Neural network 1

복습

- Regression vs. classification
- Training set, test set (xi,yi)
- Hypothesis: H_theta_(x)
- Decision boundary
- Cost function + optimization

Linear regression

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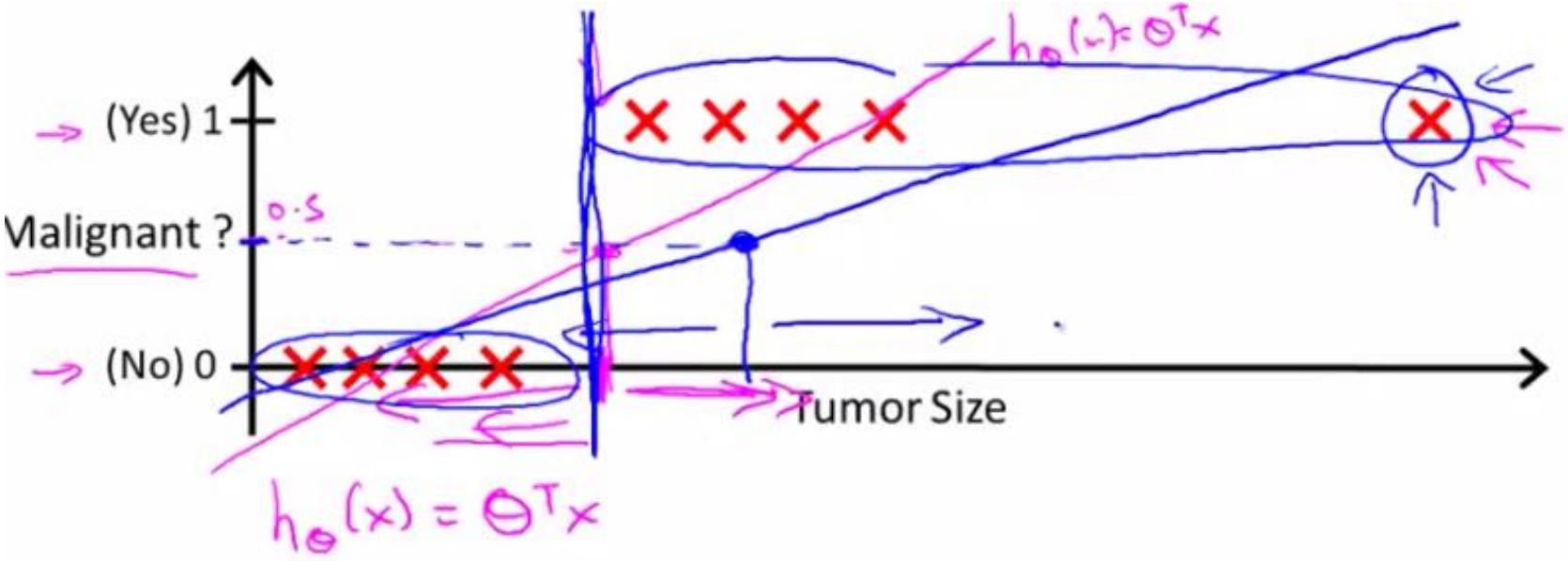
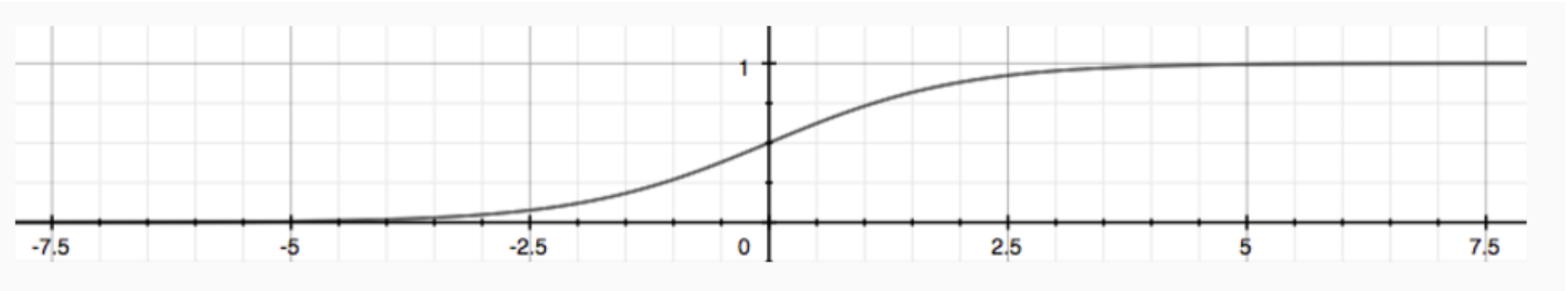
Linear regression



- Threshold classifier output $h_\theta(x)$ at 0.5:
  - If $h_\theta(x) \geq 0.5$, predict "y = 1"
  - If $h_\theta(x) < 0.5$, predict "y = 0"

Logistic regression

- Regression vs. classification
- Training set, test set (xi,yi)
- Hypothesis: H_theta_(x) = g(z) = g(theta^T x)
- Decision boundary
- Cost function + optimization

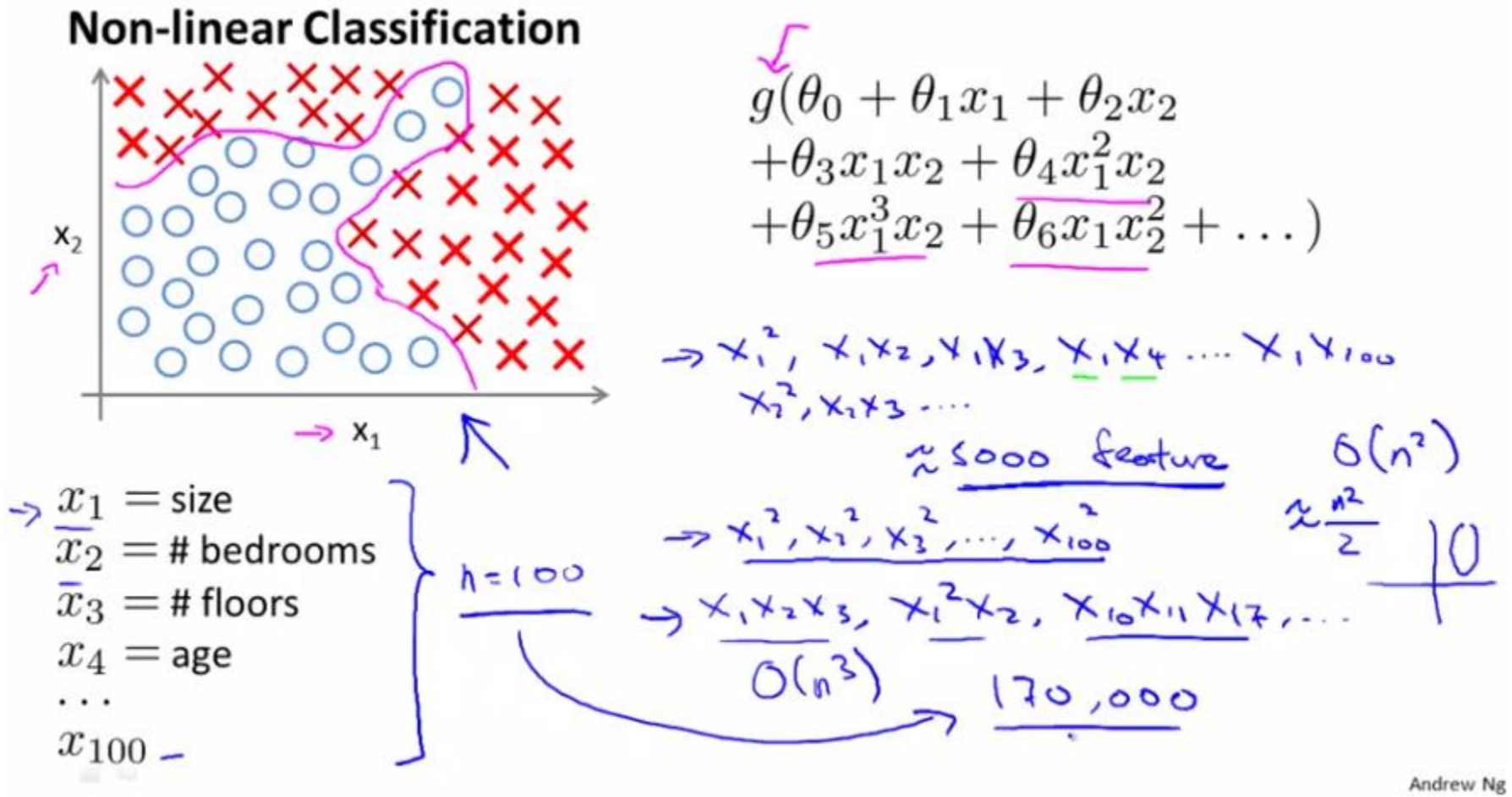


$$h_\theta(x) = g(\theta^T x)$$

$$z = \theta^T x$$

$$g(z) = \frac{1}{1+e^{-z}}$$

Neural network -motivation



Neural network -motivation

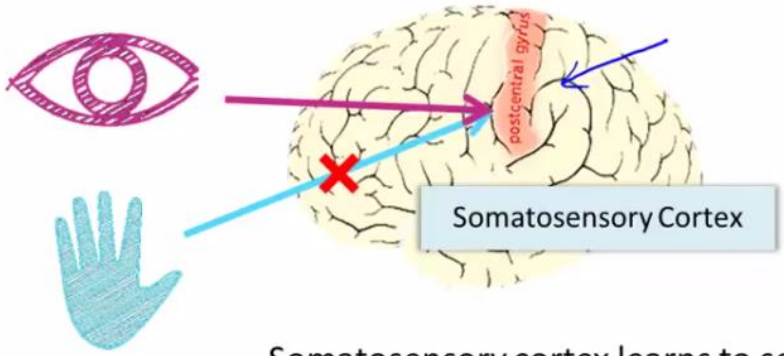
Neural Networks

Origins: Algorithms that try to mimic the brain.

Was very widely used in 80s and early 90s; popularity diminished in late 90s.

Recent resurgence: State-of-the-art technique for many applications

The "one learning algorithm" hypothesis



Somatosensory cortex learns to see

Sensor representations in the brain

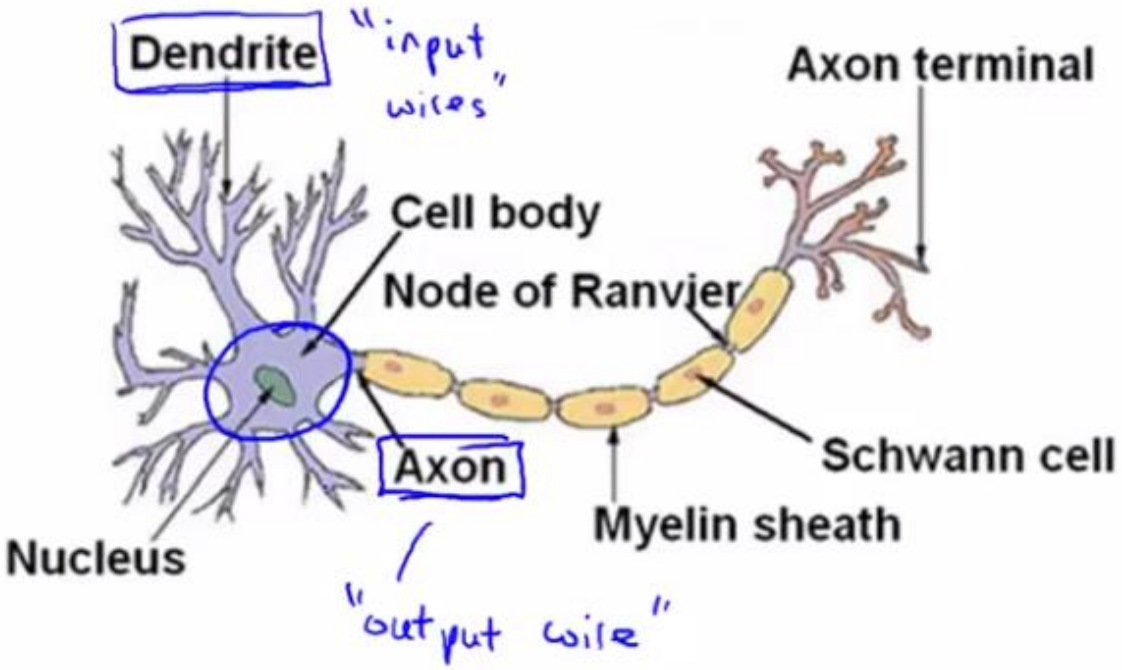
Seeing with your tongue

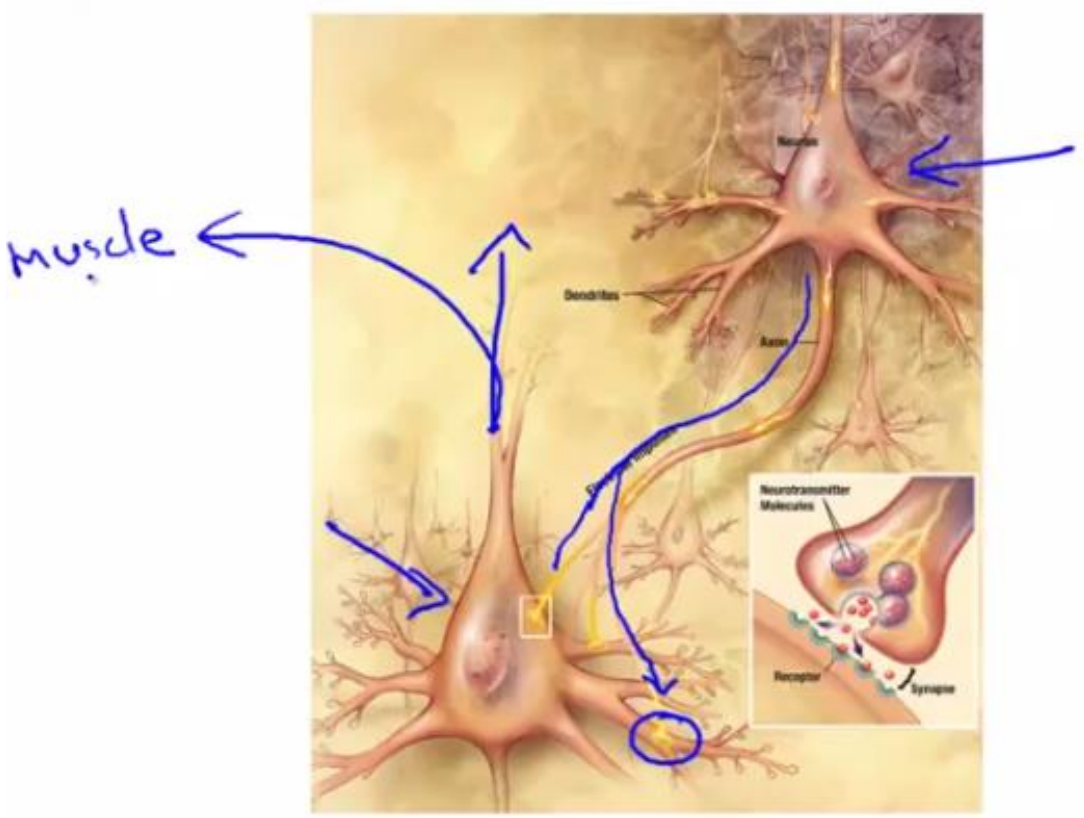
Human echolocation (sonar)

Haptic belt: Direction sense

Implanting a 3rd eye

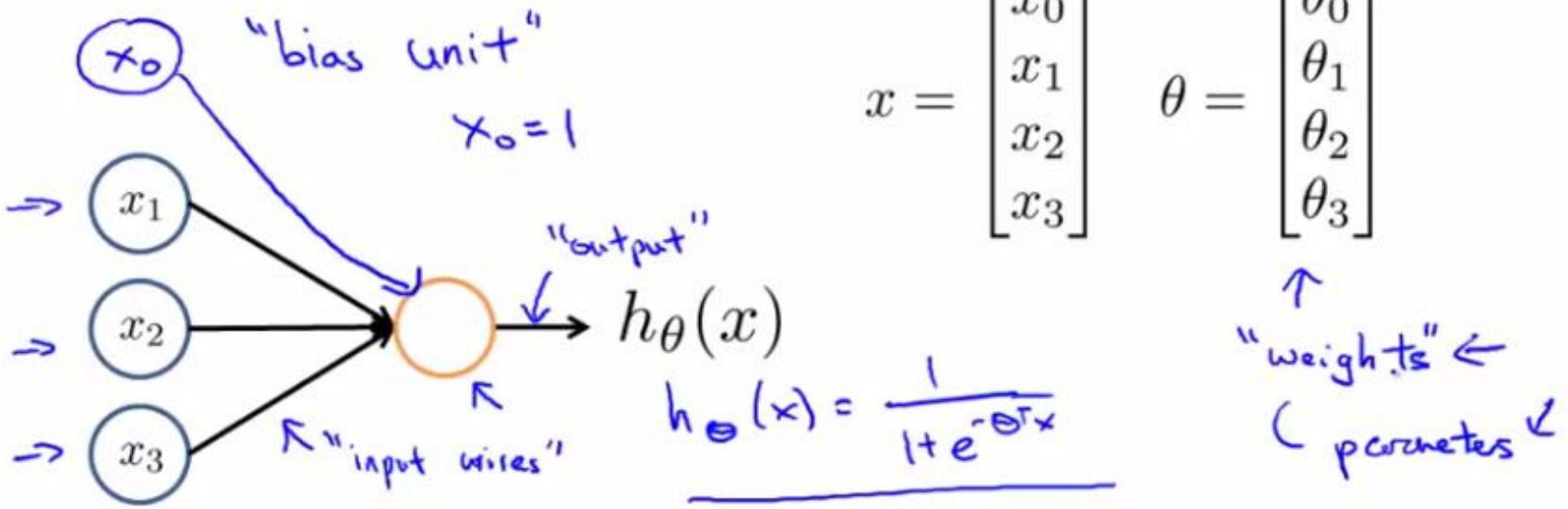
Neurons


Dendrite
"input wires"
Axon terminal
Cell body
Node of Ranvier
Axon
Schwann cell
Myelin sheath
Nucleus
"output wire"


Muscle
Dendrites
Axon
Neurotransmitter Molecules
Receptor
Synapse

Model

Neuron model: Logistic unit

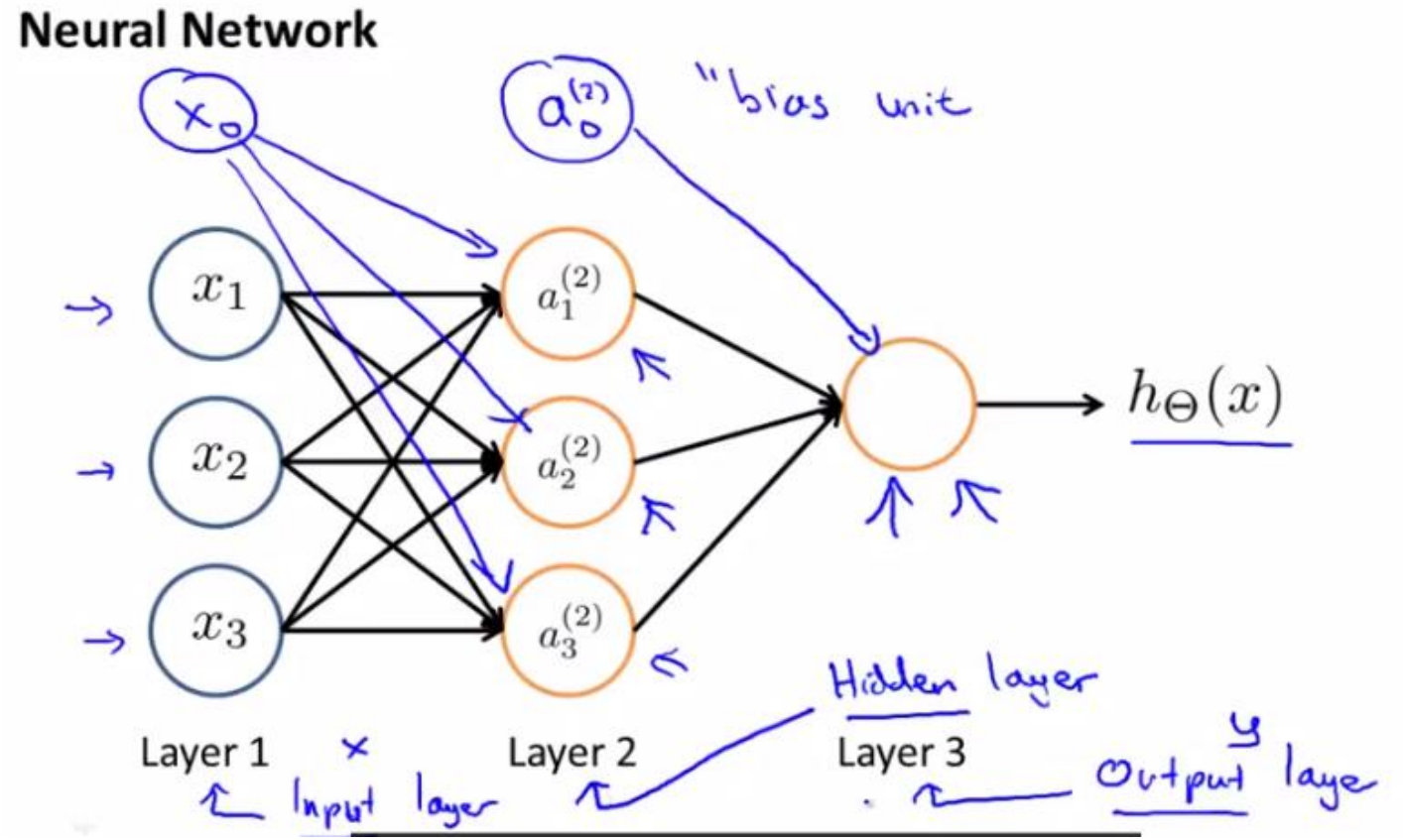


Sigmoid (logistic) activation function.

$g(z) = \frac{1}{1+e^{-z}}$

Logistic Regression?

Model



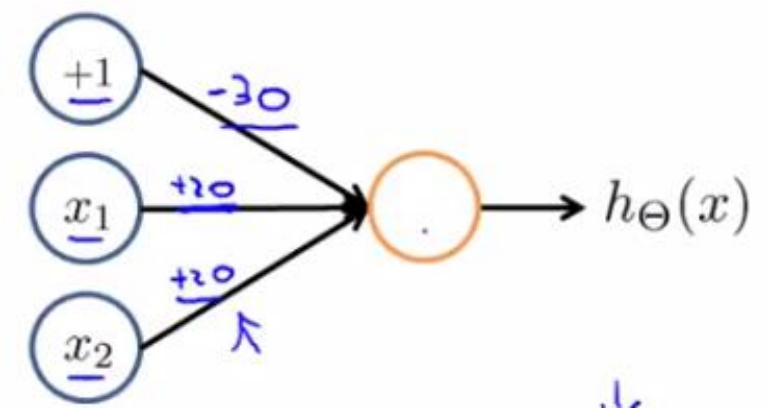
$$a_1^{(2)} = g(\Theta_{10}^{(1)} x_0 + \Theta_{11}^{(1)} x_1 + \Theta_{12}^{(1)} x_2 + \Theta_{13}^{(1)} x_3)$$

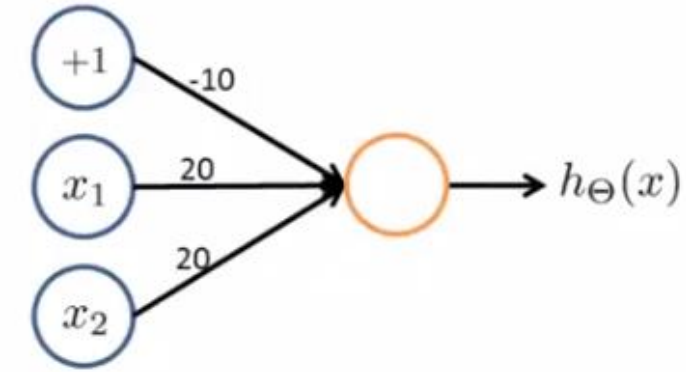
$$a_2^{(2)} = g(\Theta_{20}^{(1)} x_0 + \Theta_{21}^{(1)} x_1 + \Theta_{22}^{(1)} x_2 + \Theta_{23}^{(1)} x_3)$$

$$a_3^{(2)} = g(\Theta_{30}^{(1)} x_0 + \Theta_{31}^{(1)} x_1 + \Theta_{32}^{(1)} x_2 + \Theta_{33}^{(1)} x_3)$$

$$h_\Theta(x) = a_1^{(3)} = g(\Theta_{10}^{(2)} a_0^{(2)} + \Theta_{11}^{(2)} a_1^{(2)} + \Theta_{12}^{(2)} a_2^{(2)} + \Theta_{13}^{(2)} a_3^{(2)})$$

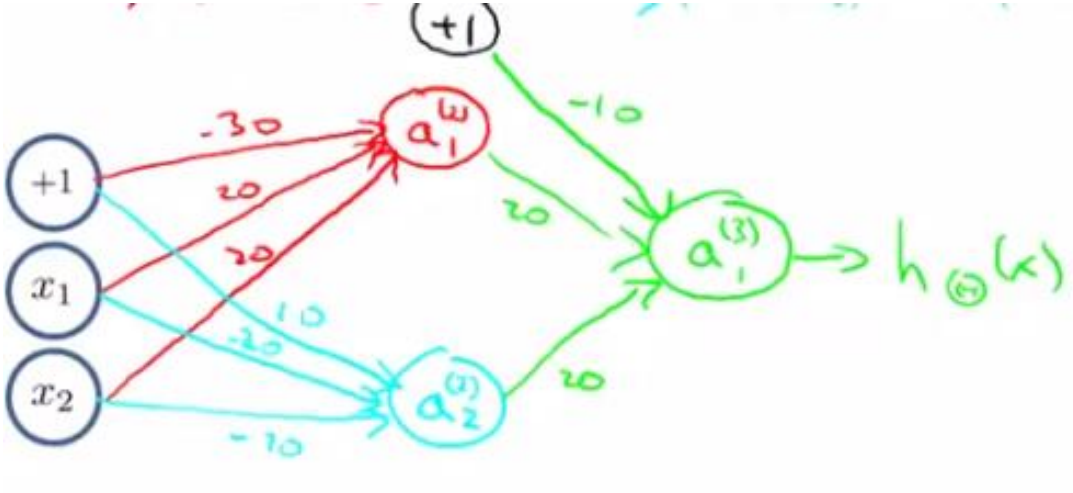
Neural network - example





x_1	x_2	$h_\Theta(x)$
0	0	
0	1	
1	0	
1	1	

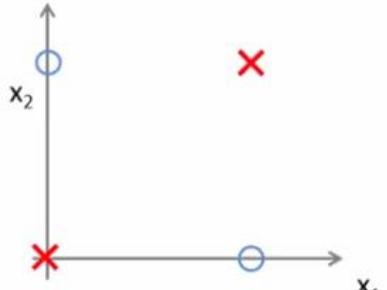
Neural network - example

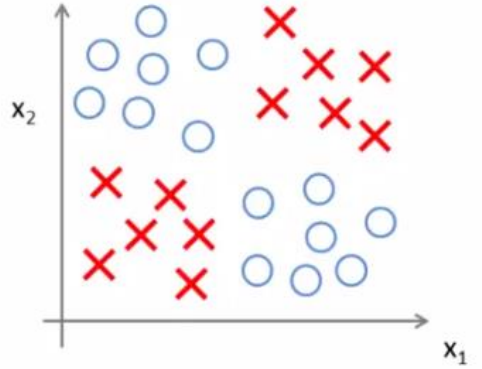


x_1	x_2	$a_1^{(2)}$	$a_2^{(2)}$	$h_\Theta(x)$
0	0	0	1	1
0	1	0	0	0
1	0	0	0	0
1	1	1	0	1

Non-linear classification example: XOR/XNOR

x_1, x_2 are binary (0 or 1).





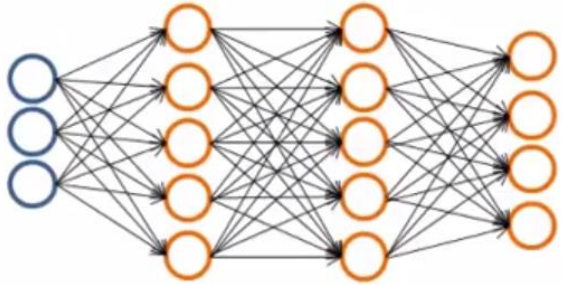
Multi-class classification


Pedestrian


Car


Motorcycle

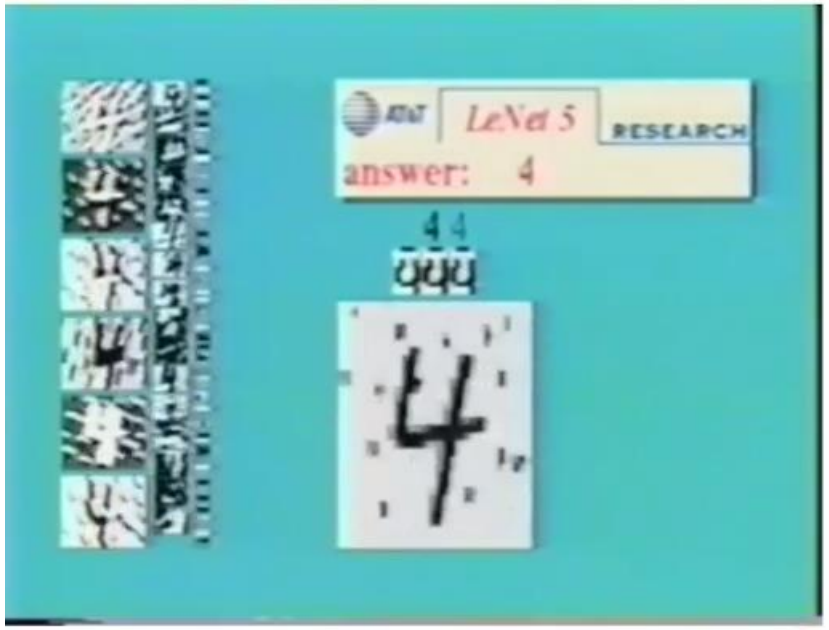

Truck



$h_\Theta(x) \in \mathbb{R}^4$

ant $h_\Theta(x) \approx \begin{bmatrix}1\\0\\0\\0\end{bmatrix}$, $h_\Theta(x) \approx \begin{bmatrix}0\\1\\0\\0\end{bmatrix}$, $h_\Theta(x) \approx \begin{bmatrix}0\\0\\1\\0\end{bmatrix}$, etc.

when pedestrian when car when motorcycle



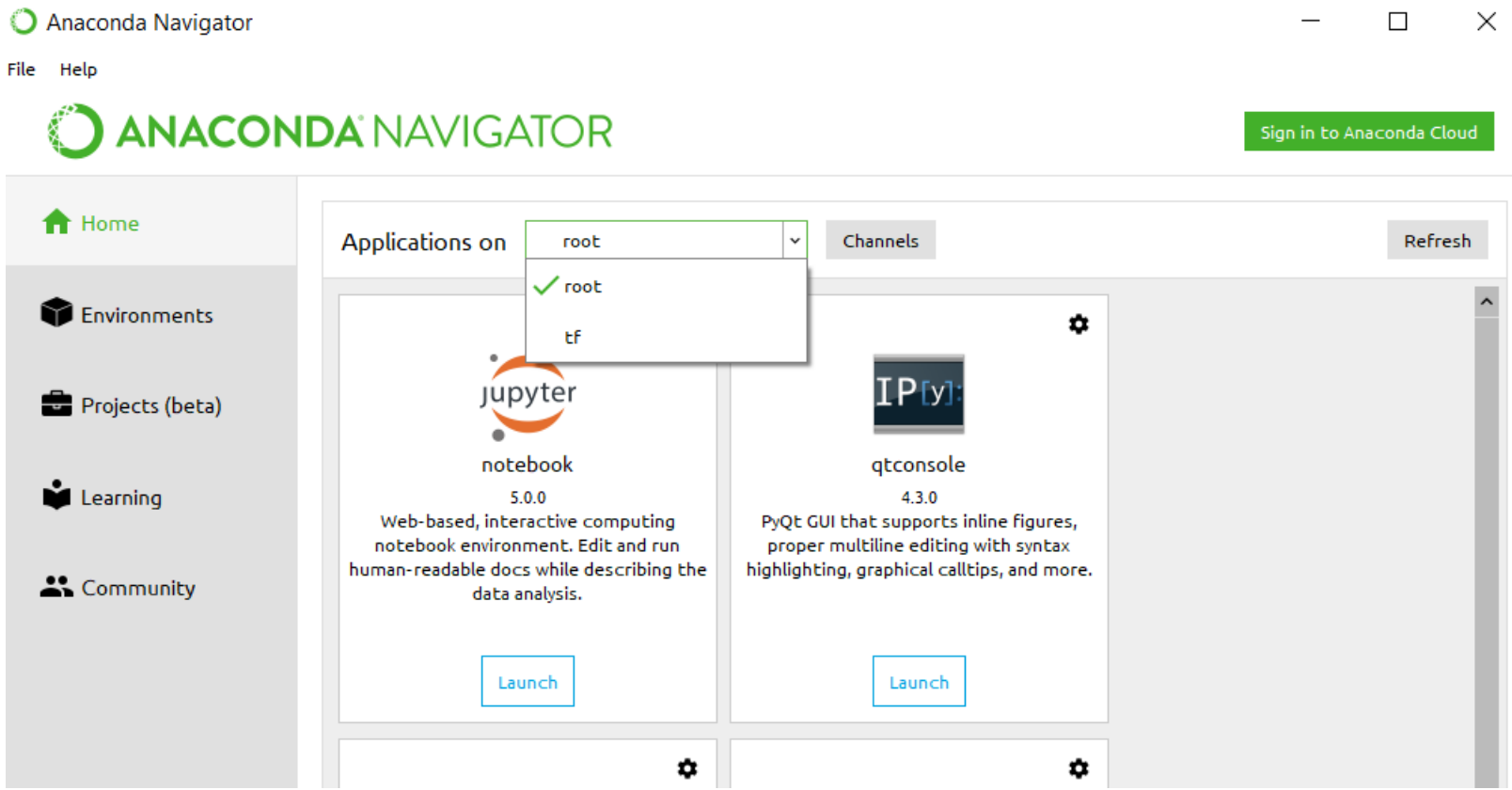
Keras install

- http://tmmse.xyz/2017/03/01/tensorflow-keras-installation-windows-linux-macos/
- Console 을 admin 으로 열기

- cd C:₩Users₩Sangwon Lee₩Anaconda3
- 혹은 맥일 경우
- export PATH=~/anaconda/bin:$PATH

- conda --v 로 version 정보 나오는지 체크할 것

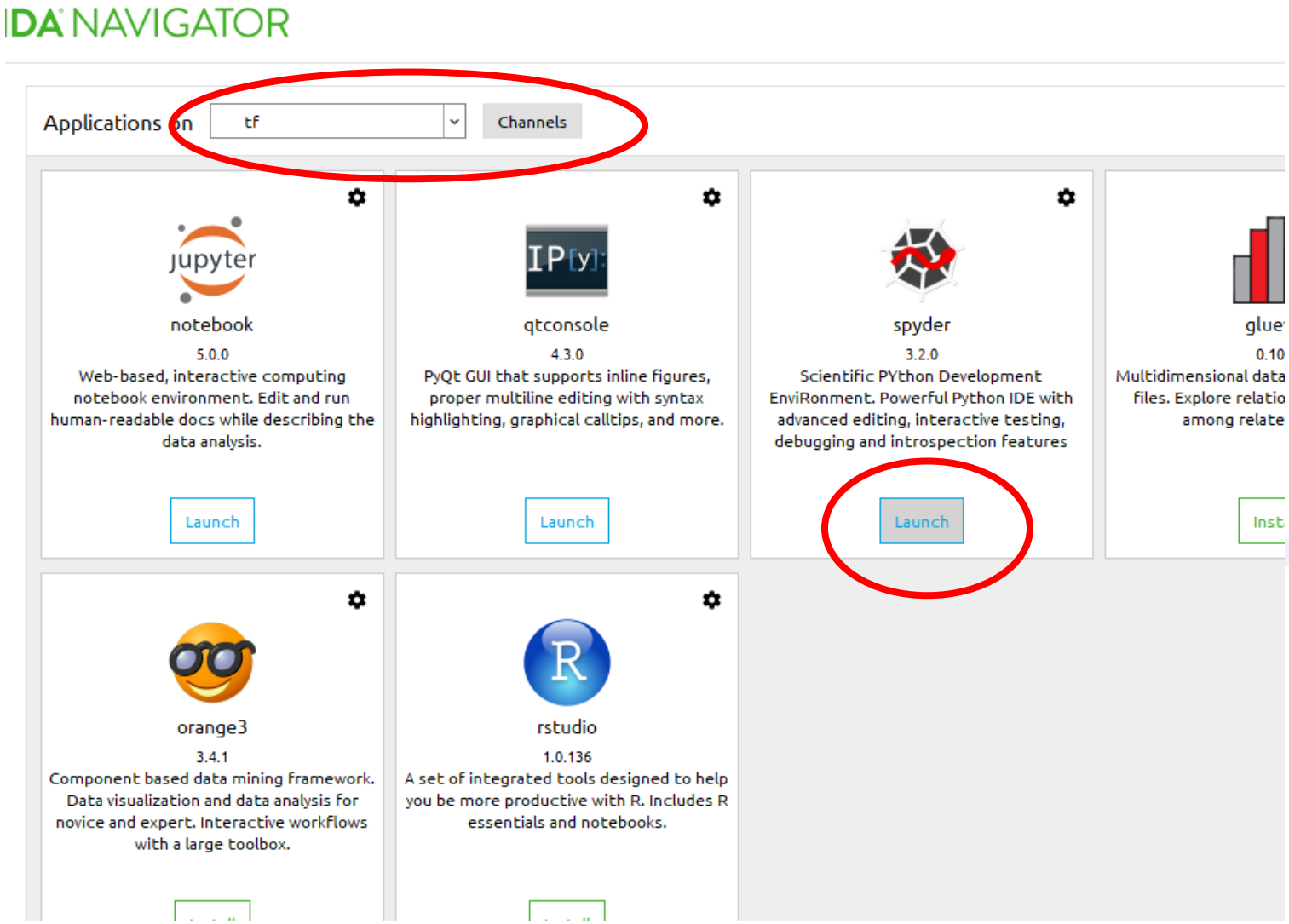
- conda create -n tf python=3.5
- activate tf
- 혹은 MAC 일 경우
- source activate tf

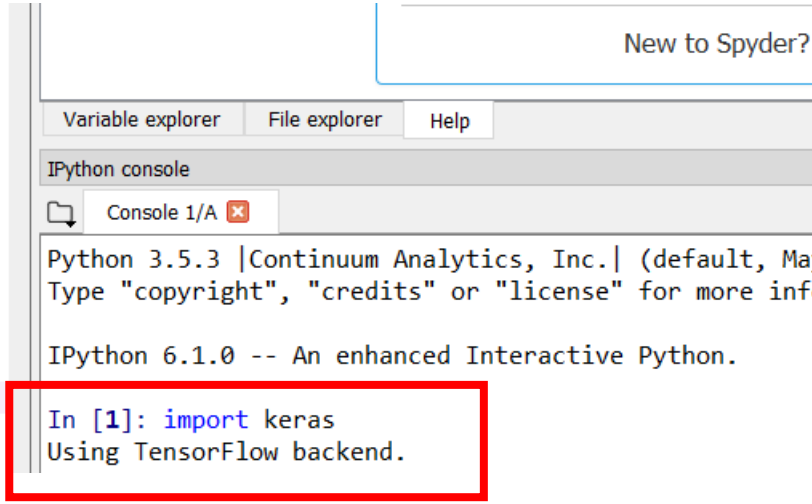


Keras

- pip install tensorflow # pip install tensorflow-gpu : GPU 버전
- conda install pandas matplotlib scikit-learn
- pip install keras
- conda install jupyter notebook
- conda install spyder
-
-

Run & test

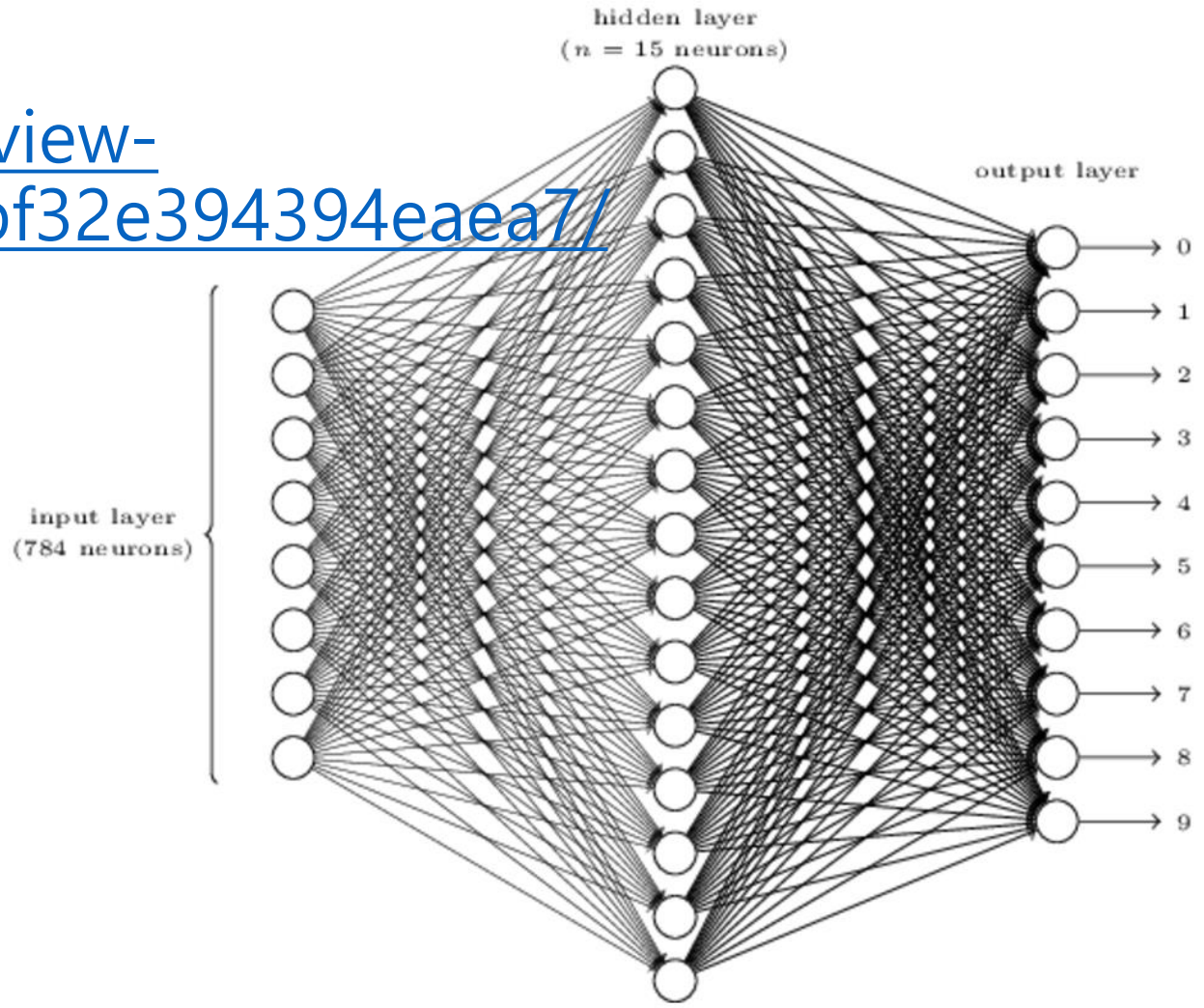

IDA NAVIGATOR
Applications on
tf
Channels
jupyter
notebook
5.0.0
Web-based, interactive computing notebook environment. Edit and run human-readable docs while describing the data analysis.
Launch
IP[y]:
qtconsole
4.3.0
PyQt GUI that supports inline figures, proper multiline editing with syntax highlighting, graphical calltips, and more.
Launch
spyder
3.2.0
Scientific PYthon Development EnviRonment. Powerful Python IDE with advanced editing, interactive testing, debugging and introspection features
Launch
glue
0.10
Multidimensional data files. Explore relatio among relate
Inst
orange3
3.4.1
Component based data mining framework. Data visualization and data analysis for novice and expert. Interactive workflows with a large toolbox.
rstudio
1.0.136
A set of integrated tools designed to help you be more productive with R. Includes R essentials and notebooks.


New to Spyder?
Variable explorer
File explorer
Help
IPython console
Console 1/A
Python 3.5.3 |Continuum Analytics, Inc.| (default, Ma
Type "copyright", "credits" or "license" for more inf
IPython 6.1.0 -- An enhanced Interactive Python.
In [1]: import keras
Using TensorFlow backend.

Example MNIST

- https://datascienceschool.net/view-notebook/51e147088d474fe1bf32e394394eaea7/

- import matplotlib.pylab as plt



CNN

- https://github.com/fchollet/keras/blob/master/examples/mnist_cnn.py