

Keras Demo

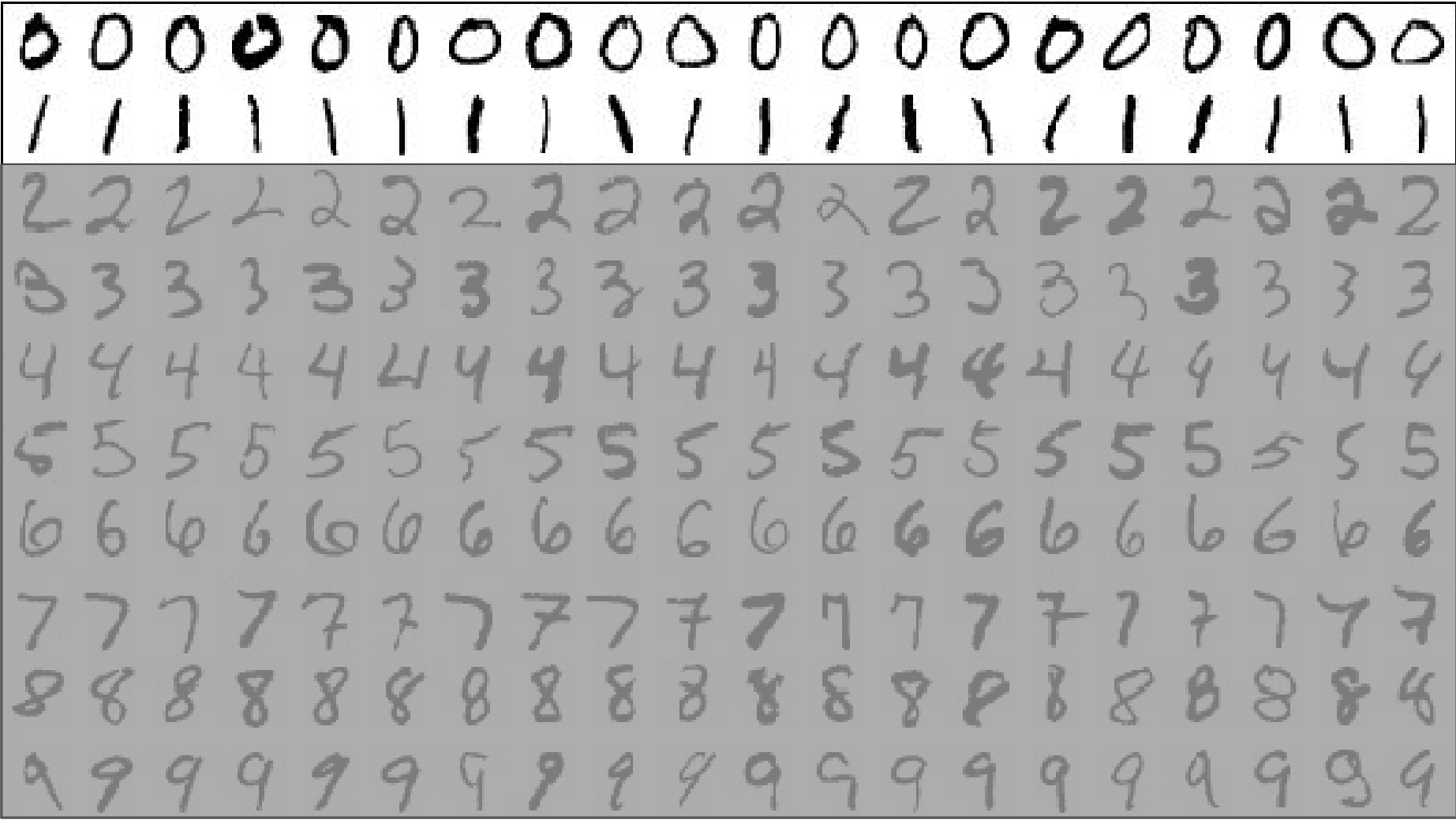
What is Keras?

Keras

- Python library for deep learning
- TensorFlow

MNIST





Multi-class classification

"One v. All" Classification

"One v. All" Classification

Training: 10 binary classifier

"0" or "not 0" classifier

"1" or "not 1" classifier , etc

"One v. All" Classification

Training: 10 binary classifier

"0" or "not 0" classifier

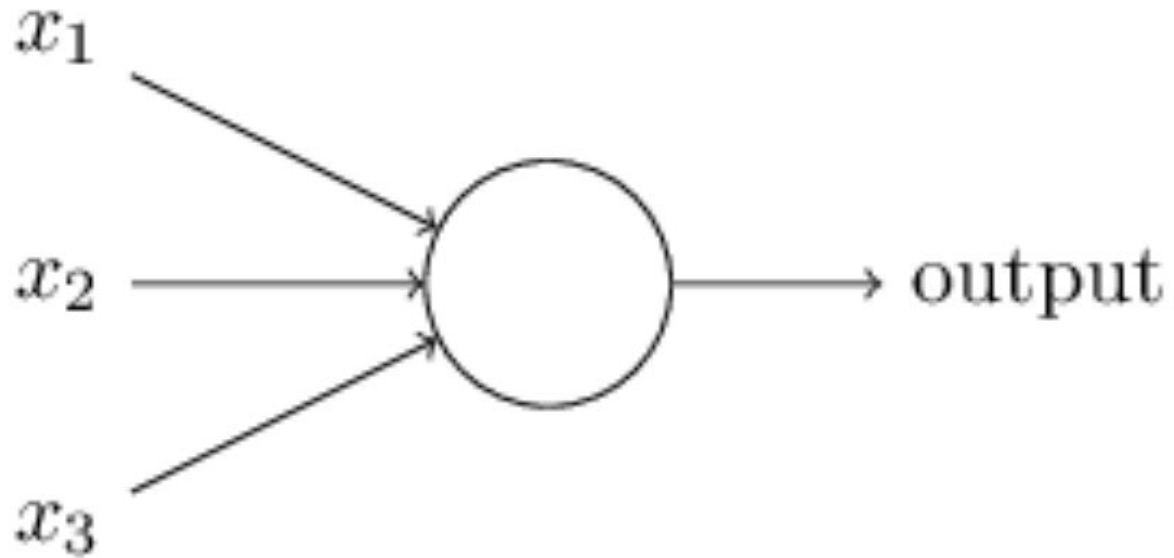
"1" or "not 1" classifier , etc

Testing: each classifier votes

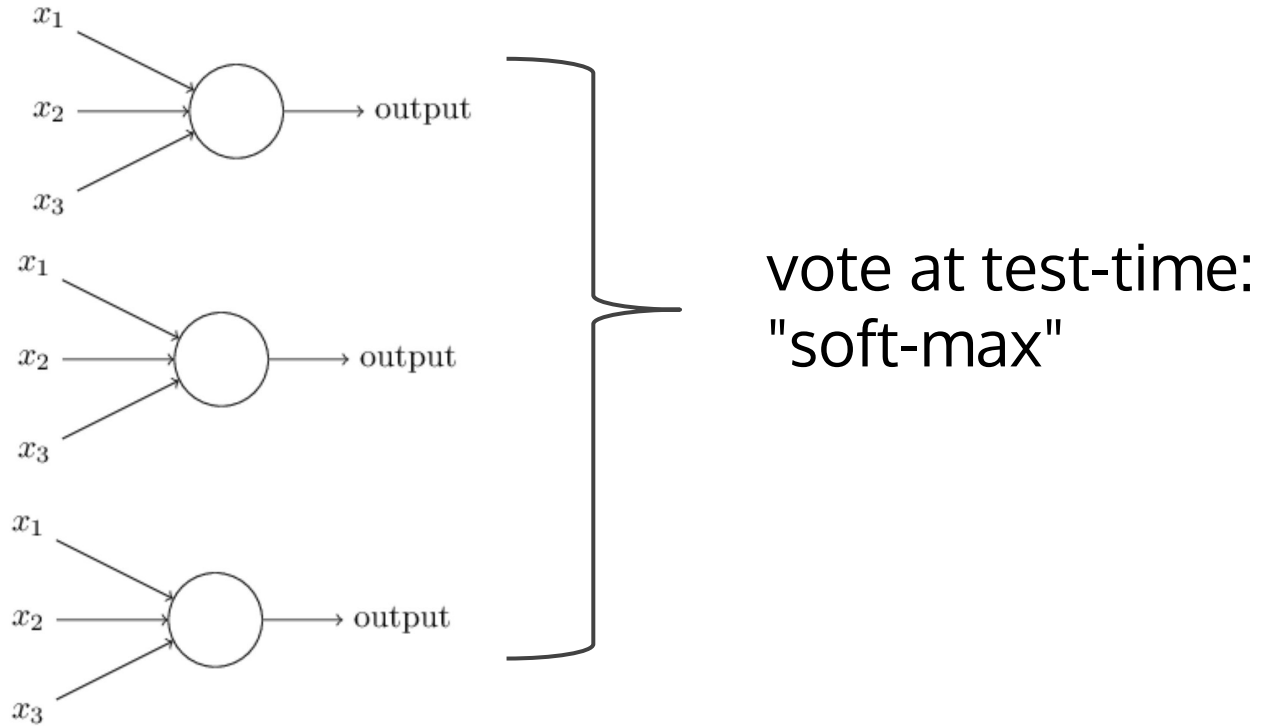
"0" or "not 0" classifier ----> votes NO!

"1" or "not 1" classifier ----> votes **YES!**

Binary Classifier

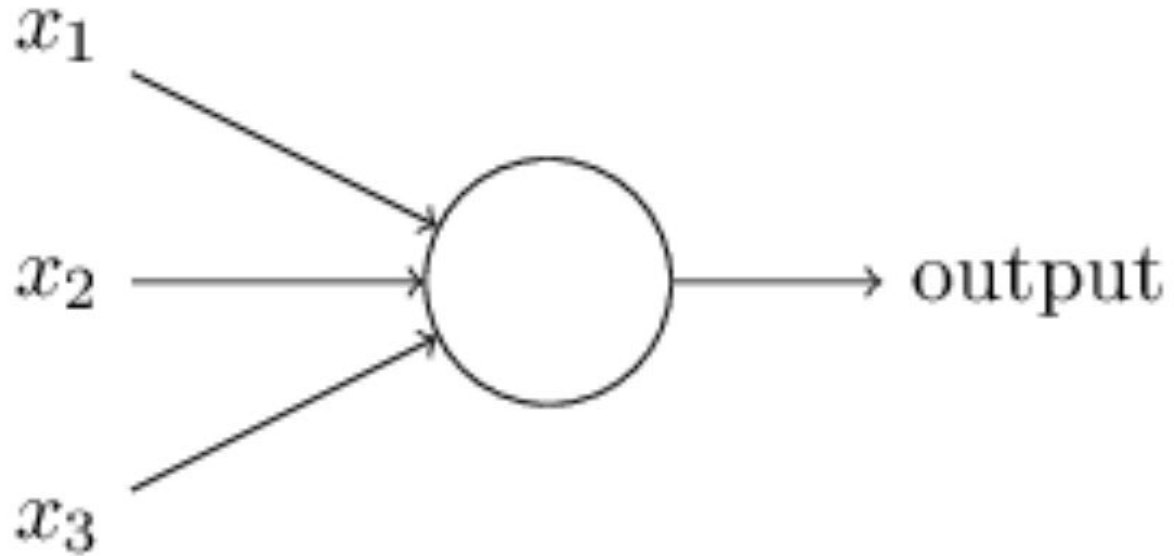


Many Classifiers



Neural Networks

Neural Networks



Activation Function

"Sign Activation Function"

$$y_i w^T x_i < 0 \quad \Longleftrightarrow \quad \text{sign}(y_i w^T x_i)$$

Activation Function

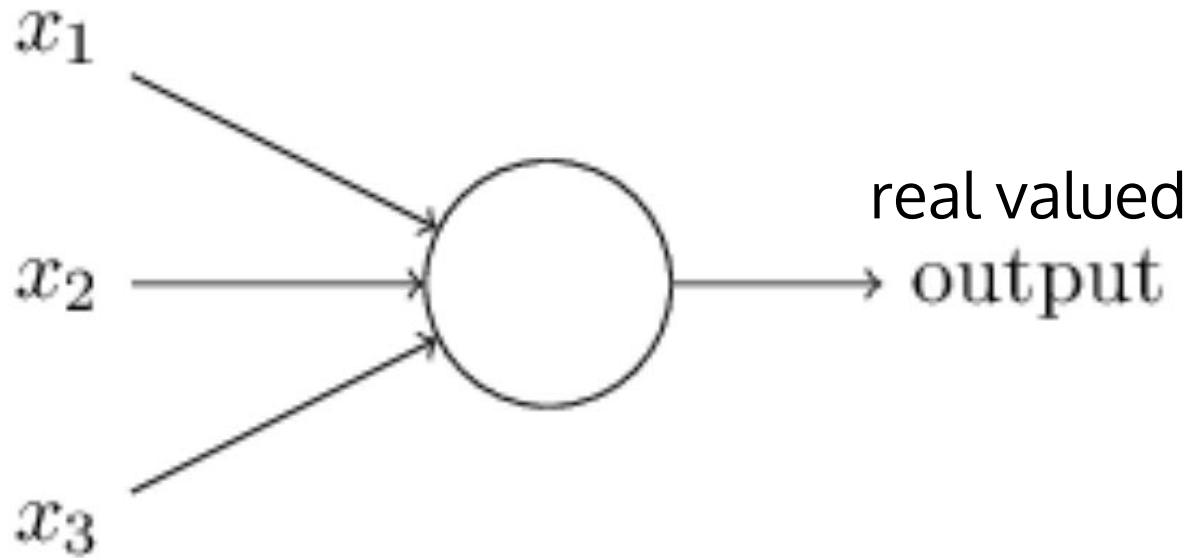
"Sign Activation Function"

$$y_i w^T x_i < 0 \quad \Longleftrightarrow \quad \text{sign}(y_i w^T x_i)$$

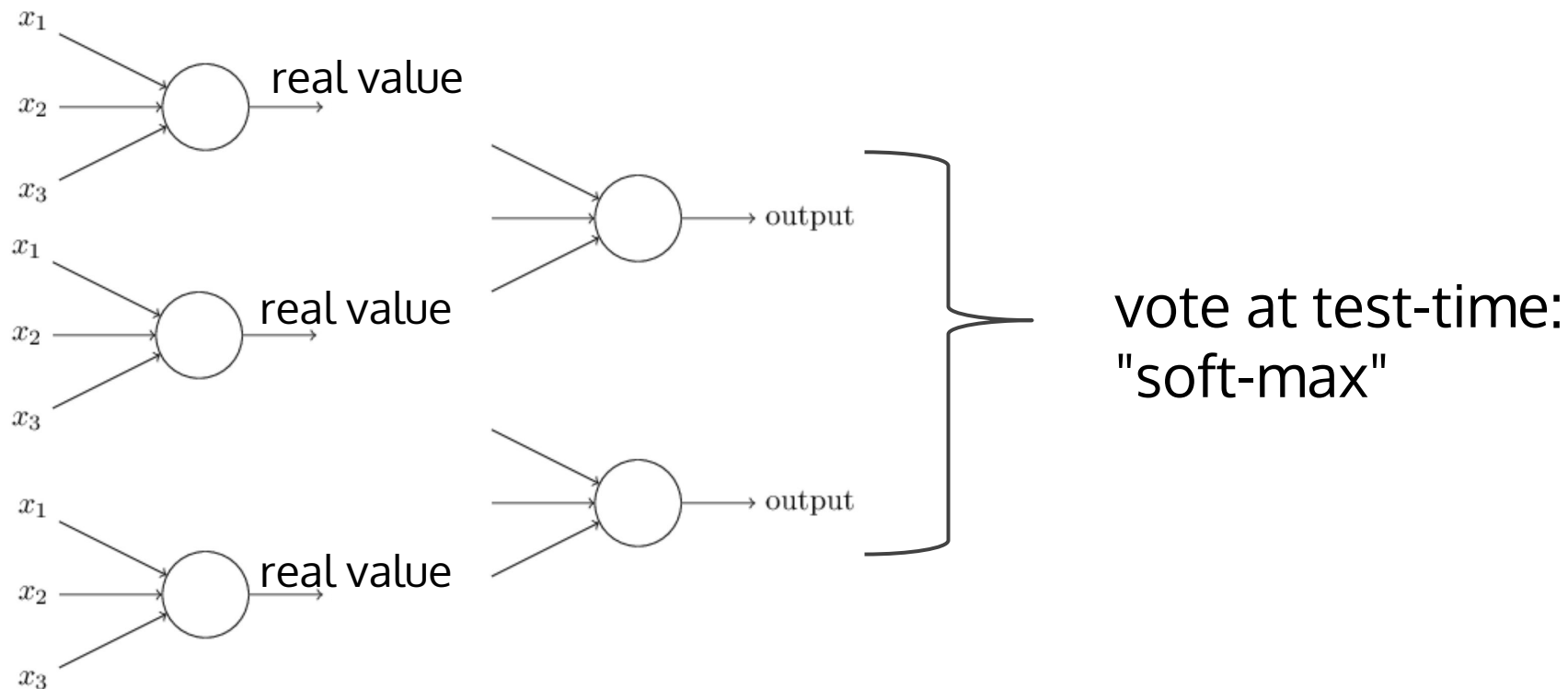
"Relu Activation Function"

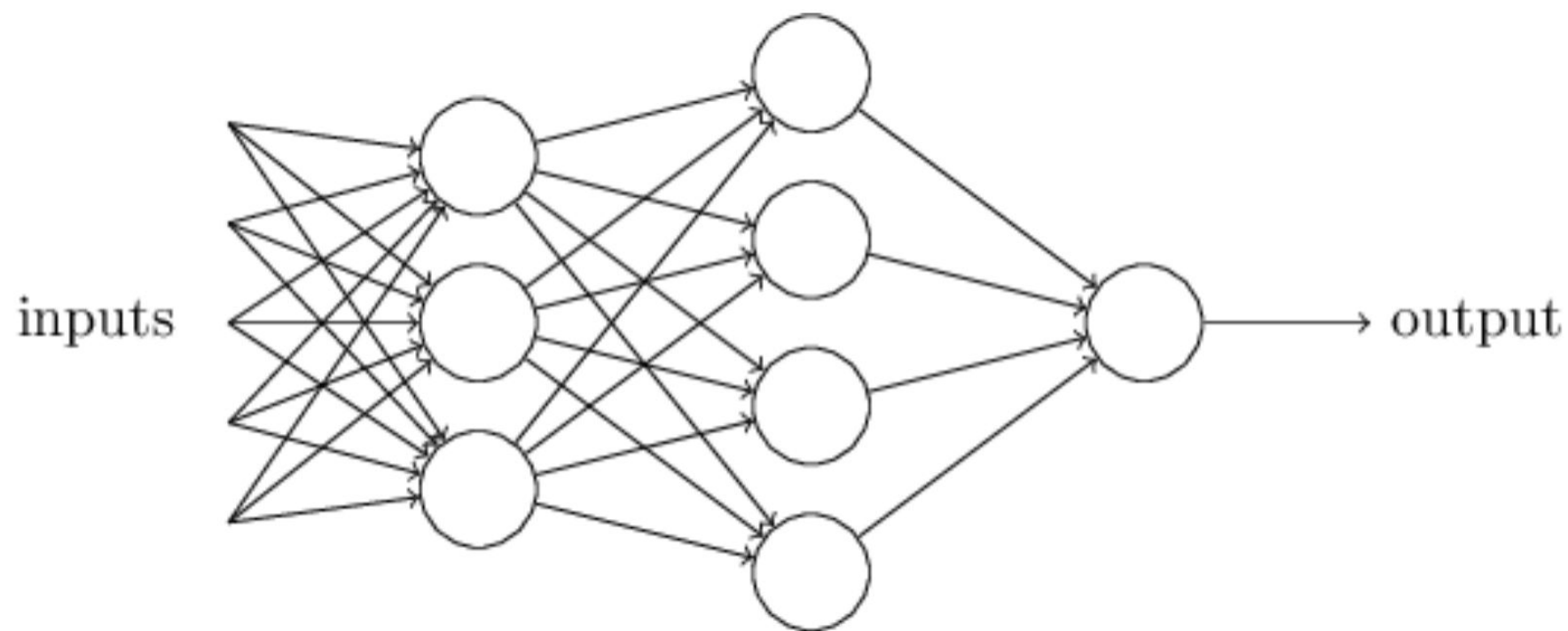
$$\max(0, y_i w^T x_i)$$

Neural Networks

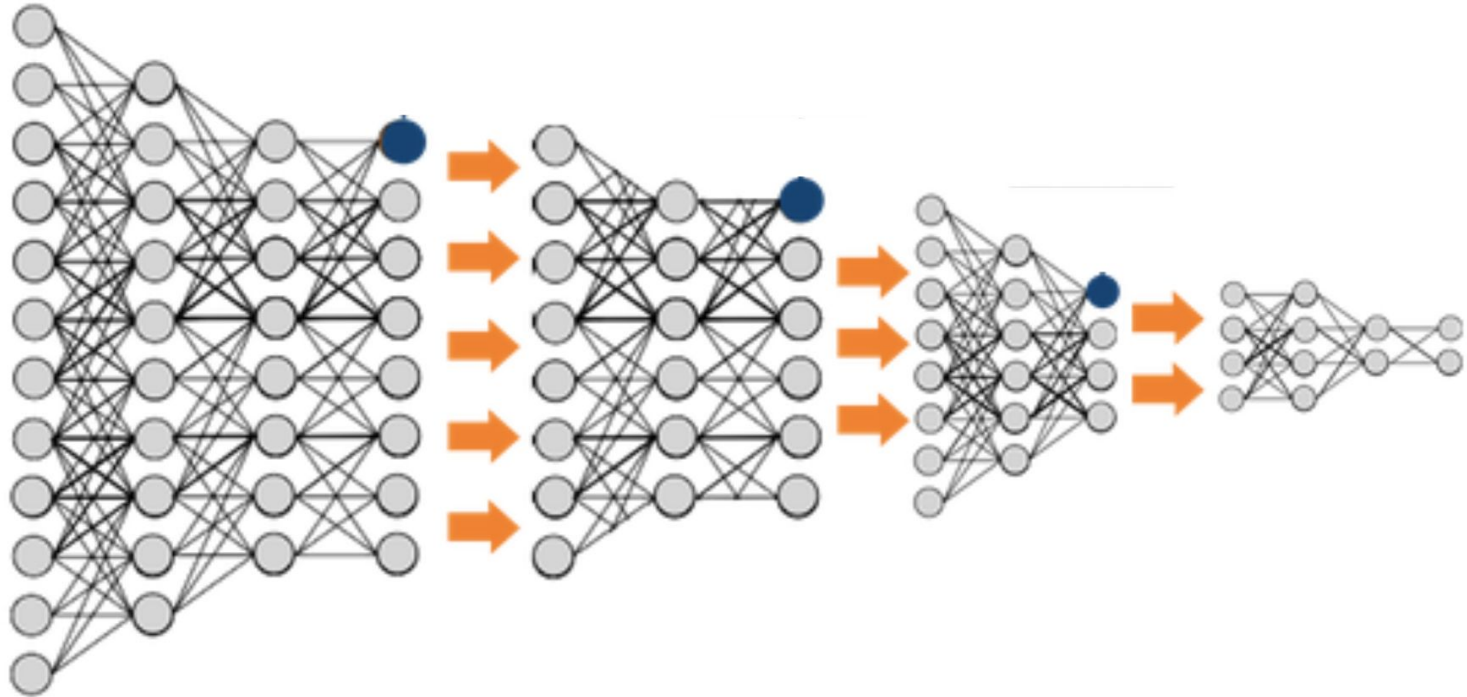


Many Classifiers

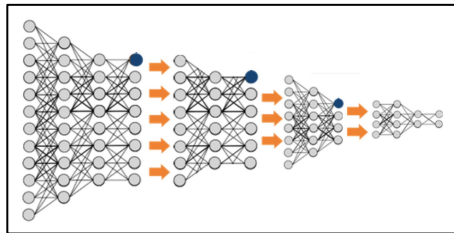
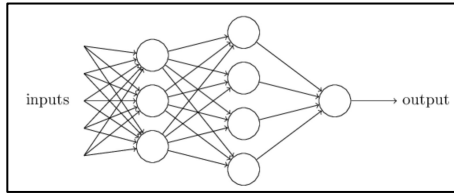
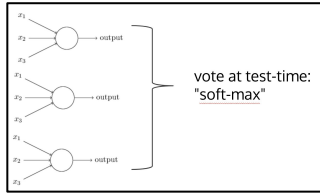
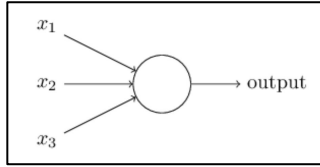




Deep Learning: "Deep" Neural Networks



Demo Outline



1. Binary classification
2. Multiclass classification
3. A simple NN
4. A deeper NN
5. Fancy NN's that get much better accuracy