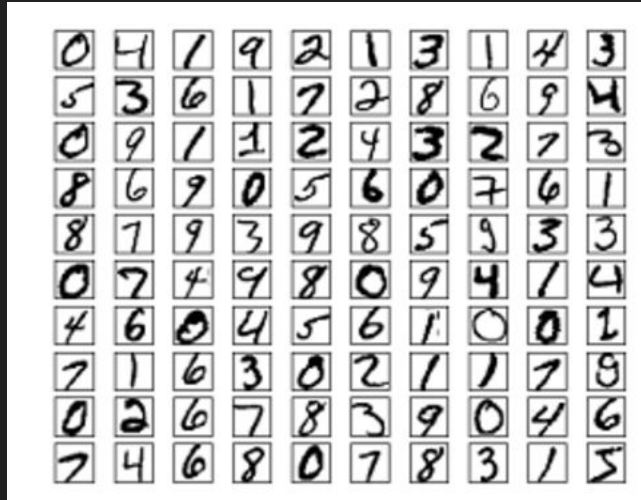


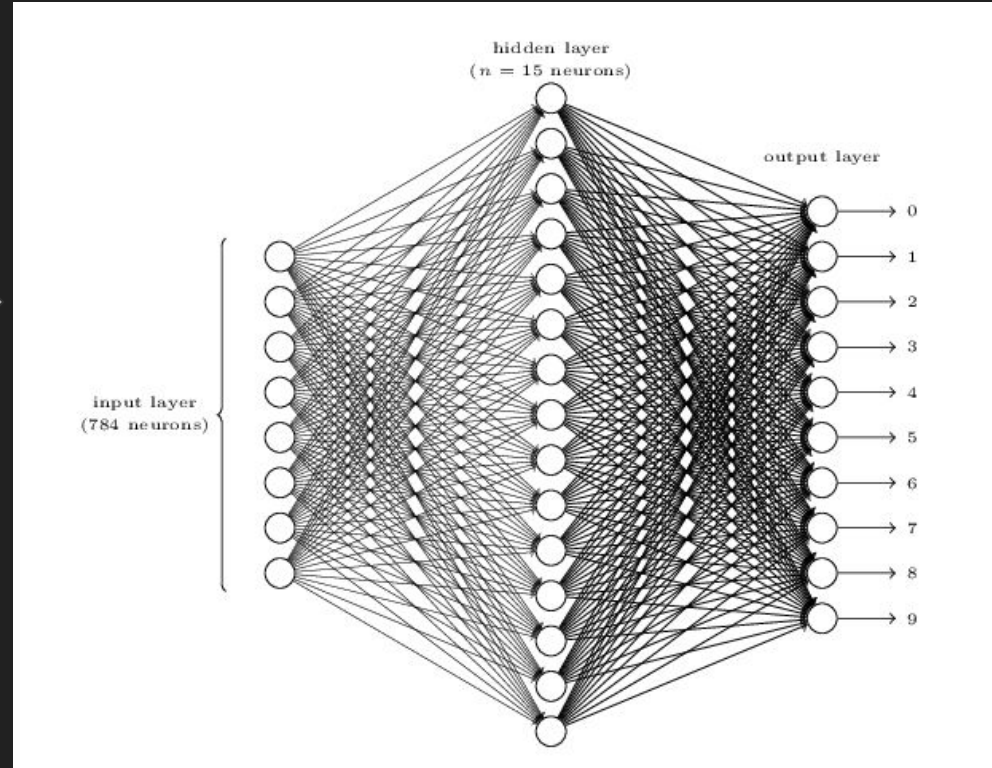
A Brief Introduction to Neural Networks with Practical Example

Youran L. @ Bosondata Inc.
2016.11.26

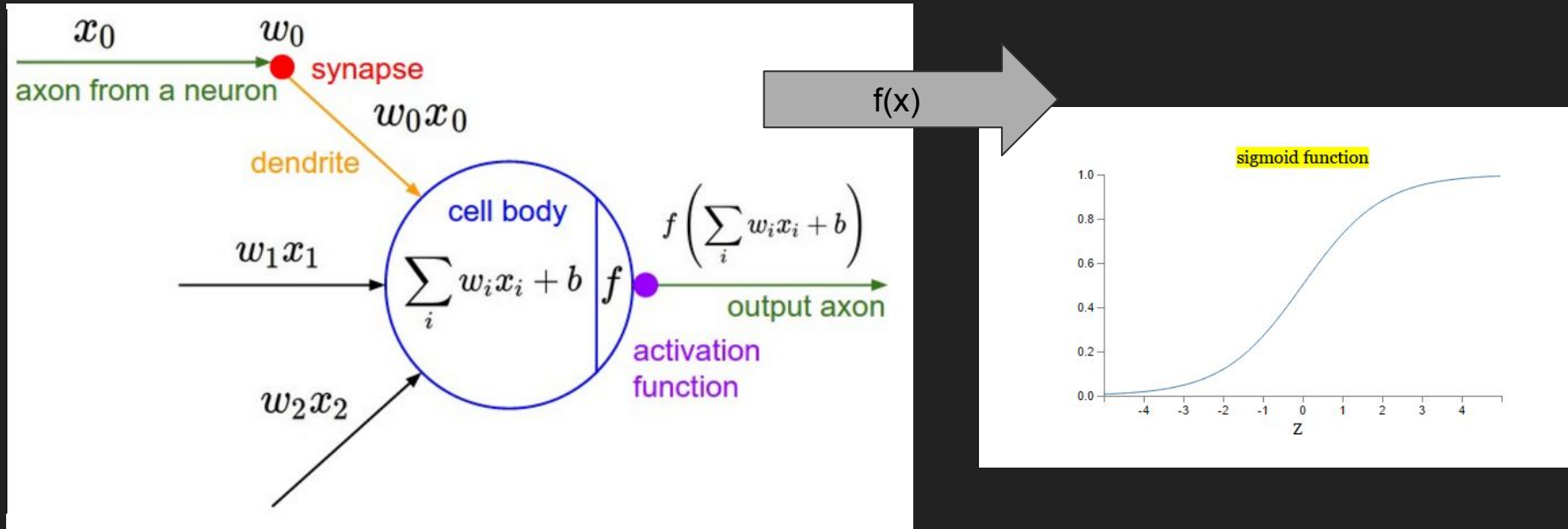
What is neural network (artificial)



MNIST DATA (handwritten digits)

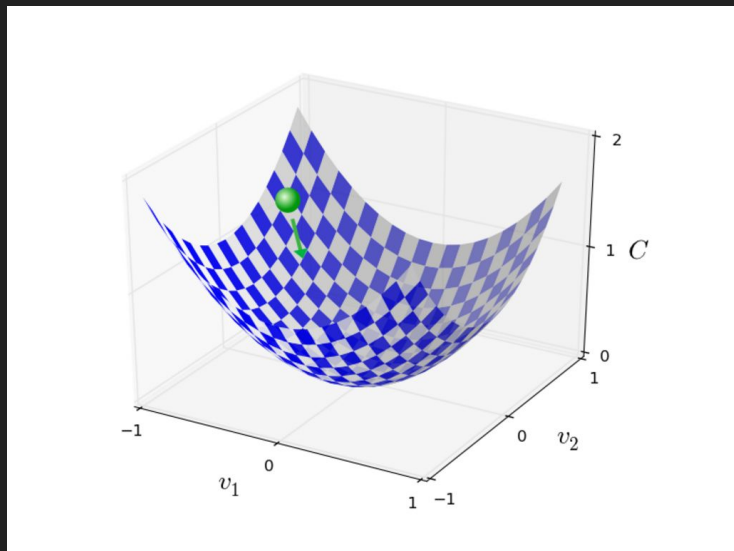


Sigmoid function (activation function)



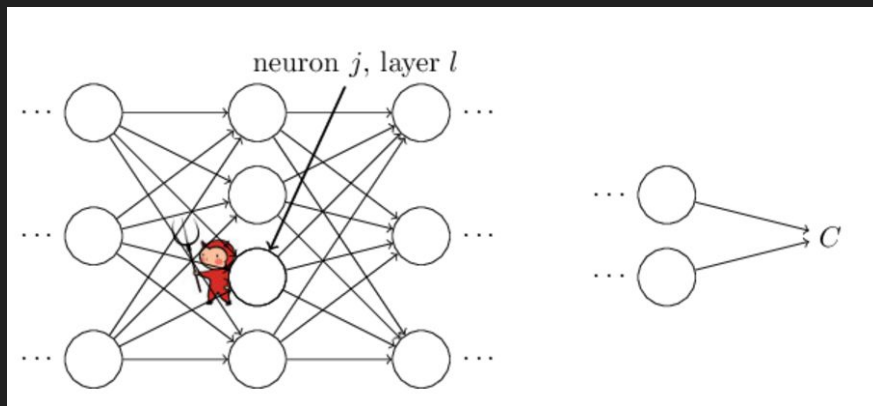
Gradient descent

- <http://cs231n.github.io/optimization-1/>
- loss function: measured the quality of a particular set of parameters based on how well the induced scores agreed with the ground truth labels in the training data.



Backpropagation

- Backpropagation is about understanding how changing the weights and biases in a network changes the cost function
- detail explain:
<https://mattmazur.com/2015/03/17/a-step-by-step-backpropagation-example/>
- <http://neuralnetworksanddeeplearning.com/chap2.html>



About the name “neural network”

In the early days of AI research people hoped that the effort to build an AI would also help us understand the principles behind intelligence and, maybe, the functioning of the human brain. But perhaps the outcome will be that we end up understanding neither the brain nor how artificial intelligence works!

Towards Deep Learning. [Neural Networks and Deep Learning . Michael Nielsen](#)

Convolutional Neural Network

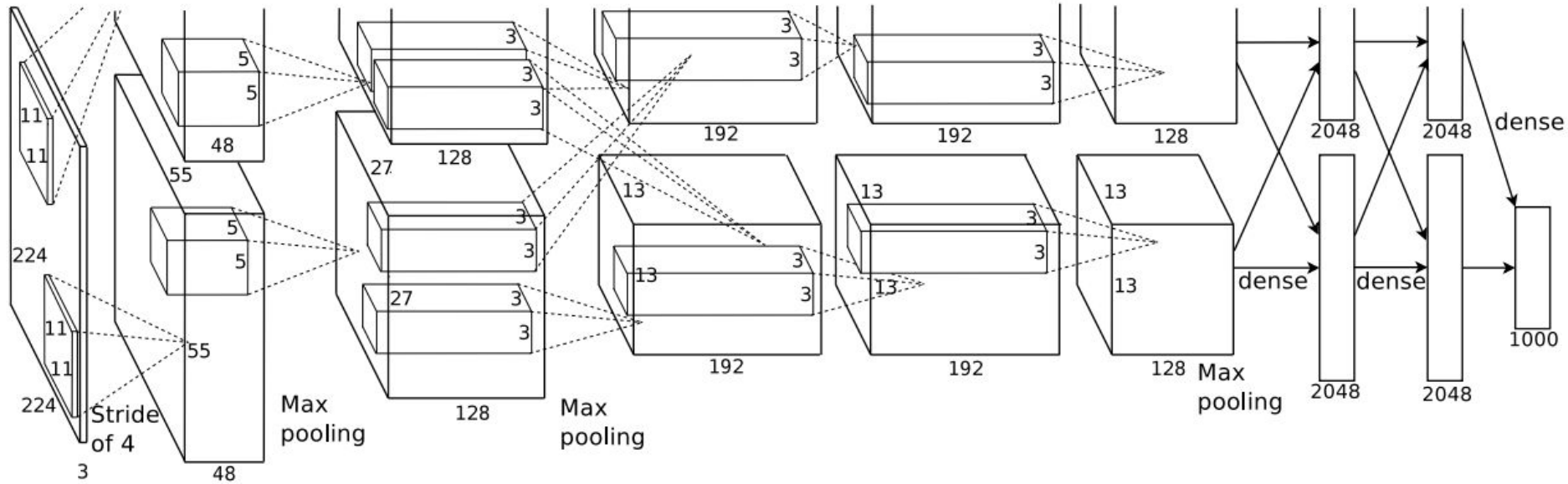


Image source: [ImageNet Classification with Deep Convolutional Neural Networks](#)

CNN can become very deep

- “Our network takes between five and six days to train on two GTX 580 3GB GPUs. All of our experiments suggest that our results can be improved simply by waiting for faster GPUs and bigger datasets to become available”[1]
- [Very Deep Convolutional Networks for Large-Scale Image Recognition](#)
- [Very Deep Convolutional Networks for Natural Language Processing](#)

[1]: [ImageNet Classification with Deep Convolutional Neural Networks](#)

Classifying MNIST data using mxnet

https://github.com/dmlc/mxnet/blob/master/example/image-classification/train_mnist.py

Our works

- Image Classification (show demo)
- [Indoor & Outdoor image scene recognition](#)
- [ImageNet](#)

Our machine

Intel(R) Xeon(R)

CPU E5-2630 v3

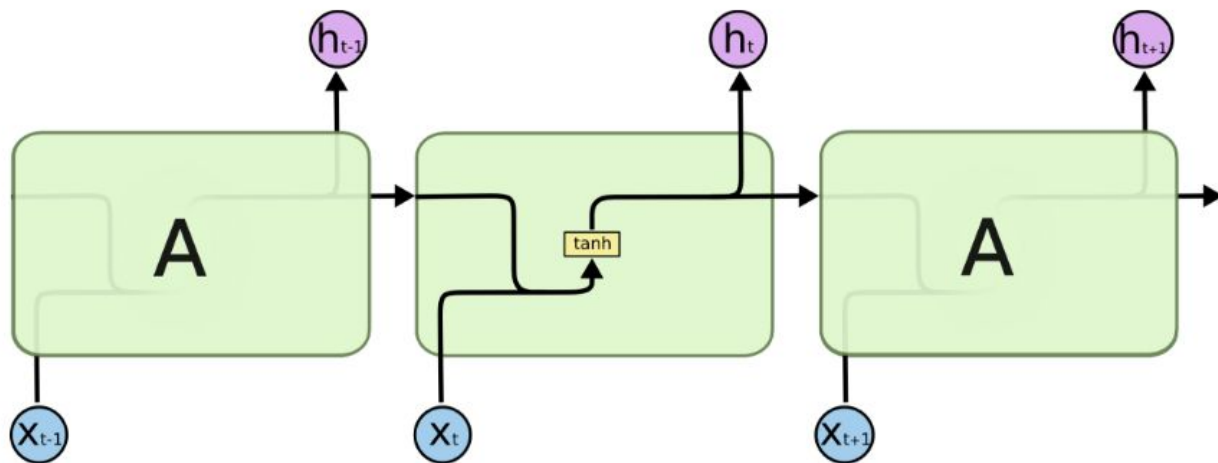
@ 2.40GHz x2

GeForce GTX

TITAN X x8



Recurrent neural network



The repeating module in a standard RNN contains a single layer.

Char-based RNN

- <http://karpathy.github.io/2015/05/21/rnn-effectiveness/>

Our works

- poem.bosonnlp.com (<https://twitter.com/poemfountain>)
- bosonask (show demo)

谈识皇恩非一品，
笑须诗句入云霄。
风前时誉添新历，
生老虚名作子孙。

RNN MNIST recognition with TensorFlow

https://github.com/aymericdamien/TensorFlow-Examples/blob/master/notebooks/3_NeuralNetworks/recurrent_network.ipynb

Understanding What Neural Network Really Learnt

<http://cs231n.github.io/understanding-cnn/>

Deep Learning Frameworks

- Caffe / Theano / Keras / Torch / mxnet / Tensorflow etc.

Deep Learning in Browser

- <https://github.com/transcranial/keras-js>
- <https://github.com/karpathy/convnetjs>

Some other wonderful works...

- Pixel Recurrent Neural Networks <https://arxiv.org/pdf/1601.06759.pdf>
- Generative Adversarial Networks <https://github.com/aleju/cat-generator>
- [Learning to simplify: fully convolutional networks for rough sketch cleanup](#)
- http://download.visinf.tu-darmstadt.de/data/from_games/
- [waifu2x](#)

Main Reference

- [CS231n: Convolutional Neural Networks for Visual Recognition](#)
- [Neural Networks and Deep Learning.Michael Nielsen](#)
- [The Unreasonable Effectiveness of Recurrent Neural Networks.Andrej Karpathy](#)

Q & A.

THANK YOU