.encoder.linear

class fastNLP.modules.encoder.linear.**Linear**(*input_size*, *output_size*, *bias=True*, *initial_method=None*)

Linear module Args: input_size : input size hidden_size : hidden size num_layers : number of hidden layers dropout : dropout rate bidirectional : If True, becomes a bidirectional RNN

forward(*x*)

Defines the computation performed at every call.

Should be overridden by all subclasses.

Note: Although the recipe for forward pass needs to be defined within this function, one should call the `Module` instance afterwards instead of this since the former takes care of running the registered hooks while the latter silently ignores them.

---

fastNLP.modules.encoder.lstm

class fastNLP.modules.encoder.lstm.**LSTM**(*input_size*, *hidden_size=100*, *num_layers=1*, *dropout=0.0*, *batch_first=True*, *bidirectional=False*, *bias=True*, *initial_method=None*, *get_hidden=False*)

Long Short Term Memory

Args: input_size : input size hidden_size : hidden size num_layers : number of hidden layers. Default: 1 dropout : dropout rate. Default: 0.5 bidirectional : If True, becomes a bidirectional RNN. Default: False.

forward(*x*, *h0=None*, *c0=None*)

Defines the computation performed at every call.

Should be overridden by all subclasses.

Note: Although the recipe for forward pass needs to be defined within this function, one should call the `Module` instance afterwards instead of this since the former takes care of running the registered hooks

while the latter silently ignores them.

fastNLP.modules.encoder.masked_rnn

class fastNLP.modules.encoder.masked_rnn.**MaskedGRU**(**args*, ***kwargs*)

Applies a multi-layer gated recurrent unit (GRU) RNN to an input sequence. For each element in the input sequence, each layer computes the following function: .. math:

```
\begin{array}{ll}
r_t = \mathrm{sigmoid}(W_{ir} x_t + b_{ir} + W_{hr} h_{(t-1)} + b_{hr}) \\
z_t = \mathrm{sigmoid}(W_{iz} x_t + b_{iz} + W_{hz} h_{(t-1)} + b_{hz}) \\
n_t = \tanh(W_{in} x_t + b_{in} + r_t * (W_{hn} h_{(t-1)}+ b_{hn})) \\
h_t = (1 - z_t) * n_t + z_t * h_{(t-1)} \\
\end{array}
```

where h_t is the hidden state at time *t*, x_t is the hidden state of the previous layer at time *t* or $input_t$ for the first layer, and r_t, z_t, n_t are the reset, input, and new gates, respectively. Args:

input_size: The number of expected features in the input x hidden_size: The number of features in the hidden state h num_layers: Number of recurrent layers. nonlinearity: The non-linearity to use ['tanh'|'relu']. Default: 'tanh' bias: If False, then the layer does not use bias weights b_ih and b_hh.

Default: True

batch_first: If True, then the input and output tensors are provided as (batch, seq, feature)

dropout: If non-zero, introduces a dropout layer on the outputs of each RNN layer except the last layer

bidirectional: If True, becomes a bidirectional RNN. Default: False

Inputs: input, mask, h_0

- **input** (seq_len, batch, input_size): tensor containing the features of the input sequence. **mask** (seq_len, batch): 0-1 tensor containing the mask of the input sequence.
- **h_0** (num_layers * num_directions, batch, hidden_size): tensor containing the initial hidden state for each element in the batch.

Outputs: output, h_n

- **output** (seq_len, batch, hidden_size * num_directions): tensor containing the output features (h_k) from the last layer of the RNN, for each k. If a `torch.nn.utils.rnn.PackedSequence` has been given as the input, the output will also be a packed sequence.
- **h_n** (num_layers * num_directions, batch, hidden_size): tensor containing the hidden state for k=seq_len.

class fastNLP.modules.encoder.masked_rnn.**MaskedLSTM**(**args*, ***kwargs*)

Applies a multi-layer long short-term memory (LSTM) RNN to an input sequence. For each element in the input sequence, each layer computes the following function: .. math:

```
\begin{array}{ll}
i_t = \mathrm{sigmoid}(W_{ii} x_t + b_{ii} + W_{hi} h_{(t-1)} + b_{hi}) \\
f_t = \mathrm{sigmoid}(W_{if} x_t + b_{if} + W_{hf} h_{(t-1)} + b_{hf}) \\
g_t = \tanh(W_{ig} x_t + b_{ig} + W_{hc} h_{(t-1)} + b_{hg}) \\
```

(continues on next page)

(continued from previous page)

```
o_t = \mathrm{sigmoid}(W_{io} x_t + b_{io} + W_{ho} h_{(t-1)} + b_{ho}) \\
c_t = f_t * c_{(t-1)} + i_t * g_t \\
h_t = o_t * \tanh(c_t)
\end{array}
```

where h_t is the hidden state at time *t*, c_t is the cell state at time *t*, x_t is the hidden state of the previous layer at time *t* or $input_t$ for the first layer, and i_t, f_t, g_t, o_t are the input, forget, cell, and out gates, respectively. Args:

input_size: The number of expected features in the input x hidden_size: The number of features in the hidden state h num_layers: Number of recurrent layers. bias: If False, then the layer does not use bias weights b_ih and b_hh.

Default: True

batch_first: If True, then the input and output tensors are provided as (batch, seq, feature)

dropout: If non-zero, introduces a dropout layer on the outputs of each RNN layer except the last layer

bidirectional: If True, becomes a bidirectional RNN. Default: False

Inputs: input, mask, (h_0, c_0)

- **input** (seq_len, batch, input_size): tensor containing the features of the input sequence. **mask** (seq_len, batch): 0-1 tensor containing the mask of the input sequence.
- **h_0** (num_layers * num_directions, batch, hidden_size): tensor containing the initial hidden state for each element in the batch.
- **c_0** (num_layers * num_directions, batch, hidden_size): tensor containing the initial cell state for each element in the batch.

Outputs: output, (h_n, c_n)

- **output** (seq_len, batch, hidden_size * num_directions): tensor containing the output features *(h_t)* from the last layer of the RNN, for each t. If a `torch.nn.utils.rnn.PackedSequence` has been given as the input, the output will also be a packed sequence.
- **h_n** (num_layers * num_directions, batch, hidden_size): tensor containing the hidden state for t=seq_len
- **c_n** (num_layers * num_directions, batch, hidden_size): tensor containing the cell state for t=seq_len

class fastNLP.modules.encoder.masked_rnn.**MaskedRNN**(**args*, ***kwargs*)

Applies a multi-layer Elman RNN with costomized non-linearity to an input sequence. For each element in the input sequence, each layer computes the following function: .. math:

```
h_t = \tanh(w_{ih} * x_t + b_{ih}  +  w_{hh} * h_{(t-1)} + b_{hh})
```

where h_t is the hidden state at time *t*, and x_t is the hidden state of the previous layer at time *t* or $input_t$ for the first layer. If nonlinearity='relu', then *ReLU* is used instead of *tanh*. Args:

input_size: The number of expected features in the input x hidden_size: The number of features in the hidden state h num_layers: Number of recurrent layers. nonlinearity: The non-linearity to use ['tanh'|'relu']. Default: 'tanh' bias: If False, then the layer does not use bias weights b_ih and b_hh.

Default: True

batch_first: If True, then the input and output tensors are provided as (batch, seq, feature)

dropout: If non-zero, introduces a dropout layer on the outputs of each RNN layer except the last layer

bidirectional: If True, becomes a bidirectional RNN. Default: False

Inputs: input, mask, h_0

- **input** (seq_len, batch, input_size): tensor containing the features of the input sequence. **mask** (seq_len, batch): 0-1 tensor containing the mask of the input sequence.
- **h_0** (num_layers * num_directions, batch, hidden_size): tensor containing the initial hidden state for each element in the batch.

Outputs: output, h_n

- **output** (seq_len, batch, hidden_size * num_directions): tensor containing the output features (h_k) from the last layer of the RNN, for each k. If a `torch.nn.utils.rnn.PackedSequence` has been given as the input, the output will also be a packed sequence.
- **h_n** (num_layers * num_directions, batch, hidden_size): tensor containing the hidden state for k=seq_len.

class fastNLP.modules.encoder.masked_rnn.**MaskedRNNBase**(*Cell*, *input_size*, *hidden_size*, *num_layers=1*, *bias=True*, *batch_first=False*, *layer_dropout=0*, *step_dropout=0*, *bidirectional=False*, *initial_method=None*, ***kwargs*)

forward(*input*, *mask=None*, *hx=None*)

Defines the computation performed at every call.

Should be overridden by all subclasses.

Note: Although the recipe for forward pass needs to be defined within this function, one should call the `Module` instance afterwards instead of this since the former takes care of running the registered hooks while the latter silently ignores them.

---

step(*input*, *hx=None*, *mask=None*)

execute one step forward (only for one-directional RNN). Args:

input (batch, input_size): input tensor of this step. hx (num_layers, batch, hidden_size): the hidden state of last step. mask (batch): the mask tensor of this step.

Returns: output (batch, hidden_size): tensor containing the output of this step from the last layer of RNN. hn (num_layers, batch, hidden_size): tensor containing the hidden state of this step

fastNLP.modules.encoder.transformer

class fastNLP.modules.encoder.transformer.**TransformerEncoder**(*num_layers*, ***kargs*)

class SubLayer(*input_size*, *output_size*, *key_size*, *value_size*, *num_atte*)

forward(*input*, *seq_mask*)
Defines the computation performed at every call.

Should be overridden by all subclasses.

Note: Although the recipe for forward pass needs to be defined within this function, one should call the `Module` instance afterwards instead of this since the former takes care of running the registered hooks while the latter silently ignores them.

forward(*x*, *seq_mask=None*)
Defines the computation performed at every call.

Should be overridden by all subclasses.

Note: Although the recipe for forward pass needs to be defined within this function, one should call the `Module` instance afterwards instead of this since the former takes care of running the registered hooks while the latter silently ignores them.

fastNLP.modules.encoder.variational_rnn

class fastNLP.modules.encoder.variational_rnn.**VarGRU**(**args*, ***kwargs*)
Variational Dropout GRU.

class fastNLP.modules.encoder.variational_rnn.**VarLSTM**(**args*, ***kwargs*)
Variational Dropout LSTM.

class fastNLP.modules.encoder.variational_rnn.**VarRNN**(**args*, ***kwargs*)
Variational Dropout RNN.

class fastNLP.modules.encoder.variational_rnn.**VarRNNBase**(*mode*, *Cell*, *input_size*, *hidden_size*, *num_layers=1*, *bias=True*, *batch_first=False*, *input_dropout=0*, *hidden_dropout=0*, *bidirectional=False*)
Implementation of Variational Dropout RNN network. refer to *A Theoretically Grounded Application of Dropout in Recurrent Neural Networks (Yarin Gal and Zoubin Ghahramani, 2016) https://arxiv.org/abs/1512.05287*.

forward(*input*, *hx=None*)
Defines the computation performed at every call.

Should be overridden by all subclasses.

Note: Although the recipe for forward pass needs to be defined within this function, one should call the `Module` instance afterwards instead of this since the former takes care of running the registered hooks while the latter silently ignores them.

class fastNLP.modules.encoder.variational_rnn.**VarRnnCellWrapper**(*cell*, *hidden_size*, *input_p*, *hidden_p*)

Wrapper for normal RNN Cells, make it support variational dropout

forward(*input*, *hidden*, *mask_x=None*, *mask_h=None*)

Parameters

- **input** – [seq_len, batch_size, input_size]
- **hidden** – for LSTM, tuple of (h_0, c_0), [batch_size, hidden_size] for other RNN, h_0, [batch_size, hidden_size]
- **mask_x** – [batch_size, input_size] dropout mask for input
- **mask_h** – [batch_size, hidden_size] dropout mask for hidden

Return output [seq_len, bacth_size, hidden_size] hidden: for LSTM, tuple of (h_n, c_n), [batch_size, hidden_size]

for other RNN, h_n, [batch_size, hidden_size]

fastNLP.modules.encoder.variational_rnn.**flip**(*input*, *dims*) → Tensor

Reverse the order of a n-D tensor along given axis in dims.

Args: input (Tensor): the input tensor dims (a list or tuple): axis to flip on

Example:

```
>>> x = torch.arange(8).view(2, 2, 2)
>>> x
tensor([[[ 0,  1],
         [ 2,  3]],

        [[ 4,  5],
         [ 6,  7]]])
>>> torch.flip(x, [0, 1])
tensor([[[ 6,  7],
         [ 4,  5]],

        [[ 2,  3],
         [ 0,  1]]])
```

class fastNLP.modules.encoder.**LSTM**(*input_size*, *hidden_size=100*, *num_layers=1*, *dropout=0.0*, *batch_first=True*, *bidirectional=False*, *bias=True*, *initial_method=None*, *get_hidden=False*)

Long Short Term Memory

Args: input_size : input size hidden_size : hidden size num_layers : number of hidden layers. Default: 1 dropout : dropout rate. Default: 0.5 bidirectional : If True, becomes a bidirectional RNN. Default: False.

forward(*x*, *h0=None*, *c0=None*)

Defines the computation performed at every call.

Should be overridden by all subclasses.

Note: Although the recipe for forward pass needs to be defined within this function, one should call the Module instance afterwards instead of this since the former takes care of running the registered hooks while the latter silently ignores them.

---

class fastNLP.modules.encoder.**Embedding**(*nums*, *dims*, *padding_idx=0*, *sparse=False*, *init_emb=None*, *dropout=0.0*)

A simple lookup table Args: nums : the size of the lookup table dims : the size of each vector padding_idx : pads the tensor with zeros whenever it encounters this index sparse : If True, gradient matrix will be a sparse tensor. In this case, only optim.SGD(cuda and cpu) and optim.Adagrad(cpu) can be used

forward(*x*)

Defines the computation performed at every call.

Should be overridden by all subclasses.

Note: Although the recipe for forward pass needs to be defined within this function, one should call the `Module` instance afterwards instead of this since the former takes care of running the registered hooks while the latter silently ignores them.

---

class fastNLP.modules.encoder.**Linear**(*input_size*, *output_size*, *bias=True*, *initial_method=None*)

Linear module Args: input_size : input size hidden_size : hidden size num_layers : number of hidden layers dropout : dropout rate bidirectional : If True, becomes a bidirectional RNN

forward(*x*)

Defines the computation performed at every call.

Should be overridden by all subclasses.

Note: Although the recipe for forward pass needs to be defined within this function, one should call the `Module` instance afterwards instead of this since the former takes care of running the registered hooks while the latter silently ignores them.

---

class fastNLP.modules.encoder.**Conv**(*in_channels*, *out_channels*, *kernel_size*, *stride=1*, *padding=0*, *dilation=1*, *groups=1*, *bias=True*, *activation='relu'*, *initial_method=None*)

Basic 1-d convolution module. initialize with xavier_uniform

forward(*x*)

Defines the computation performed at every call.

Should be overridden by all subclasses.

Note: Although the recipe for forward pass needs to be defined within this function, one should call the `Module` instance afterwards instead of this since the former takes care of running the registered hooks while the latter silently ignores them.

---

class fastNLP.modules.encoder.**ConvMaxpool**(*in_channels*, *out_channels*, *kernel_sizes*, *stride=1*, *padding=0*, *dilation=1*, *groups=1*, *bias=True*, *activation='relu'*, *initial_method=None*)

Convolution and max-pooling module with multiple kernel sizes.

forward(*x*)

Defines the computation performed at every call.

Should be overridden by all subclasses.

Note: Although the recipe for forward pass needs to be defined within this function, one should call the

`Module` instance afterwards instead of this since the former takes care of running the registered hooks while the latter silently ignores them.

fastNLP.modules.dropout

class fastNLP.modules.dropout.**TimestepDropout**(*p=0.5*, *inplace=False*)

This module accepts a *[batch_size, num_timesteps, embedding_dim)]* and use a single dropout mask of shape *(batch_size, embedding_dim)* to apply on every time step.

forward(*x*)

Defines the computation performed at every call.

Should be overridden by all subclasses.

Note: Although the recipe for forward pass needs to be defined within this function, one should call the `Module` instance afterwards instead of this since the former takes care of running the registered hooks while the latter silently ignores them.

fastNLP.modules.other_modules

class fastNLP.modules.other_modules.**BiAffine**(*n_enc*, *n_dec*, *n_labels*, *biaffine=True*, ***kwargs*)

forward(*input_d*, *input_e*, *mask_d=None*, *mask_e=None*)

Args:

input_d: Tensor the decoder input tensor with shape = [batch, length_decoder, input_size]

input_e: Tensor the child input tensor with shape = [batch, length_encoder, input_size]

mask_d: Tensor or None the mask tensor for decoder with shape = [batch, length_decoder]

mask_e: Tensor or None the mask tensor for encoder with shape = [batch, length_encoder]

Returns: Tensor the energy tensor with shape = [batch, num_label, length, length]

class fastNLP.modules.other_modules.**BiLinear**(*n_left*, *n_right*, *n_out*, *bias=True*)

forward(*input_left*, *input_right*)

Args:

input_left: Tensor the left input tensor with shape = [batch1, batch2, ..., left_features]

input_right: Tensor the right input tensor with shape = [batch1, batch2, ..., right_features]

Returns:

class fastNLP.modules.other_modules.**GroupNorm**(*num_features*, *num_groups=20*, *eps=1e-05*)

forward(*x*)

Defines the computation performed at every call.

Should be overridden by all subclasses.

> **Note:** Although the recipe for forward pass needs to be defined within this function, one should call the `Module` instance afterwards instead of this since the former takes care of running the registered hooks while the latter silently ignores them.

class fastNLP.modules.other_modules.**LayerNormalization**(*layer_size*, *eps=0.001*)
Layer normalization module

forward(*z*)
Defines the computation performed at every call.

Should be overridden by all subclasses.

> **Note:** Although the recipe for forward pass needs to be defined within this function, one should call the `Module` instance afterwards instead of this since the former takes care of running the registered hooks while the latter silently ignores them.

fastNLP.modules.utils

fastNLP.modules.utils.**initial_parameter**(*net*, *initial_method=None*)
A method used to initialize the weights of PyTorch models.

Parameters

- **net** – a PyTorch model
- **initial_method** – str, one of the following initializations
  - xavier_uniform
  - xavier_normal (default)
  - kaiming_normal, or msra
  - kaiming_uniform
  - orthogonal
  - sparse
  - normal
  - uniform

fastNLP.modules.utils.**seq_mask**(*seq_len*, *max_len*)
Create sequence mask.

Parameters

- **seq_len** – list or torch.Tensor, the lengths of sequences in a batch.
- **max_len** – int, the maximum sequence length in a batch.

Return mask torch.LongTensor, [batch_size, max_len]

class fastNLP.modules.**TimestepDropout**(*p=0.5*, *inplace=False*)
This module accepts a *[batch_size, num_timesteps, embedding_dim)]* and use a single dropout mask of shape *(batch_size, embedding_dim)* to apply on every time step.

forward(*x*)

Defines the computation performed at every call.

Should be overridden by all subclasses.

Note: Although the recipe for forward pass needs to be defined within this function, one should call the `Module` instance afterwards instead of this since the former takes care of running the registered hooks while the latter silently ignores them.

CHAPTER 4

Indices and tables

- genindex
- modindex
- search

Python Module Index

f

Index

G

H

I

K

L

M

N

O

P

R

S

T

U

V