

Data Workshop #6

Neural Network

dataworkshop.eu

DataWorkshop.eu

Data Workshop

[Intro](#)

[Goal](#)

[Approach](#)

[Prerequisite](#)

[Success metric](#)

[How to join?](#)

**Talk is cheap. Show me
the data!**

Matters is only ready-made solution with actionable insights. The rest is secondary. Practice and learn.



About me



Vladimir Alekseichenko

Love analyze data



Architect



slon1024



slon1024



hello@vova.me

Disclaimer

Data Workshop *[all time]* focuses on the **intuition** and **practical** tips.

For a formal treatment, see something else^{}.*

^{*} papers or classical machine learning books

Environment

github.com/dataworkshop/prerequisite
github.com/dataworkshop/environment

github.com/dataworkshop/allstate_keras

Packages

github.com/**dataworkshop/prerequisite**

```
$ python run.py
seaborn-0.7.0 - OK
xgboost-0.4 - OK
matplotlib-1.5.1 - OK
IPython-4.1.2 - OK
numpy-1.11.0 - OK
pandas-0.18.0 - OK
sklearn-0.17.1 - OK
```

```
=====
All right, you are ready to go on Data Workshop!
```

```
$ python run.py
seaborn-0.6 should be upgraded to seaborn-0.7
xgboost-0.4 - OK
matplotlib-1.5.1 - OK
IPython-4.1.2 - OK
numpy-1.11.0 - OK
pandas-0.18.0 - OK
sklearn-0.17.1 - OK
```

```
=====
RECOMENDATION (without upgrade some needed features could be missing)
pip install --upgrade seaborn
```

```
$ python run.py
seaborn-0.7.0 - OK
xgboost - missing
matplotlib-1.5.1 - OK
IPython-4.1.2 - OK
numpy-1.11.0 - OK
pandas-0.18.0 - OK
sklearn-0.17.1 - OK
```

```
=====
REQUIRED
Please install those packages before Data Workshop: xgboost
pip install xgboost
More info how to install xgboost: http://xgboost.readthedocs.org/en/latest/build.html
```

jupyter notebook



```
$ jupyter notebook
[I 22:17:17.650 NotebookApp] The port 8888 is already in use, trying another random port.
[I 22:17:17.650 NotebookApp] The port 8889 is already in use, trying another random port.
[I 22:17:17.651 NotebookApp] The port 8890 is already in use, trying another random port.
[I 22:17:17.651 NotebookApp] The port 8891 is already in use, trying another random port.
[I 22:17:17.657 NotebookApp] Serving notebooks from local directory: /Users/vova/src/github/dataworkshop/titanic/vladimir/tmp
[I 22:17:17.657 NotebookApp] 0 active kernels
[I 22:17:17.657 NotebookApp] The IPython Notebook is running at: http://localhost:8892/
[I 22:17:17.657 NotebookApp] Use Control-C to stop this server and shut down all kernels (twice to skip confirmation).
```



 jupyter

Files Running Clusters

Select items to perform actions on them.

Notebook list empty.

Upload New

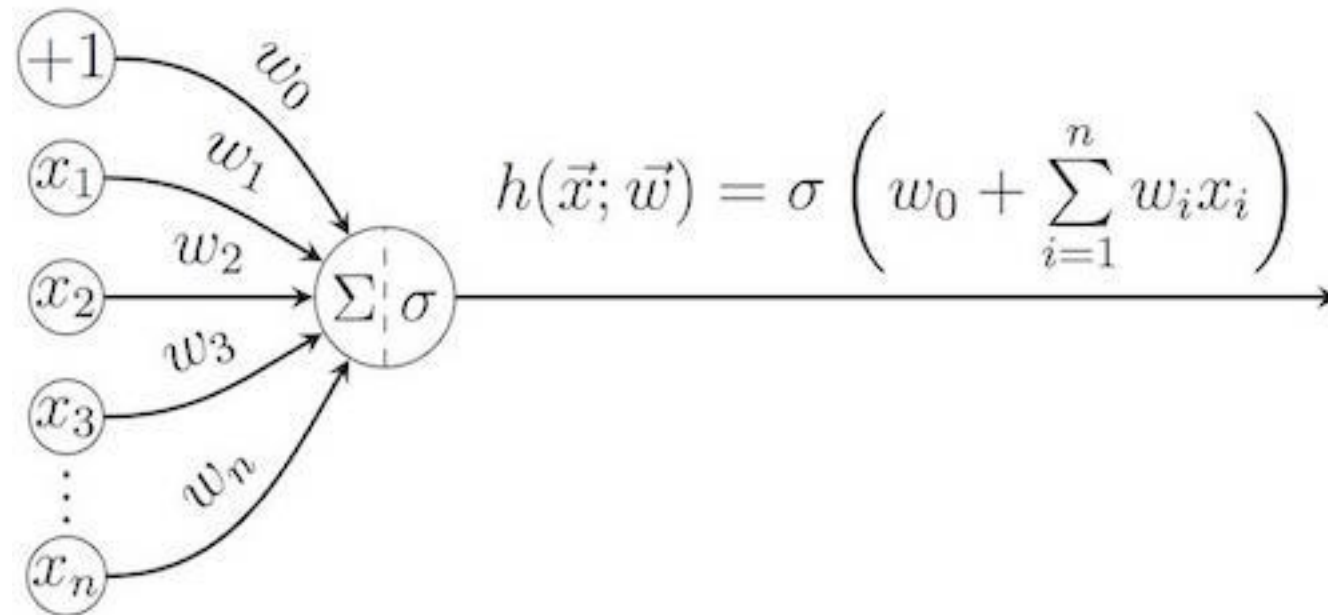
Text File
Folder
Terminal

Notebooks
Haskell
Julia 0.3.8
Python 2

2

Motivation

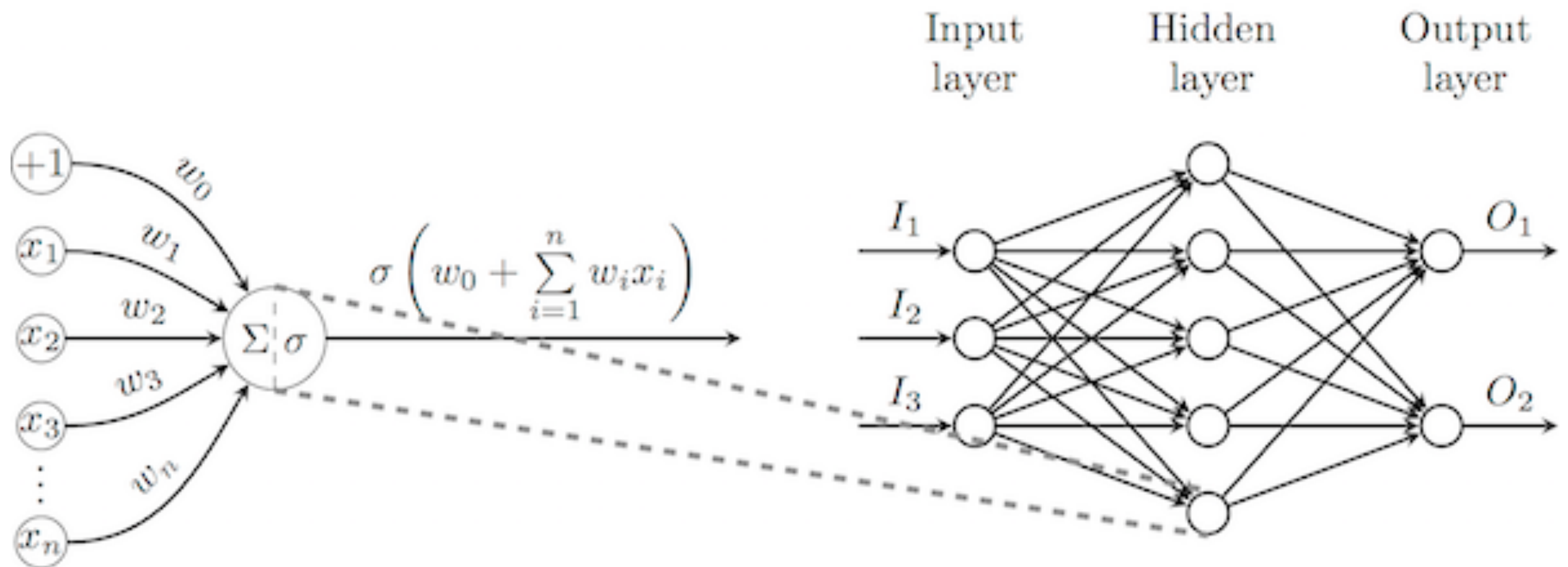
Neuron



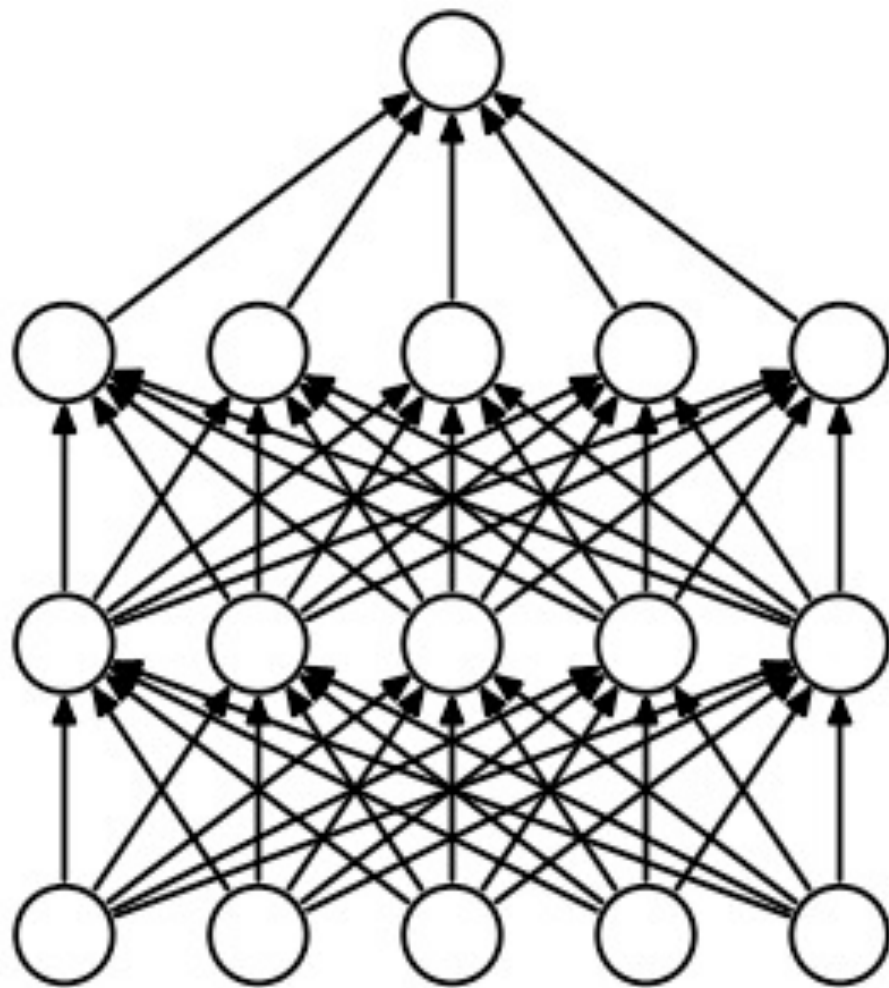
Activation function

- Tanh
- ReLU
- PRELU
- Sigmoid
- SoftMax (normalized exponential function)

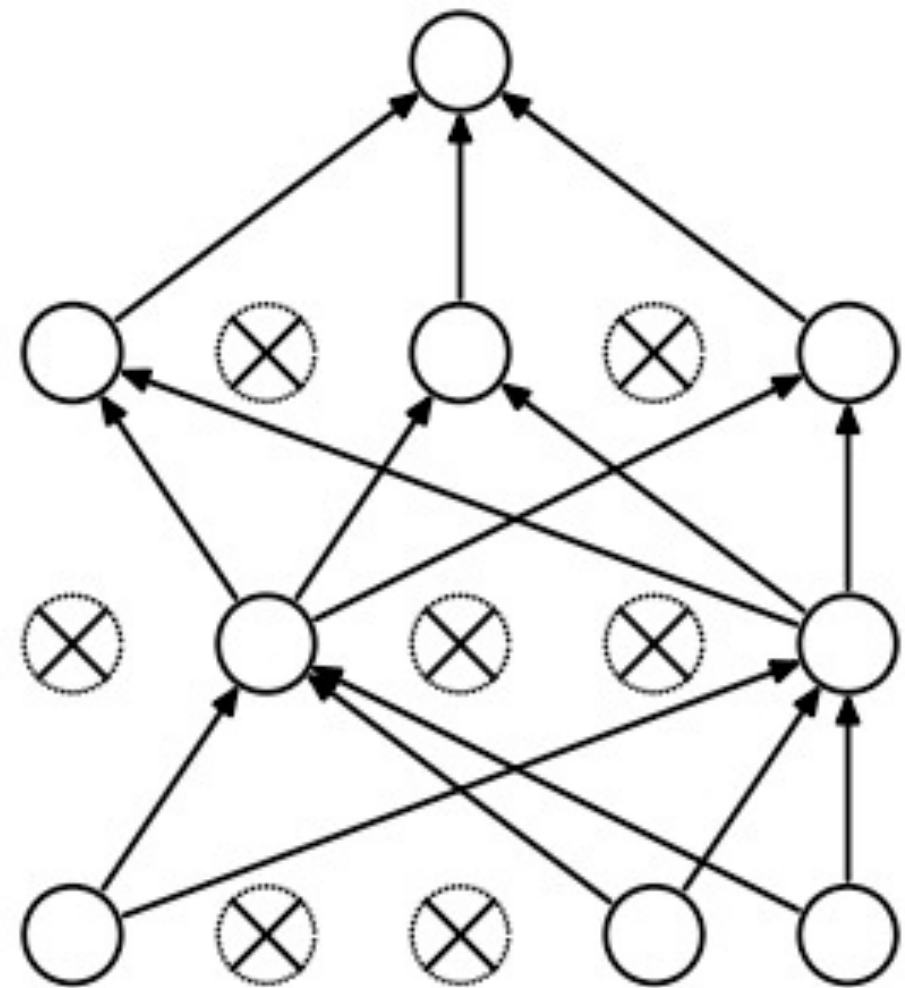
(Artificial) Neural Network



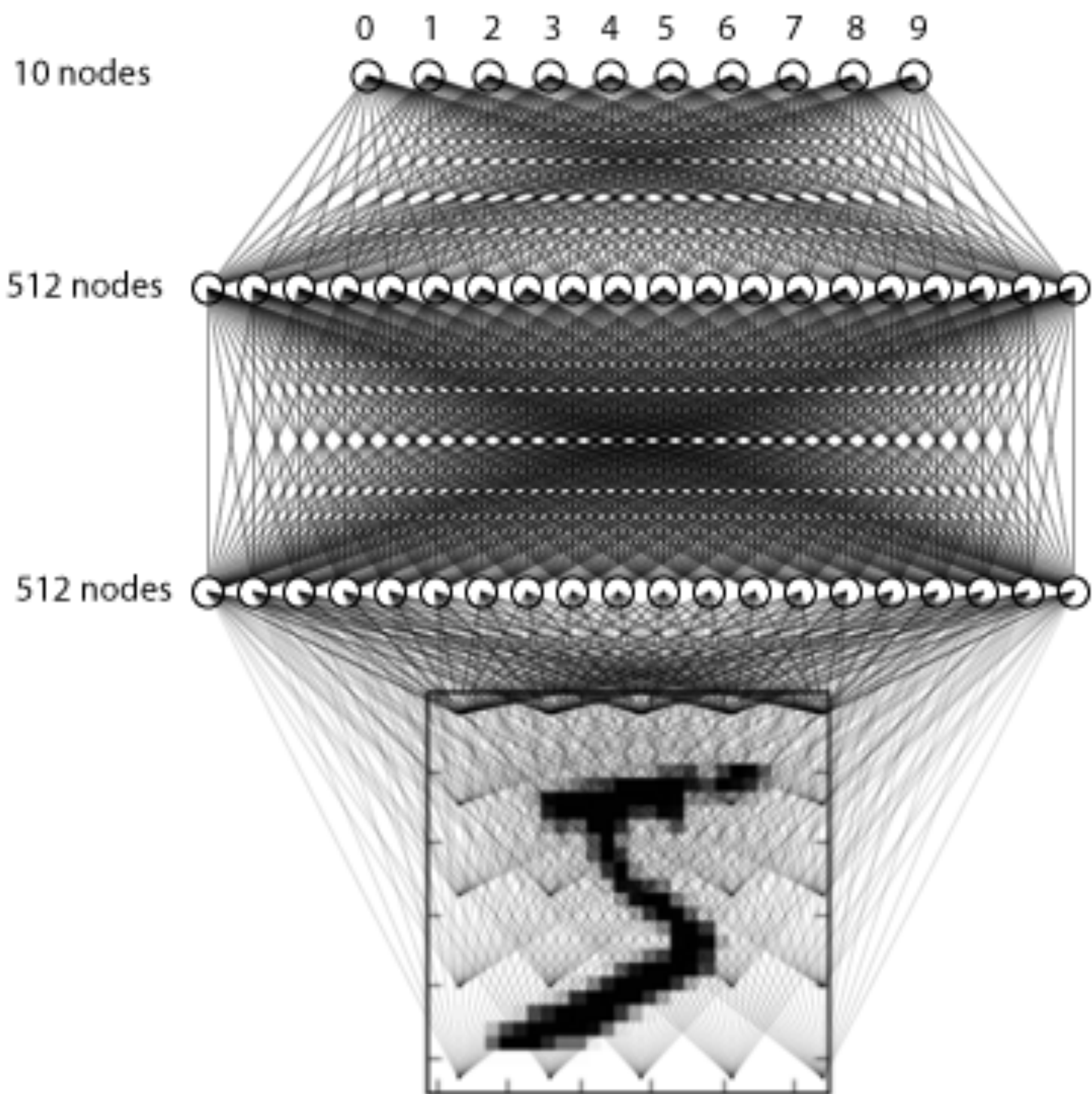
Dropout



(a) Standard Neural Net

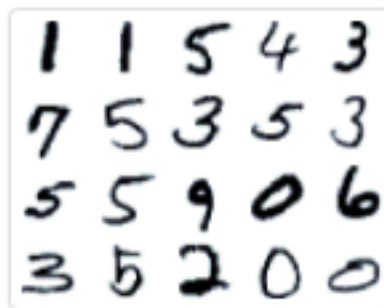


(b) After applying dropout.



MNIST
















MNIST 50 results collected

Units: error %

Classify handwritten digits. Some additional results are available on the [original dataset page](#).

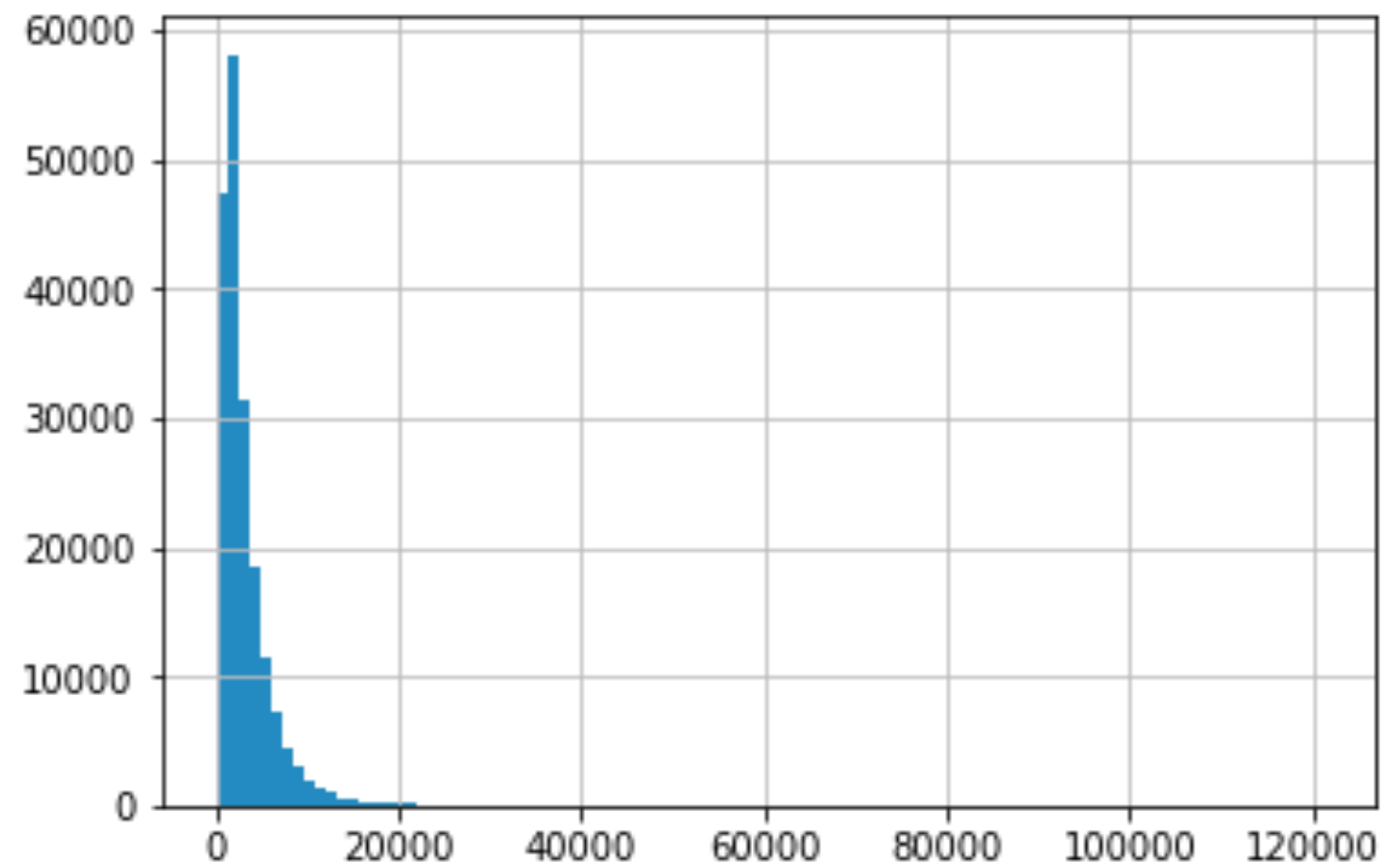
Result	Method	Venue	Details
0.21%	Regularization of Neural Networks using DropConnect 	ICML 2013	
0.23%	Multi-column Deep Neural Networks for Image Classification 	CVPR 2012	
0.23%	APAC: Augmented PAttern Classification with Neural Networks 	arXiv 2015	
0.24%	Batch-normalized Maxout Network in Network 	arXiv 2015	Details
0.29%	Generalizing Pooling Functions in Convolutional Neural Networks: Mixed, Gated, and Tree 	AISTATS 2016	Details
0.31%	Recurrent Convolutional Neural Network for Object Recognition 	CVPR 2015	
0.31%	On the Importance of Normalisation Layers in Deep Learning with Piecewise Linear Activation Units 	arXiv 2015	
0.32%	Fractional Max-Pooling 	arXiv 2015	Details
0.33%	Competitive Multi-scale Convolution 	arXiv 2015	
0.35%	Deep Big Simple Neural Nets Excel on Handwritten Digit Recognition 	Neural Computation 2010	Details
0.35%	C-SVDDNet: An Effective Single-Layer Network for Unsupervised Feature Learning 	arXiv 2014	



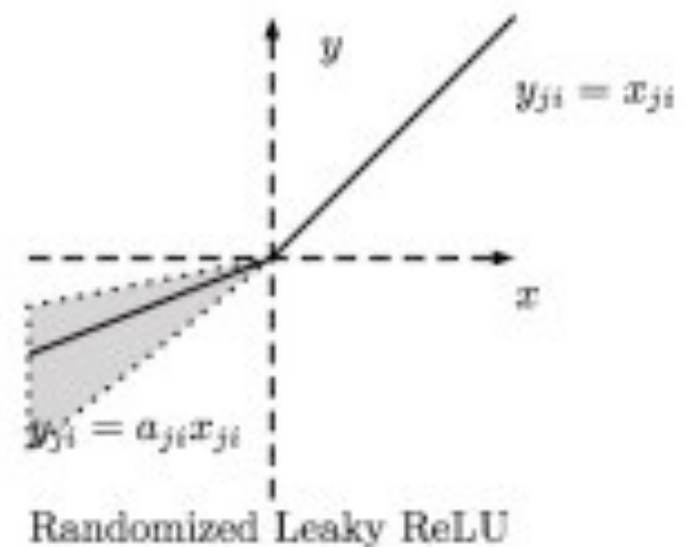
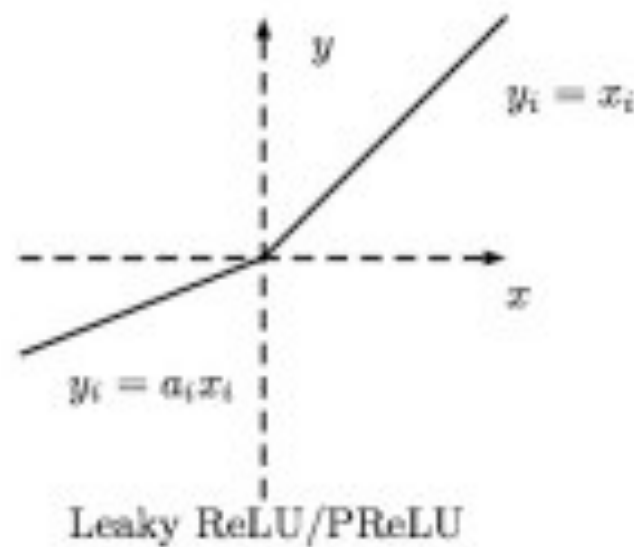
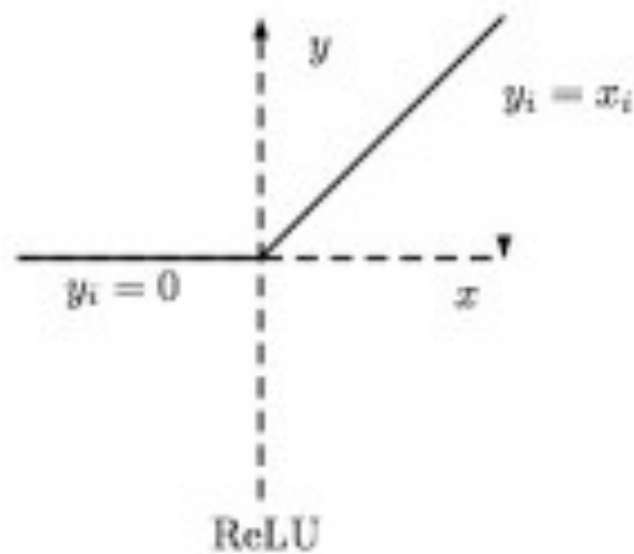
Predict loss (in dollars)

Loss distribution

~180K objects (rows)
~132 features (columns)



Parametric ReLU at. el.



Activation	Training Error	Test Error
ReLU	0.00318	0.1245
Leaky ReLU, $a = 100$	0.0031	0.1266
Leaky ReLU, $a = 5.5$	0.00362	0.1120
PReLU	0.00178	0.1179
RRReLU	0.00550	0.1119

Table 3. Error rate of CIFAR-10 Network in Network with different activation function

Three things

if you can remember only three...

- Neural network is a block box
- Neural network is good one for computer vision, voice recognition, nlp
- Be careful about overfitting

Thank you



@slon1024



hello@vova.me

dataworkshop.eu