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# **Deep Neural Networks: Algorithms Documentation**

*Release 0.0.1*

**Alpesis**

**Dec 21, 2017**



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## Contents:

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|          |                                    |          |
|----------|------------------------------------|----------|
| <b>1</b> | <b>Maths</b>                       | <b>1</b> |
| 1.1      | BLAS                               | 1        |
| 1.2      | Probability and Information Theory | 1        |
| 1.3      | Numerical Computation              | 1        |
| <b>2</b> | <b>Neurons</b>                     | <b>3</b> |
| 2.1      | Weights                            | 3        |
| 2.1.1    | Zeros                              | 3        |
| 2.1.2    | Ones                               | 3        |
| 2.1.3    | Constants                          | 3        |
| 2.1.4    | Random Uniform                     | 3        |
| 2.1.5    | Random Normal                      | 3        |
| 2.1.6    | Truncated Normal                   | 3        |
| 2.1.7    | Uniform Unit Scaling               | 3        |
| 2.1.8    | Random Walk                        | 3        |
| <b>3</b> | <b>Layers</b>                      | <b>5</b> |
| 3.1      | Convolutions                       | 6        |
| 3.1.1    | Convolutions                       | 6        |
| 3.1.1.1  | 1D Convolution                     | 6        |
| 3.1.1.2  | 2D Convolution                     | 6        |
| 3.1.1.3  | 3D Convolution                     | 6        |
| 3.1.1.4  | Group Convolution                  | 6        |
| 3.1.1.5  | Dilated Convolution                | 6        |
| 3.1.2    | Pooling                            | 6        |
| 3.1.2.1  | Max Pooling                        | 6        |
| 3.1.2.2  | Avg Pooling                        | 6        |
| 3.1.2.3  | RoI Pooling                        | 6        |
| 3.2      | Regions                            | 6        |
| 3.2.1    | Selective Search                   | 6        |
| 3.2.2    | Region Proposal Network            | 6        |
| 3.3      | Fully Connected                    | 6        |
| 3.3.1    | Inner Product                      | 6        |
| 3.4      | Activations                        | 6        |
| 3.4.1    | Identity                           | 7        |
| 3.4.2    | Step                               | 7        |
| 3.4.3    | Piecewise Linear                   | 7        |

|          |                                 |           |
|----------|---------------------------------|-----------|
| 3.4.4    | Sigmoid                         | 7         |
| 3.4.5    | Complementary Log Log           | 7         |
| 3.4.6    | Bipolar                         | 7         |
| 3.4.7    | Bipolar Sigmoid                 | 7         |
| 3.4.8    | TanH                            | 7         |
| 3.4.9    | LeCun's TanH                    | 7         |
| 3.4.10   | Hard TanH                       | 7         |
| 3.4.11   | Absolute                        | 7         |
| 3.4.12   | Rectifier                       | 7         |
| 3.4.13   | Modifications of ReLU           | 7         |
| 3.4.14   | Smooth Rectifier                | 7         |
| 3.4.15   | Logit                           | 7         |
| 3.4.16   | Probit                          | 7         |
| 3.4.17   | Cosine                          | 7         |
| 3.4.18   | Softmax                         | 7         |
| 3.4.19   | Maxout                          | 7         |
| 3.4.20   | (RBF) Gaussian                  | 8         |
| 3.4.21   | (RBF) Multiquadratic            | 8         |
| 3.4.22   | (RBF) Inverse Multiquadratic    | 8         |
| 3.4.23   | References                      | 8         |
| 3.5      | Normalizations                  | 8         |
| 3.6      | Regularizations                 | 8         |
| 3.6.1    | L1 Regularization               | 8         |
| 3.6.2    | L2 Regularization               | 8         |
| 3.6.3    | Dropout                         | 8         |
| 3.7      | Losses                          | 9         |
| 3.7.1    | Contrastive Loss                | 9         |
| 3.7.2    | Hinge Loss                      | 9         |
| 3.7.3    | Euclidean Loss                  | 9         |
| 3.7.4    | Infogain Loss                   | 9         |
| 3.7.5    | Sigmoid Cross Entropy Loss      | 9         |
| 3.7.6    | Softmax Loss                    | 9         |
| 3.7.7    | Multinomial Logistic Loss       | 9         |
| 3.7.8    | Smooth L1 Loss                  | 9         |
| 3.8      | Gradients                       | 9         |
| 3.8.1    | Stochastic Gradient Descent     | 9         |
| 3.8.2    | Ada Delta                       | 9         |
| 3.8.3    | Adaptive Gradient               | 9         |
| 3.8.4    | Adam                            | 9         |
| 3.8.5    | Nesterov's Accelerated Gradient | 9         |
| 3.8.6    | RMS Prop                        | 9         |
| <b>4</b> | <b>Networks</b>                 | <b>11</b> |
| 4.1      | Faster R-CNN                    | 11        |
| 4.2      | YOLO                            | 11        |
| <b>5</b> | <b>Solvers</b>                  | <b>13</b> |
| 5.1      | Train                           | 13        |
| 5.2      | Validate                        | 13        |
| 5.3      | Test                            | 13        |
| <b>6</b> | <b>Models</b>                   | <b>15</b> |
| 6.1      | Convolutional Neural Networks   | 15        |
| 6.1.1    | LeNet                           | 15        |

|          |                     |           |
|----------|---------------------|-----------|
| 6.1.1.1  | Model               | 15        |
| 6.1.2    | AlexNet             | 16        |
| 6.1.2.1  | Model               | 16        |
| 6.1.3    | Overfeat            | 16        |
| 6.1.4    | VGG                 | 16        |
| 6.1.4.1  | Model               | 16        |
| 6.1.5    | GoogLeNet           | 17        |
| 6.1.6    | ResNet              | 17        |
| <b>7</b> | <b>Applications</b> | <b>19</b> |
| 7.1      | MNIST               | 19        |
| 7.2      | CIFAR               | 19        |
| 7.3      | PASCAL              | 19        |
| 7.4      | COCO                | 19        |
| 7.5      | ImageNet            | 19        |



# CHAPTER 1

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Maths

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## 1.1 BLAS

## 1.2 Probability and Information Theory

## 1.3 Numerical Computation





## **2.1 Weights**

### **2.1.1 Zeros**

### **2.1.2 Ones**

### **2.1.3 Constants**

### **2.1.4 Random Uniform**

### **2.1.5 Random Normal**

### **2.1.6 Truncated Normal**

### **2.1.7 Uniform Unit Scaling**

### **2.1.8 Random Walk**



## CHAPTER 3

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### Layers

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Forward:

## 3.1 Convolutions

### 3.1.1 Convolutions

#### 3.1.1.1 1D Convolution

#### 3.1.1.2 2D Convolution

#### 3.1.1.3 3D Convolution

#### 3.1.1.4 Group Convolution

#### 3.1.1.5 Dilated Convolution

### 3.1.2 Pooling

#### 3.1.2.1 Max Pooling

#### 3.1.2.2 Avg Pooling

#### 3.1.2.3 RoI Pooling

## 3.2 Regions

### 3.2.1 Selective Search

### 3.2.2 Region Proposal Network

## 3.3 Fully Connected

### 3.3.1 Inner Product

## 3.4 Activations

Single-Fold X

#### **3.4.1 Identity**

#### **3.4.2 Step**

#### **3.4.3 Piecewise Linear**

#### **3.4.4 Sigmoid**

#### **3.4.5 Complementary Log Log**

#### **3.4.6 Bipolar**

#### **3.4.7 Bipolar Sigmoid**

#### **3.4.8 TanH**

#### **3.4.9 LeCun's TanH**

#### **3.4.10 Hard TanH**

#### **3.4.11 Absolute**

#### **3.4.12 Rectifier**

#### **3.4.13 Modifications of ReLU**

#### **3.4.14 Smooth Rectifier**

#### **3.4.15 Logit**

#### **3.4.16 Probit**

#### **3.4.17 Cosine**

Multi-Fold Xs

#### **3.4.18 Softmax**

#### **3.4.19 Maxout**

RBF

#### **3.4.20 (RBF) Gaussian**

#### **3.4.21 (RBF) Multiquadratic**

#### **3.4.22 (RBF) Inverse Multiquadratic**

#### **3.4.23 References**

- [Deep Sparse Rectifier Neural Networks](#)

### **3.5 Normalizations**

### **3.6 Regularizations**

#### **3.6.1 L1 Regularization**

#### **3.6.2 L2 Regularization**

#### **3.6.3 Dropout**

Backward:

## **3.7 Losses**

### **3.7.1 Contrastive Loss**

### **3.7.2 Hinge Loss**

### **3.7.3 Euclidean Loss**

### **3.7.4 Infogain Loss**

### **3.7.5 Sigmoid Cross Entropy Loss**

### **3.7.6 Softmax Loss**

### **3.7.7 Multinomial Logistic Loss**

### **3.7.8 Smooth L1 Loss**

## **3.8 Gradients**

### **3.8.1 Stochastic Gradient Descent**

### **3.8.2 Ada Delta**

### **3.8.3 Adaptive Gradient**

### **3.8.4 Adam**

### **3.8.5 Nesterov's Accelerated Gradient**

### **3.8.6 RMS Prop**





#### **4.1 Faster R-CNN**

#### **4.2 YOLO**



#### 5.1 Train

#### 5.2 Validate

#### 5.3 Test



## 6.1 Convolutional Neural Networks

| Network      | Year    |
|--------------|---------|
| LeNet        | 1998    |
| AlexNet      | 2012    |
| VGG          | 9/2014  |
| GoogleLeNet  | 9/2014  |
| InceptionBN  | 2/2015  |
| Inception V3 | 12/2015 |
| ResNet       | 12/2015 |

### 6.1.1 LeNet

#### 6.1.1.1 Model

```

00 input
01 conv          5x5/1,20      20x24x24
02 activation    relu / tanh   20x24x24
03 pool          2x2/2         20x12x12
04 conv          5x5/1,50      50x8x8
05 activation    relu / tanh   50x8x8
06 pool          2x2/2         50x4x4
07 flatten
07 fc            500            500
08 activation    relu / tanh   500
09 fc            10             10
10 softmax

```

## 6.1.2 AlexNet

### 6.1.2.1 Model

|    |            |             |           |
|----|------------|-------------|-----------|
| 00 | input      |             |           |
| 01 | conv       | 11x11/4, 96 | 96x54x54  |
| 02 | activation | relu        | 96x54x54  |
| 03 | pool       | max 3x3/2   | 96x27x27  |
| 04 | LRN        |             | 96x27x27  |
| 05 | conv       | 5x5/1, 256  | 256x27x27 |
| 06 | activation | relu        | 256x27x27 |
| 07 | pool       | max 3x3/2   | 256x13x13 |
| 08 | LRN        |             | 256x13x13 |
| 09 | conv       | 3x3/1, 384  | 384x13x13 |
| 10 | activation | relu        | 384x13x13 |
| 11 | conv       | 3x3/1, 384  | 384x13x13 |
| 12 | activation | relu        | 384x13x13 |
| 13 | conv       | 3x3/1, 256  | 256x13x13 |
| 14 | activation | relu        | 256x13x13 |
| 15 | pool       | max 3x3/2   | 256x6x6   |
| 16 | flatten    |             | 9216      |
| 17 | fc         | 4096        | 4096      |
| 18 | activation | relu        | 4096      |
| 19 | dropout    |             | 4096      |
| 20 | fc         | 4096        | 4096      |
| 21 | activation | relu        | 4096      |
| 22 | dropout    |             | 4096      |
| 23 | fc         | 2           | 2         |
| 24 | softmax    |             |           |

## 6.1.3 Overfeat

## 6.1.4 VGG

### 6.1.4.1 Model

|    |            |            |             |
|----|------------|------------|-------------|
| 00 | input      |            |             |
| 01 | conv       | 3x3/1, 64  | 64x224x224  |
| 02 | activation | relu       | 64x224x224  |
| 03 | pool       | max 2x2/2  | 64x112x112  |
| 04 | conv       | 3x3/1, 128 | 128x112x112 |
| 05 | activation | relu       | 128x112x112 |
| 06 | pool       | max 2x2/2  | 128x56x56   |
| 07 | conv       | 3x3/1, 256 | 256x56x56   |
| 08 | activation | relu       | 256x56x56   |
| 09 | conv       | 3x3/1, 256 | 256x56x56   |
| 10 | activation | relu       | 256x56x56   |
| 11 | pool       | max 2x2/2  | 256x28x28   |

|    |            |      |            |           |
|----|------------|------|------------|-----------|
| 12 | conv       |      | 3x3/1, 512 | 512x28x28 |
| 13 | activation | relu |            | 512x28x28 |
| 14 | conv       |      | 3x3/1, 512 | 512x28x28 |
| 15 | activation | relu |            | 512x28x28 |
| 16 | pool       | max  | 2x2/2      | 512x14x14 |
| 17 | conv       |      | 3x3/1, 512 | 512x14x14 |
| 18 | activation | relu |            | 512x14x14 |
| 19 | conv       |      | 3x3/1, 512 | 512x14x14 |
| 20 | activation | relu |            | 512x14x14 |
| 21 | pool       | max  | 2x2/2      | 512x7x7   |
| 22 | flatten    |      |            | 25088     |
| 23 | fc         |      | 4096       | 4096      |
| 24 | activation | relu |            | 4096      |
| 25 | dropout    |      |            | 4096      |
| 26 | fc         |      | 4096       | 4096      |
| 27 | activation | relu |            | 4096      |
| 28 | dropout    |      |            | 4096      |
| 29 | fc         |      | 2          | 2         |
| 30 | softmax    |      |            |           |

### 6.1.5 GoogleNet

### 6.1.6 ResNet





#### 7.1 MNIST

#### 7.2 CIFAR

#### 7.3 PASCAL

#### 7.4 COCO

#### 7.5 ImageNet