WELCOME TO INTRODUCTION TO DEEP LEARNING

Theory and Practice using Watson Visual Recognition

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bit.ly/wplwatsonstudio

Introductions

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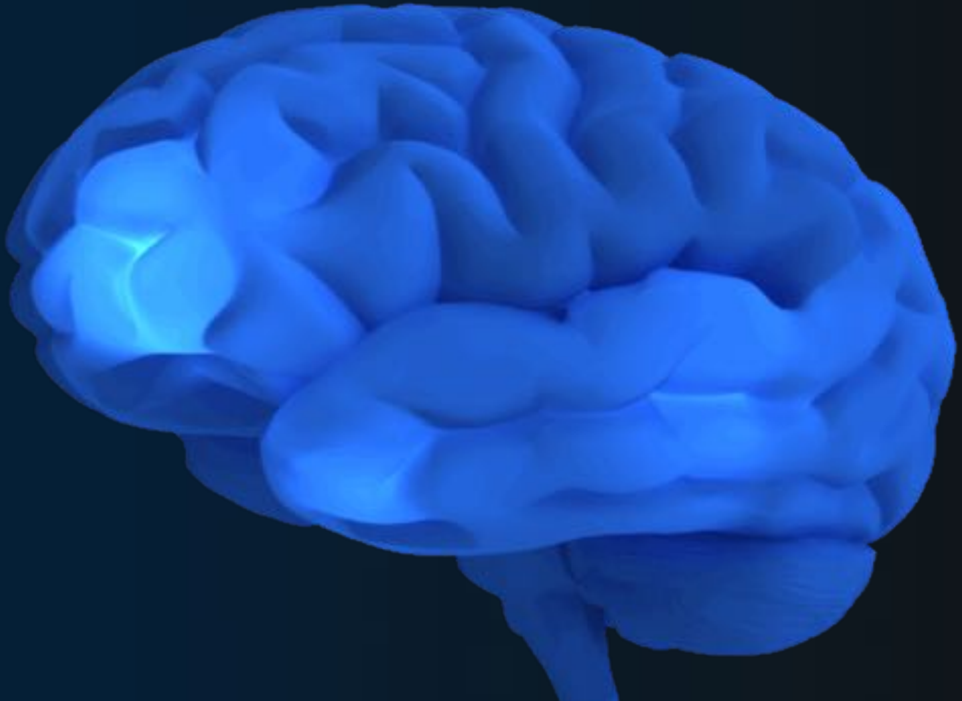
Agenda

1. Deep Learning Theory
2. Why Deep Learning
3. Neural Networks
4. Watson Visual Recognition Workshop



Deep Learning Introduction

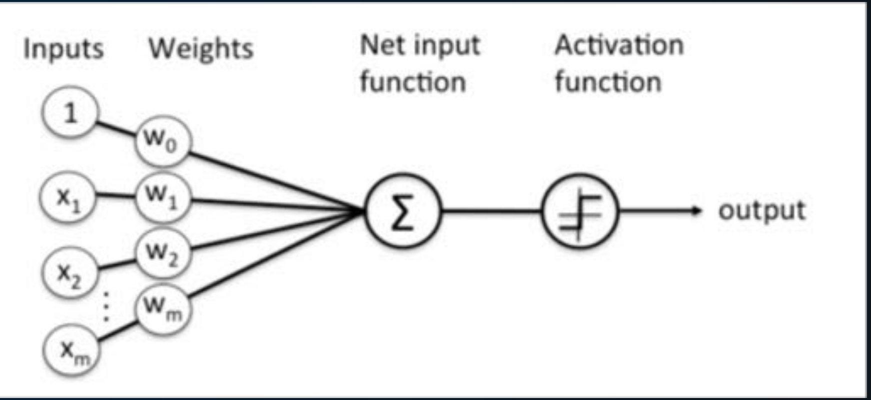
Deep Learning is inspired by the human brain, it attempts to mimic the activity in layers of neurons in the human brain where thinking occurs.

Deep Learning is...

- a collection of statistical machine learning techniques
- used to learn feature hierarchies
- based on artificial neural networks

Deep Learning Introduction

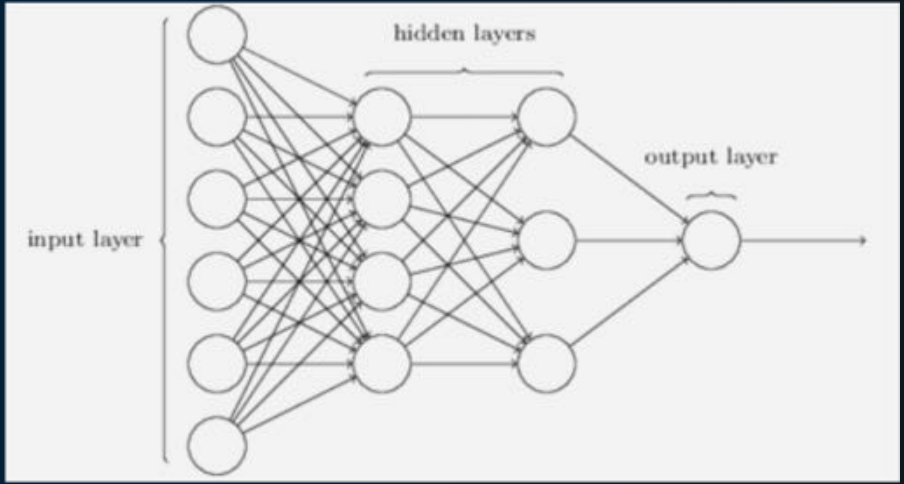
Activation of a neuron



The output from the neuron is a real number between 0 and 1

The neural net "learns" by tweaking the weights and biases step by step until the prediction closely matches the correct output, i.e. minimize the "cost value"

Deep Learning Introduction



Forward Propagation

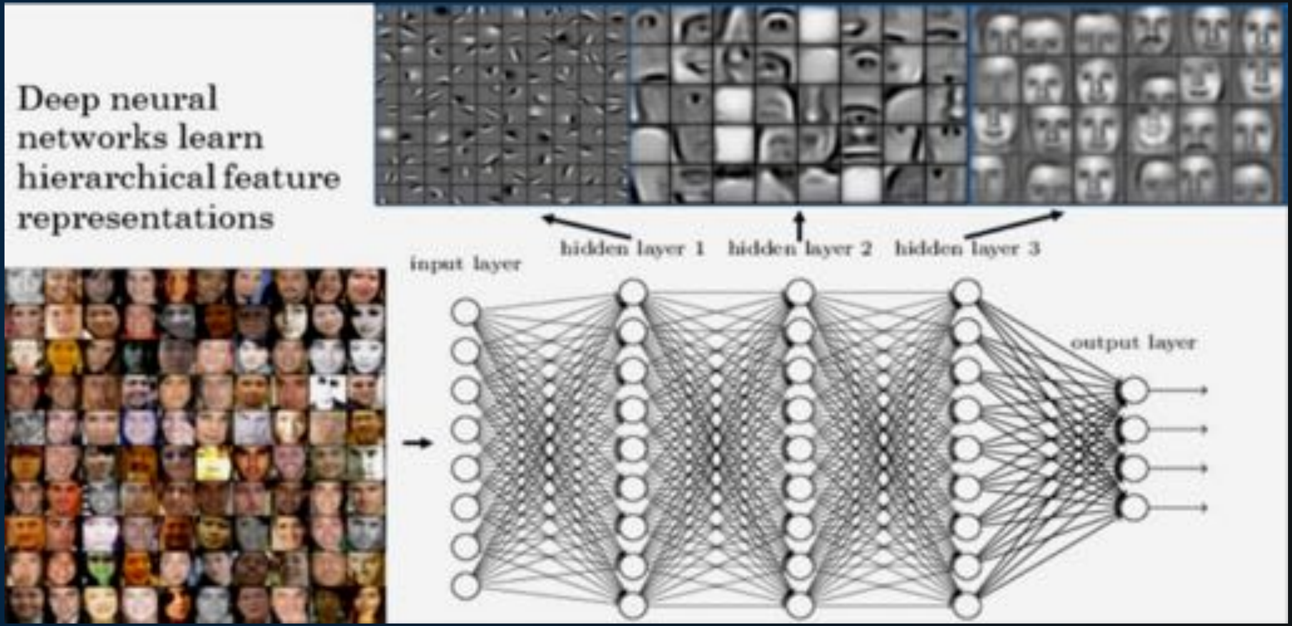
Scores are passed on as input to the next layer

Input layer: Ingest input values, e.g. pixels of an image, vital statistics of a patient

Output layer: The predicted value. e.g. the category of the image or if the patient is sick

Deep Learning Introduction

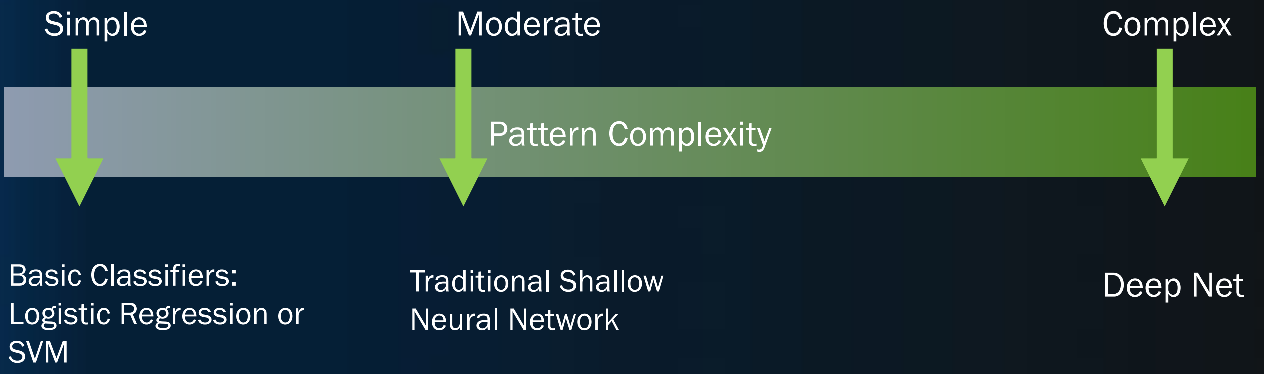
Deep Learning algorithms learn “Feature Hierarchies” as they progresses through their hidden layers



Why the need for Deep Learning?

Why Deep Learning? Why now?

DL algorithms learn more complex patterns than is possible with traditional machine learning algorithms



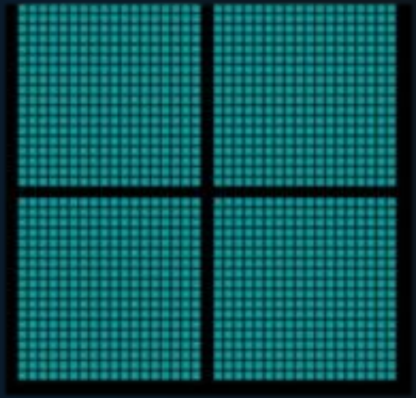
- Increased availability of labelled data
- Deep nets take a long time to train
- Availability of high performance GPUs speeds up training of a deep net
- GPU is approximately 250 times faster than CPU, i.e. the difference between one day of training and over eight months.

Make me a Lego shark!

Make me a Lego shark with deep learning

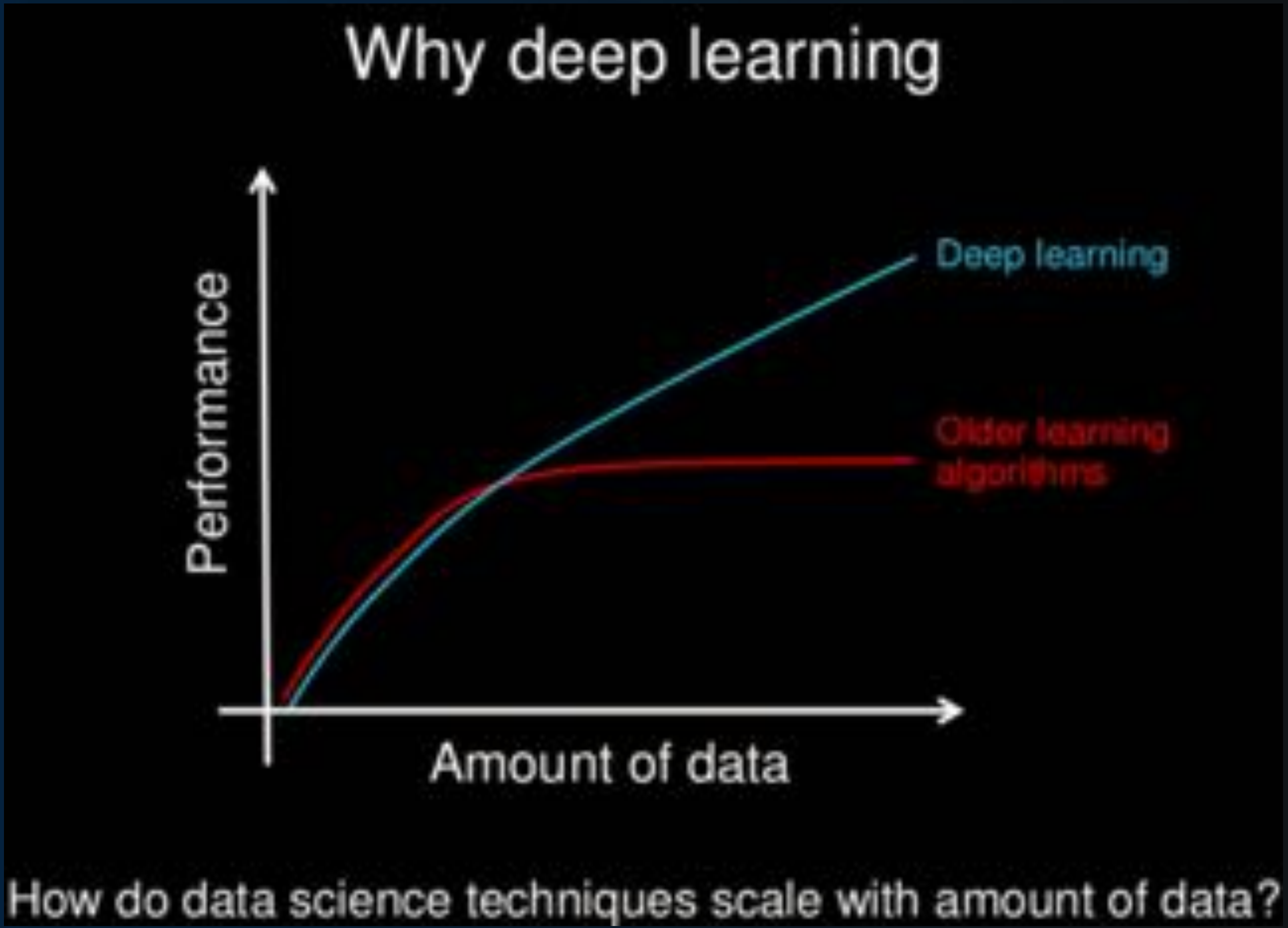
What’s the difference between CPU’s and GPU’s?

CPU
Multiple Cores



GPU
Thousands of Cores

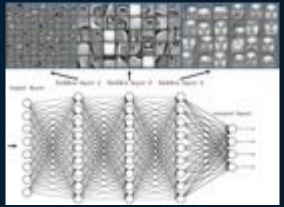
https://www.youtube.com/watch?v=-P28LKWTzrI


Why deep learning
Performance
Amount of data
Deep learning
Older learning algorithms
How do data science techniques scale with amount of data?

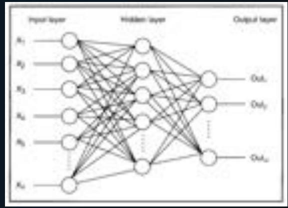
Deep Learning is…

- a collection of statistical machine learning techniques
  - *Deep Boltzmann Machine (DBM)*
  - *Deep Belief Networks (DBN)*
  - *Recurrent Neural Networks (RNN)*
  - *Convolutional Neural Networks (CNN), etc.*

- used to learn feature hierarchies



- based on artificial neural networks



How does it work?

Let's get started… with a QUIZ!!

Do you see a Cat or a Dog?

Where is the cat?

What is the cat doing?

Deep Learning is structured to be effective in problem domains which have an inherently Hierarchical Composition

VISION

pixels -> edge -> texton -> motif -> part -> object

e.g. self-driving cars, reading medical images

SPEECH

sample -> spectral band -> formant -> motif -> phone -> word

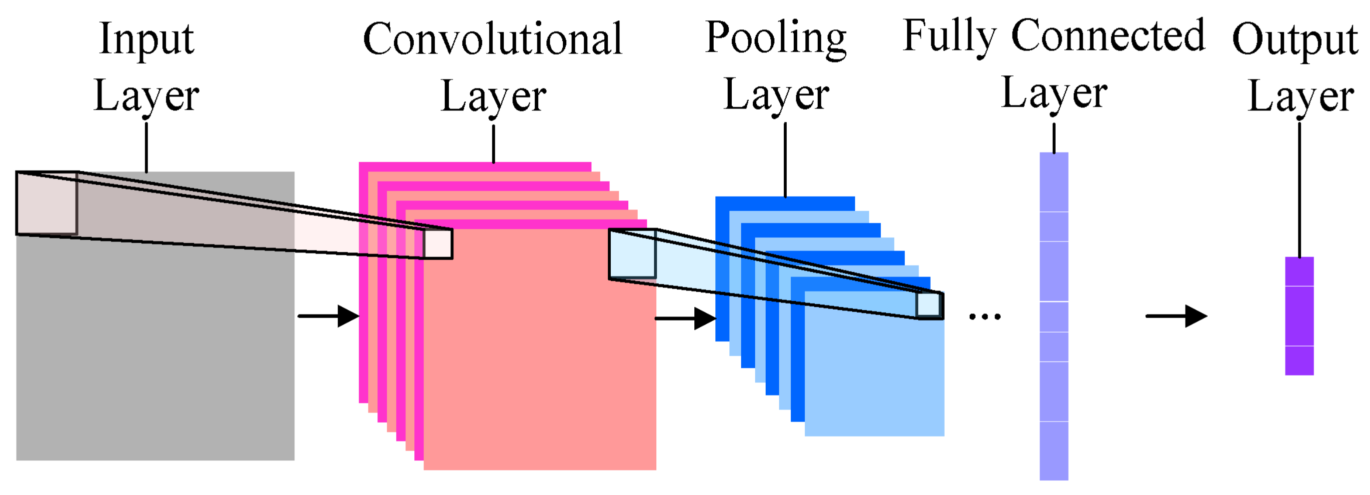
e.g. Alexa

NATURAL LANGUAGE PROCESSING

character -> word -> clause -> sentence -> story

e.g. DeepText: Facebook's text understanding engine

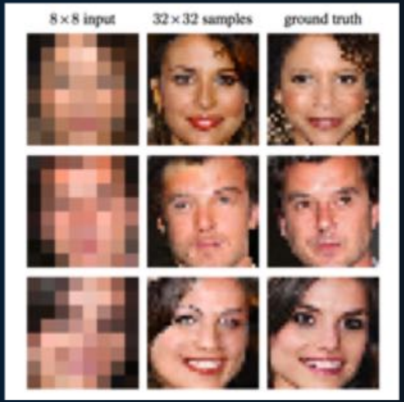
Convolutional Neural Networks



Input

Use Cases

Restore Colors to B/W Photos



Pixel Restoration: CSI Style

Self Driving Cars

Hands-on Workshop

Lab Guide

http://bit.ly/wplwvrlab