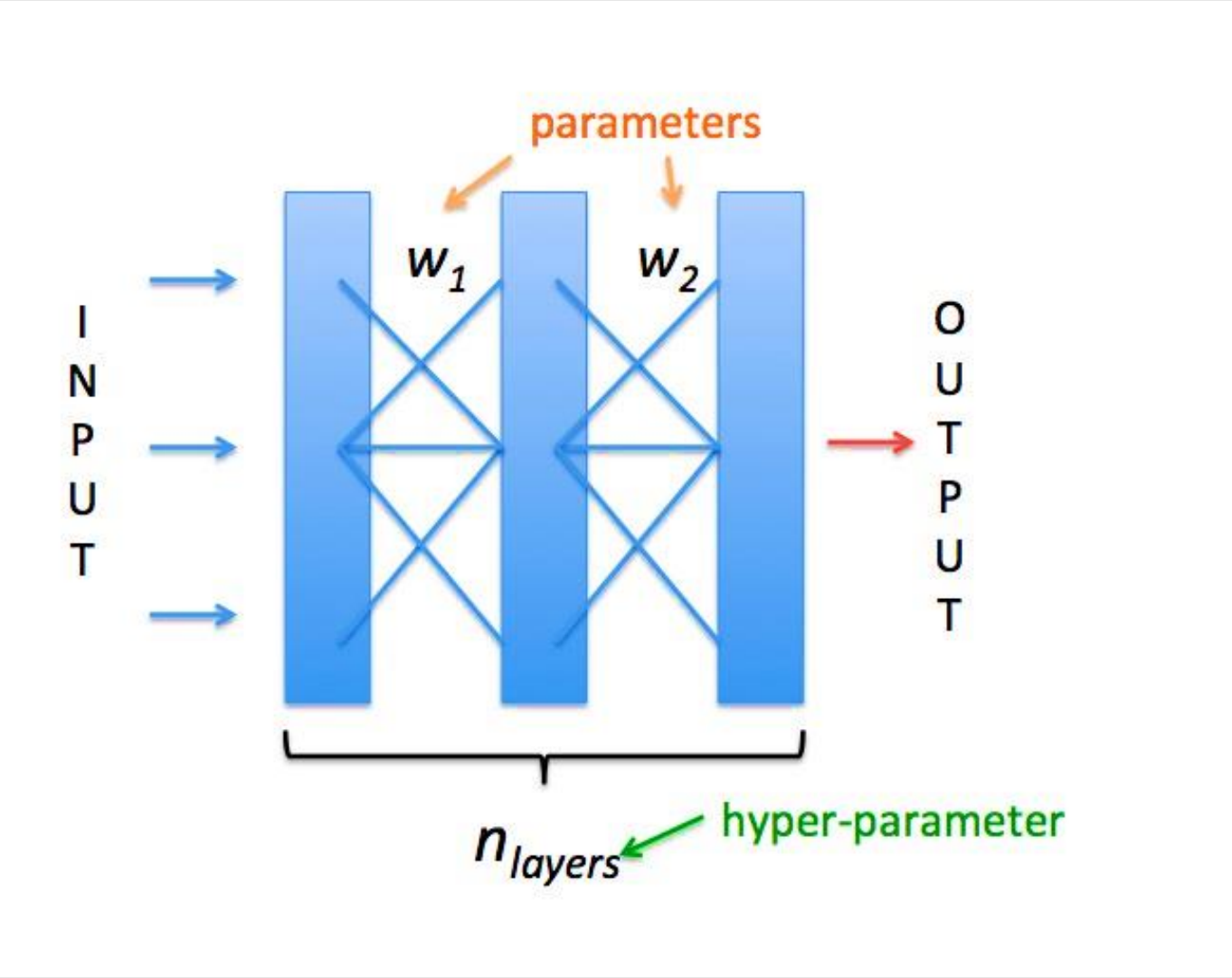
Getting Started with ML and Deep Learning Frameworks

Fatos Ismali

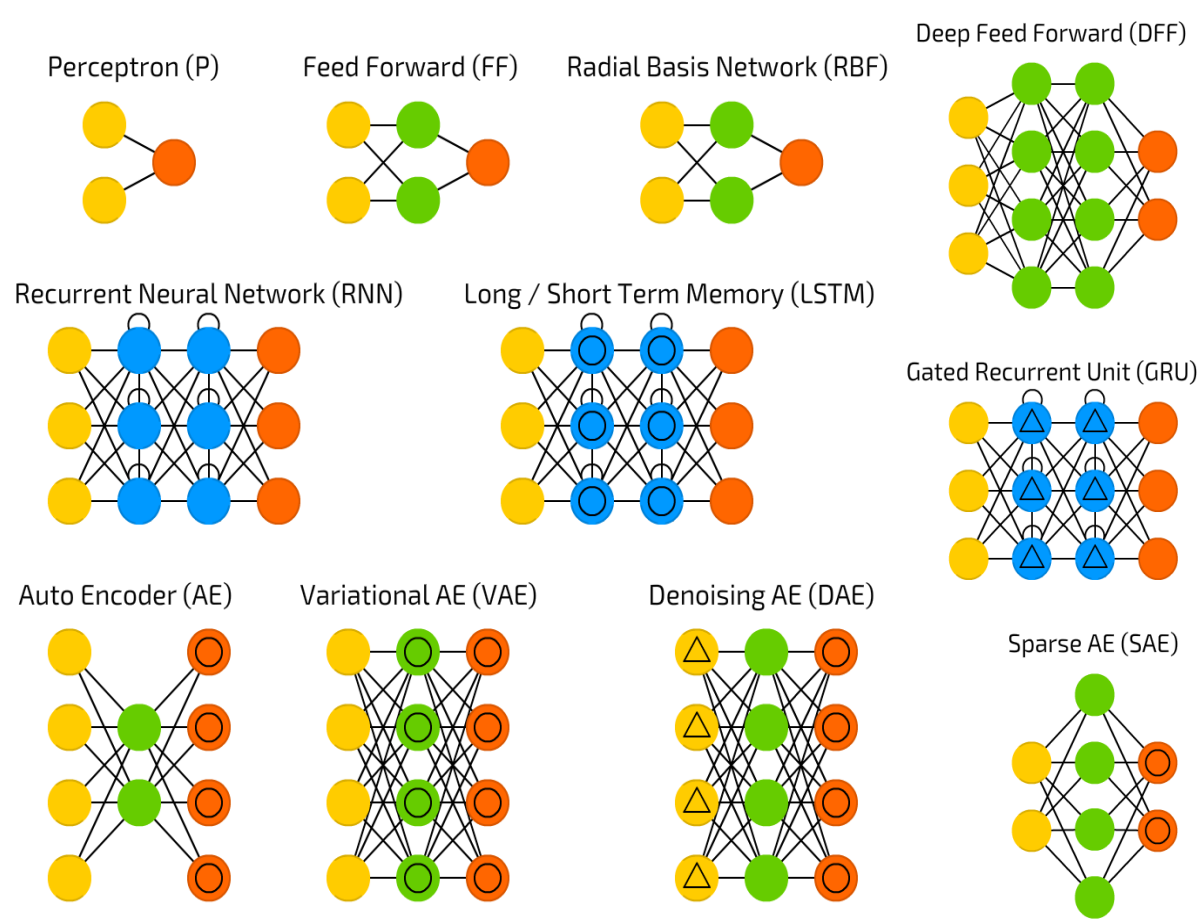
Agenda

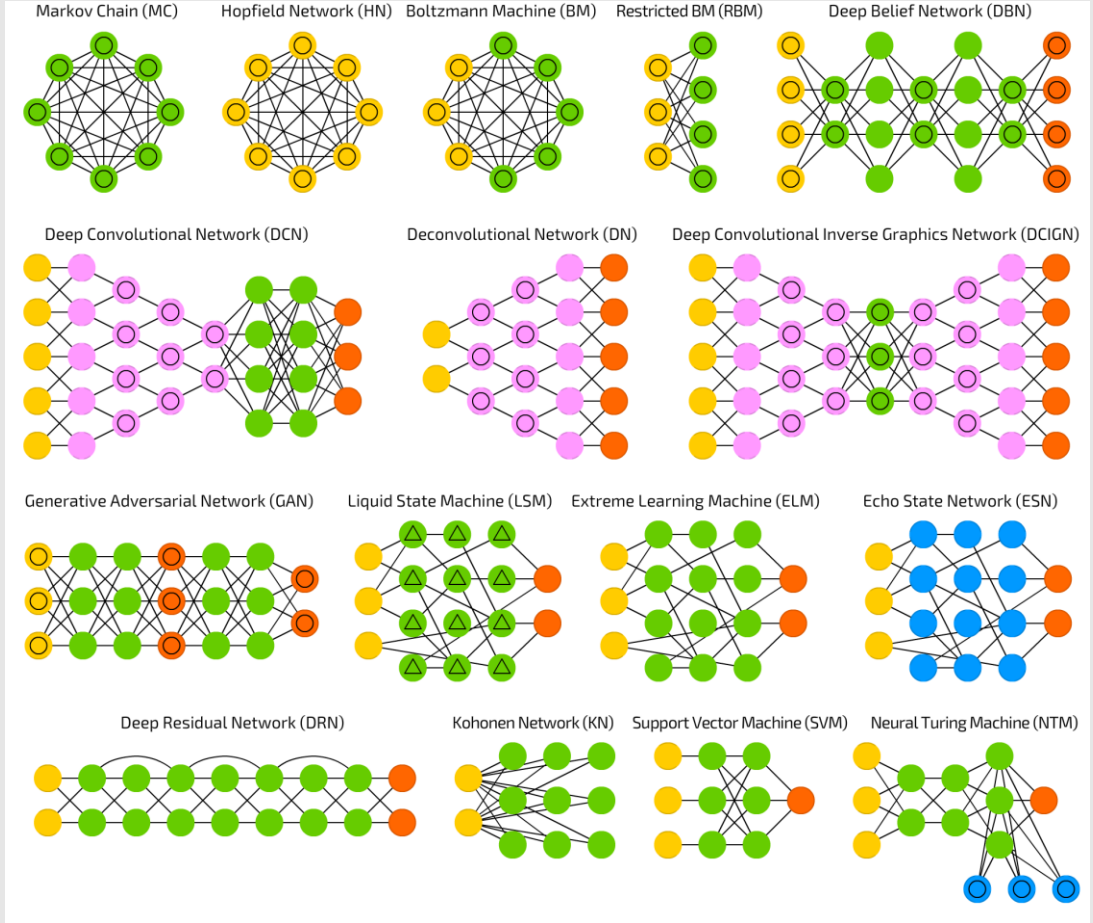
- Brief overview of Neural Networks
- Getting hands-on with PyTorch
- Getting hands-on with Keras and Tensorflow

What is a Neural Network?



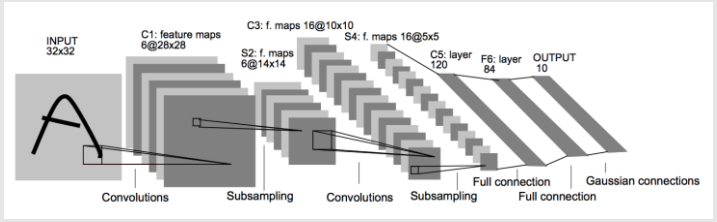
Variants of Neural Networks



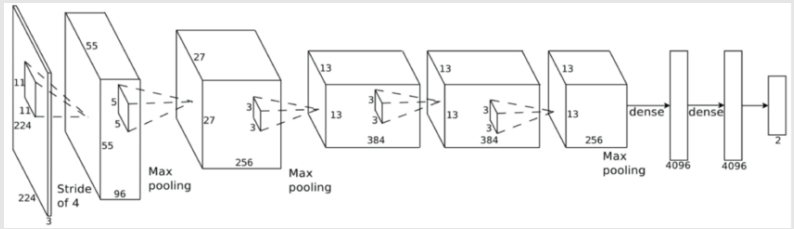


Common Architectures in Convolutional NNs

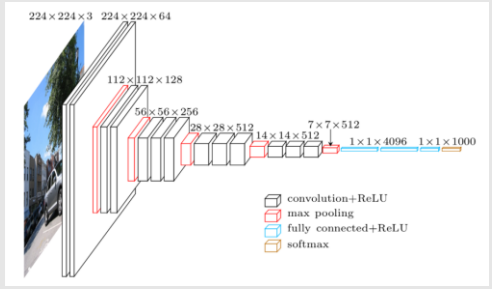
LeNET-5



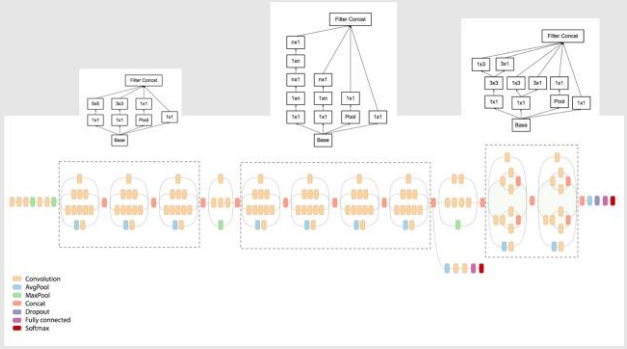
AlexNet



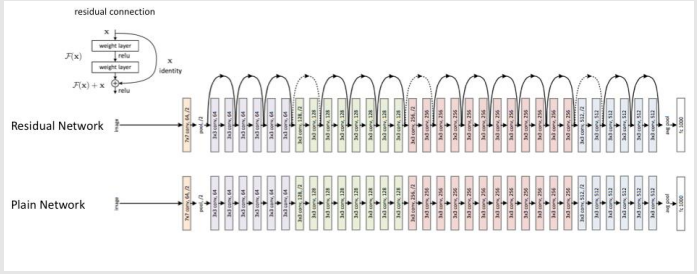
VGG-16



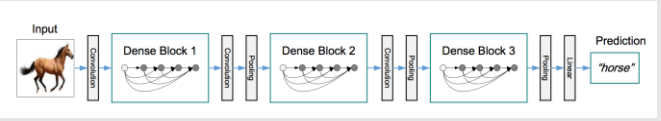
Inception (GoogleNet)



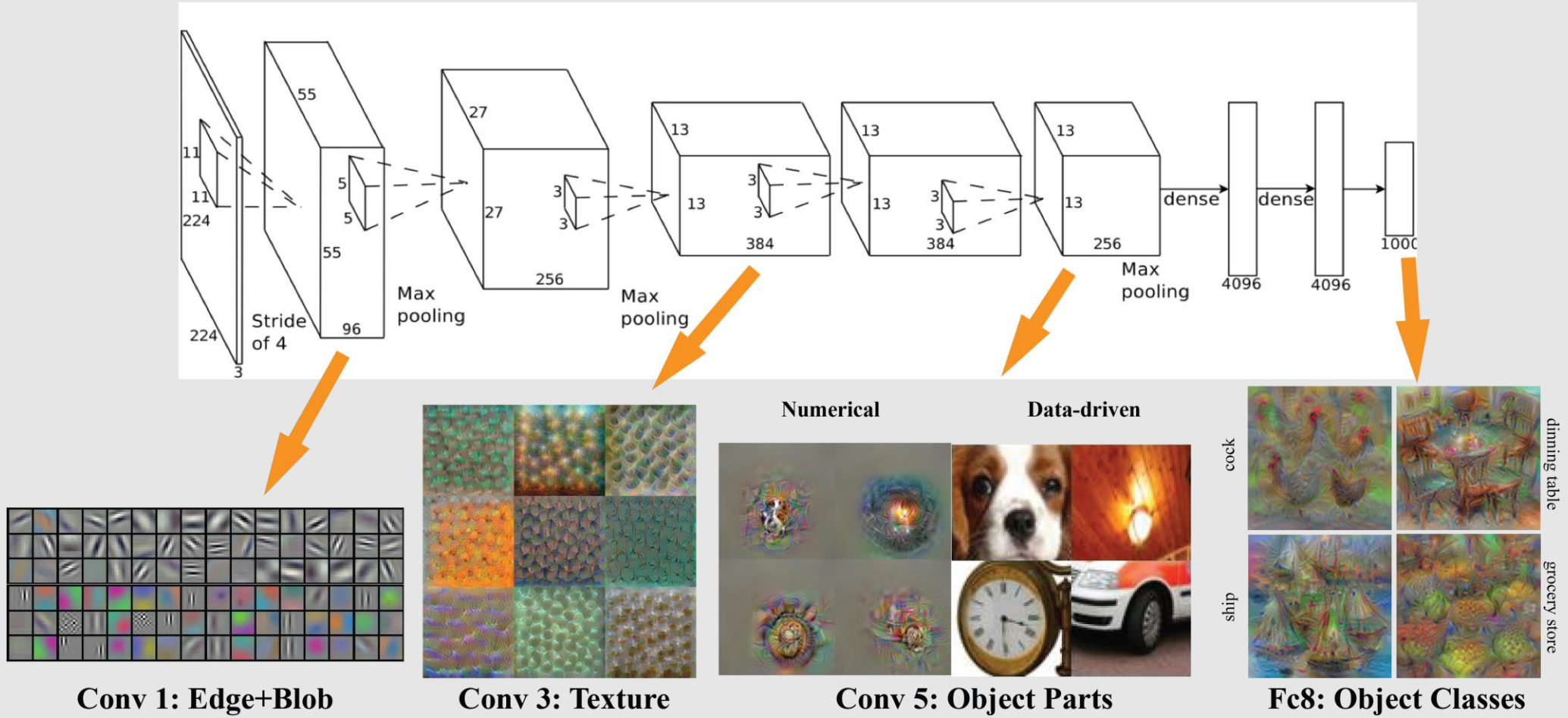
ResNet



DenseNet

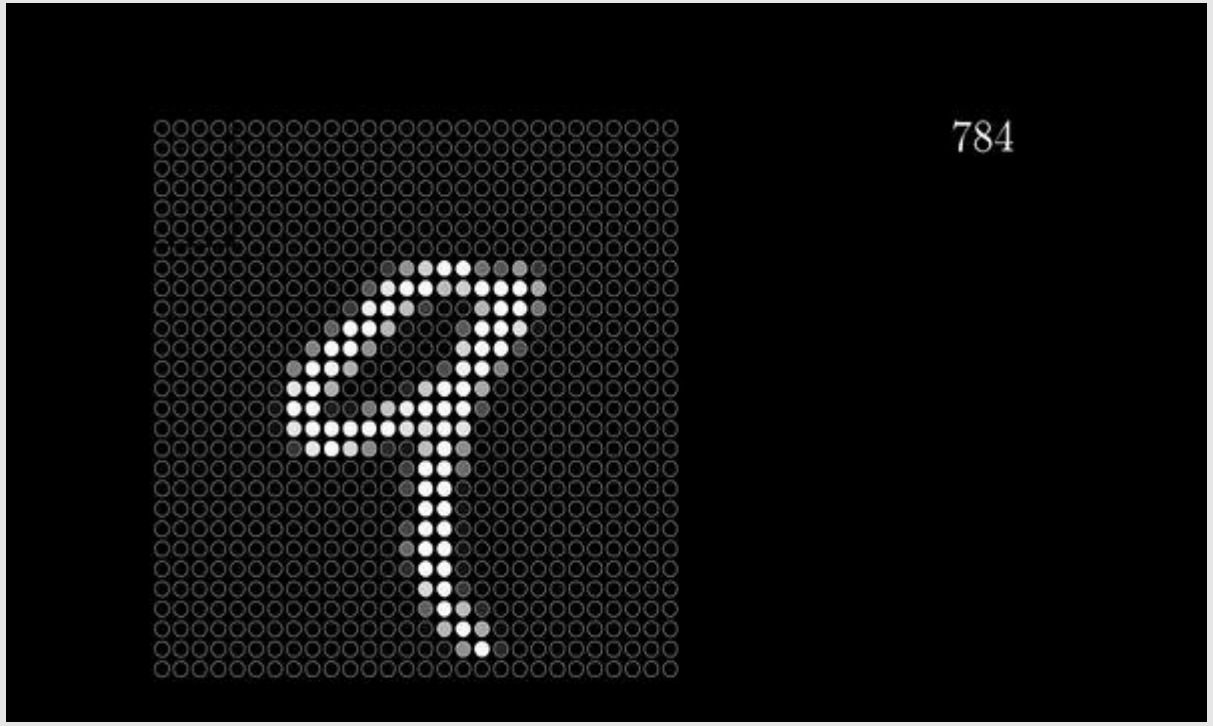


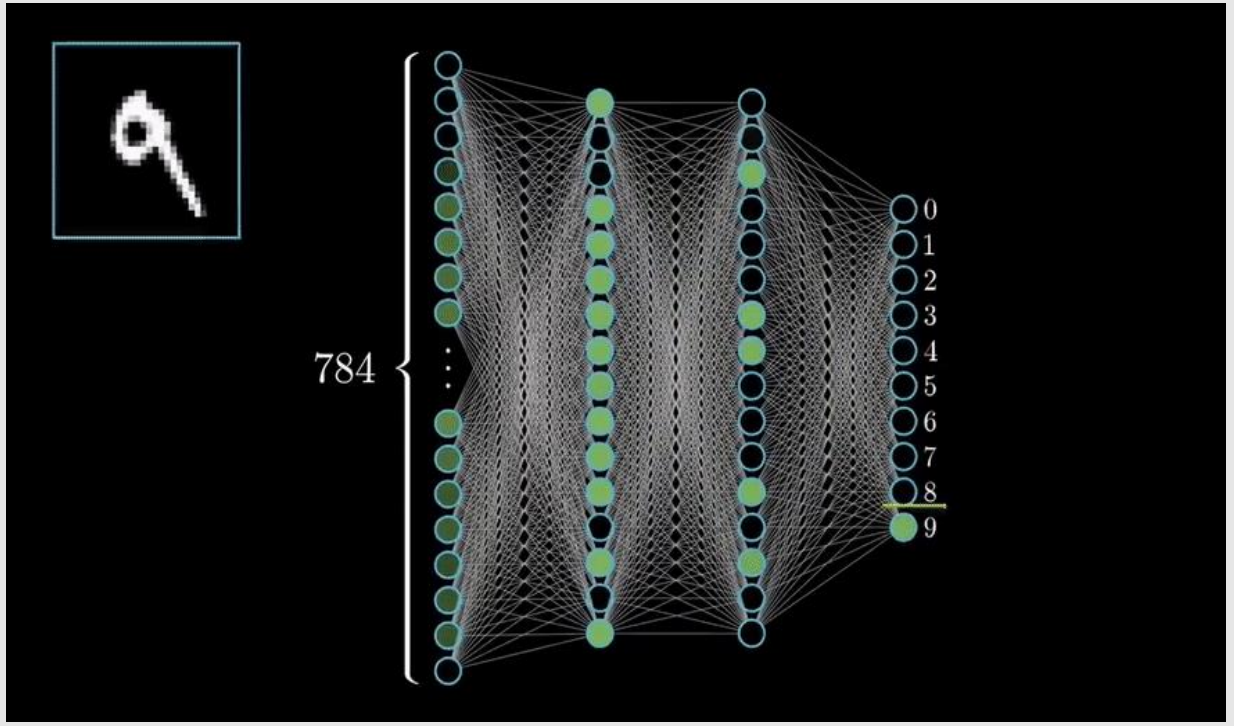
Different layers different semantic representation



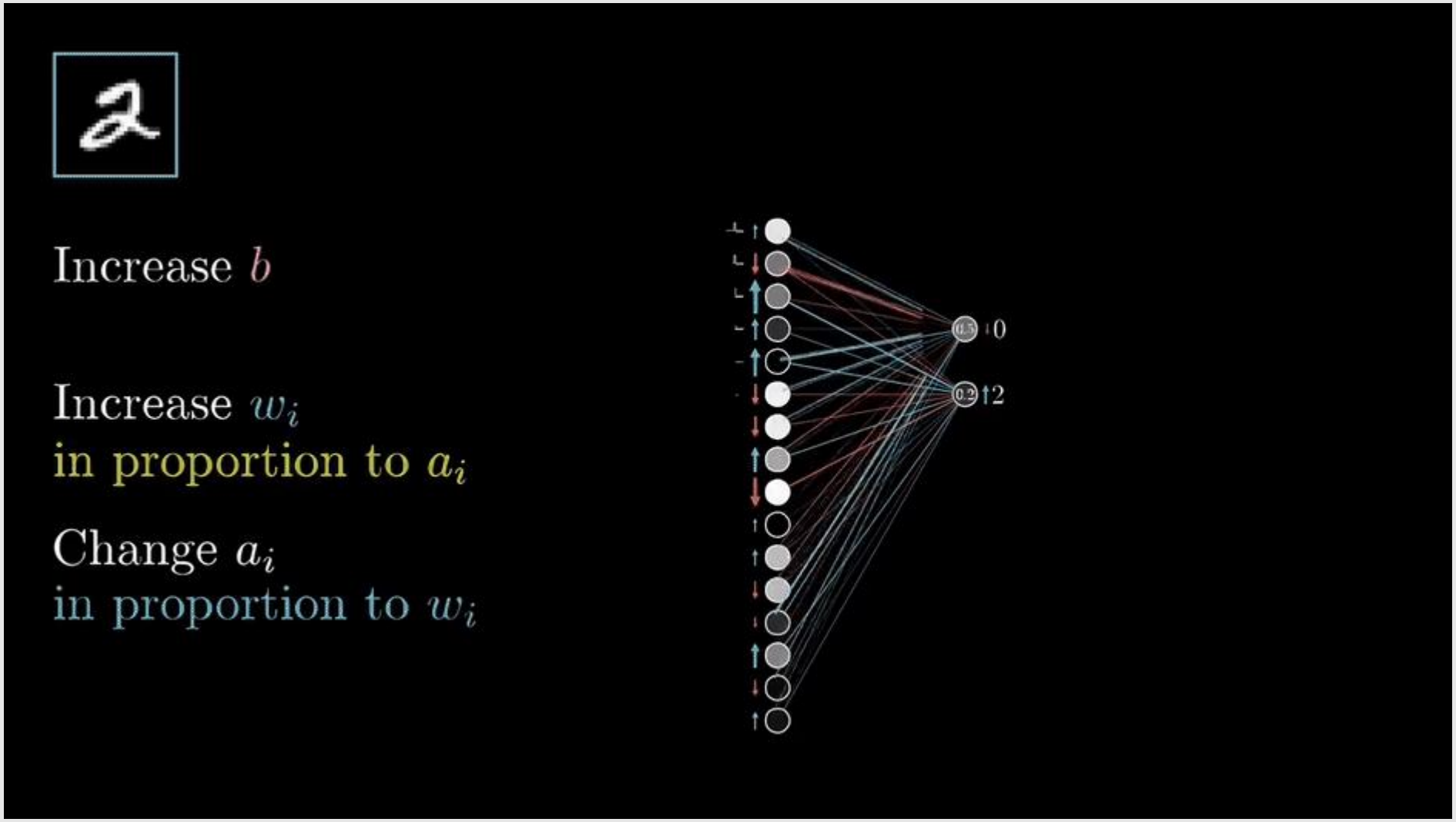
[Erhan et al., Simonyan et al., Zhou et al.] (2015)

How does a NN propagate input values across layers?

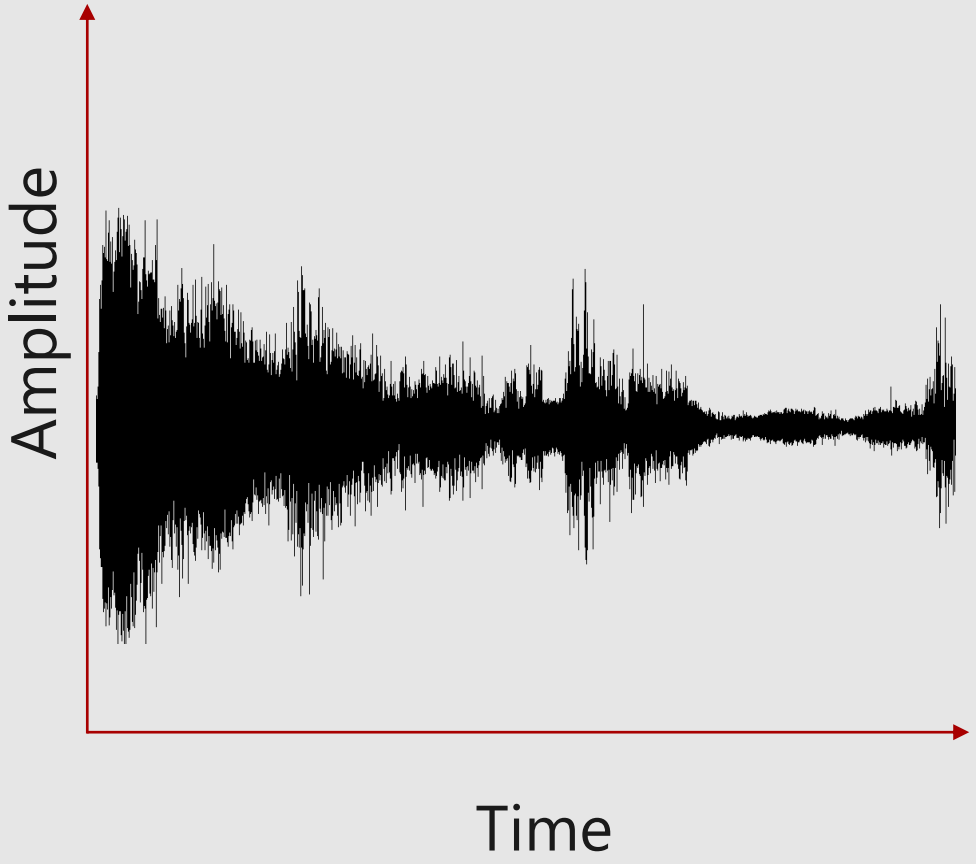




How does backpropagation work?

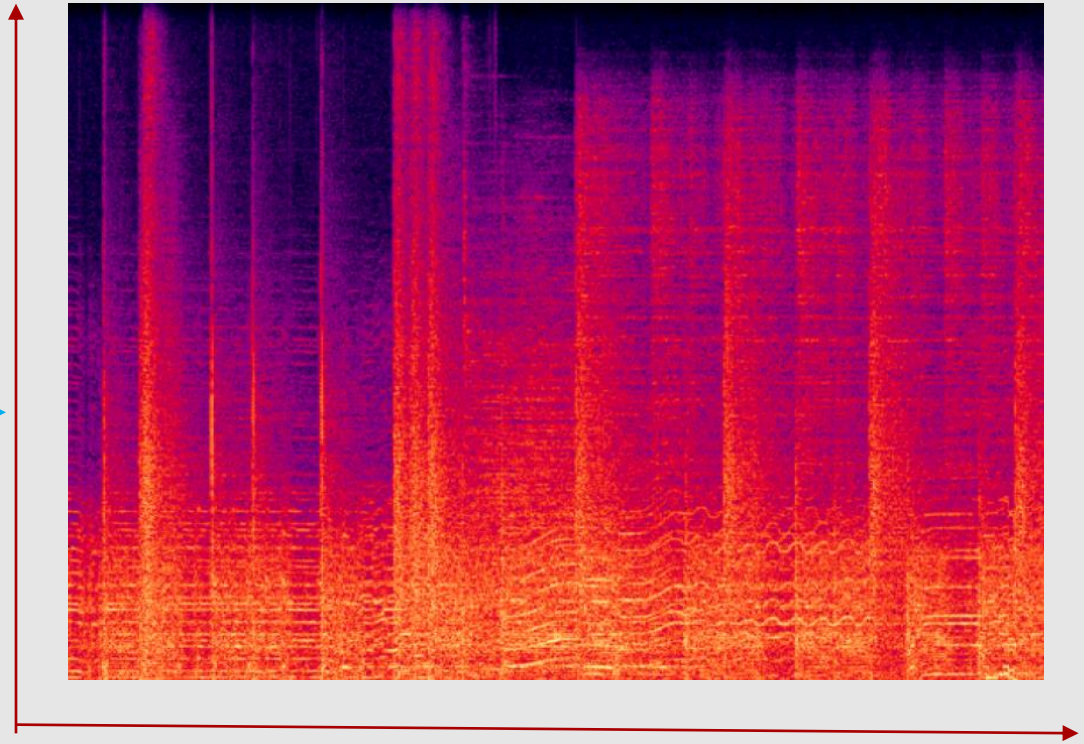


From wave to spectrogram




```
array([-0.02746582, -0.02560425, -0.02203369, -0.01846313, . . .])
```

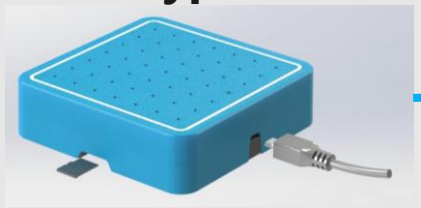
Color = amplitude



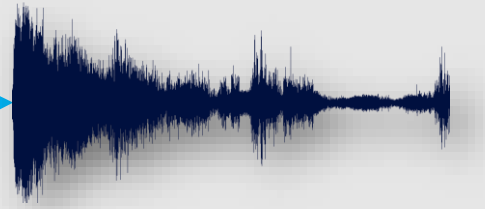

```
array([[1.52478102e+00, 2.05976986e+00, 1.26201334e+00, ...],
       [2.96875731e+00, 7.89774332e+00, 2.15371033e+01, ...],
       [1.30643798e+01, 9.32107594e+00, 8.57415558e+00, ...],
        .
        .
        .                                                  ]])
```

High-Level Solution – CNN Model

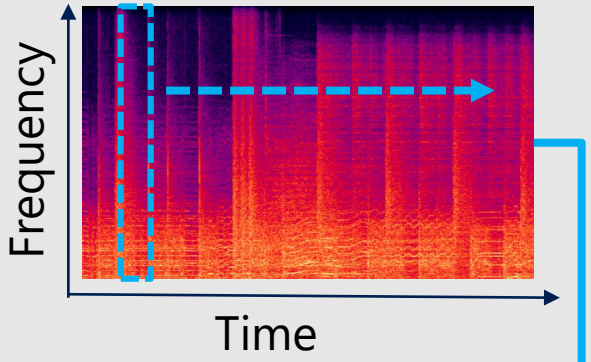
1) Prototype Device



2) Raw Audio Format

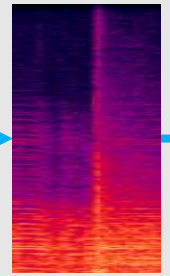


3) Log-Mel Spectrogram

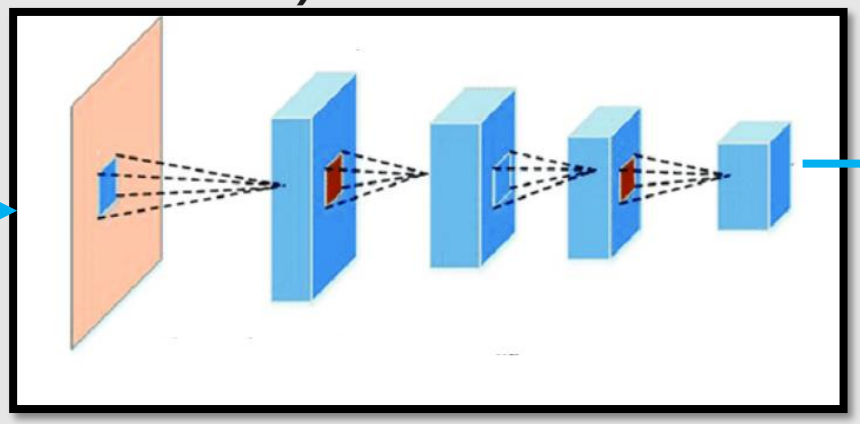


4) Concatenate several spectrogram slices (0.1 sec each)

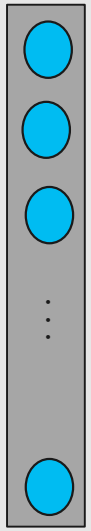
1-second
(10x64)



5) CNN Model



Prediction Vector



Link to hands-on workshop

Github:
https://github.com/thinkgradient/Getting-started-with-ml-dl

Resources

The most complete chart of Neural Networks explained:
https://towardsdatascience.com/the-mostly-complete-chart-of-neural-networks-explained-3fb6f2367464

Understanding Neural Networks, from neuron to RNN, CNN, and Deep Learning
https://towardsdatascience.com/understanding-neural-networks-from-neuron-to-rnn-cnn-and-deep-learning-cd88e90e0a90

Deep Learning Specialization
https://www.deeplearning.ai/

Making neural nets uncool again
https://www.fast.ai/

CS231n: Convolutional Neural Networks for Visual Recognition (Stanford University)
http://cs231n.stanford.edu/

CS230 Deep Learning (Stanford University)
http://cs230.stanford.edu/syllabus/

Getting Started With ML and Deep Learning Frameworks
https://github.com/thinkgradient/Getting-started-with-ml-dl

ThinkGradient's Medium publication
https://medium.com/thinkgradient

ThinkGradient ML projects / collaboration
https://www.thinkgradient.com/