DL+CV

Session 0

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Session Outline

- Course Outcomes
- Introduction: The Buzzwords
- Resources: Courses, Books, Blogs, etc.,
- Neural Networks: The Basics
- Coding Session
- Course Repository

Course Outcomes

At the end of this course, you *may*

- get an idea about this field and the necessity of the research conducted
- explore various applications deep learning (DL) is used in
- understand and code in some of the softwares used for DL
- know how and where to continue learning about DL

Introduction

The Buzzwords

What is...

- Deep Learning
  - A type of ML that uses Neural Networks
- Machine Learning
  - Teaching the machine to predict “something”
- Neural Networks
  - Algorithms that mathematically mimic the human brain’s neurons (not entirely)
  - Intertwined with neuroscience
- Computer Vision
  - Using image processing to understand the real-world -- image understanding

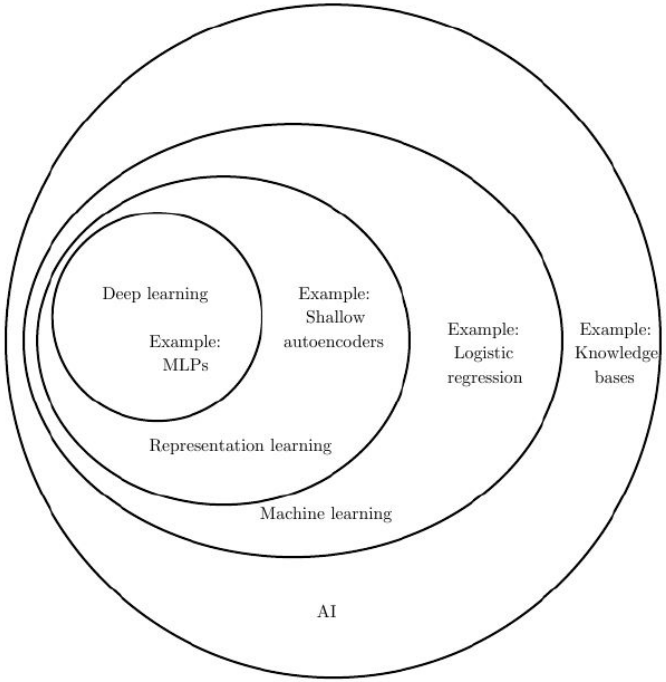


Figure 1.4: A Venn diagram showing how deep learning is a kind of representation learning, which is in turn a kind of machine learning, which is used for many but not all approaches to AI. Each section of the Venn diagram includes an example of an AI technology.

Resources

Courses, Books, Blogs, etc.,

Courses

- Short:
  - Deep Learning Specialization on Coursera
  - Apply financial aid for each course -- this way your assignments get evaluated
  - Enter $0 in your income
  - Answer the two questions honestly by mentioning how broke you are
- Long:
  - CS231n
  - 2017’s edition: https://www.youtube.com/playlist?list=PL3FW7Lu3i5JvHM8ljYj-zLfQRF3EO8sYv
  - Recommended

Books

- Image Processing:
  - “Digital Image Processing” by Rafael C. Gonzalez and Richard E. Woods
- Computer Vision:
  - “Computer Vision: Algorithms and Applications” by Richard Szeliski
- Deep Learning:
  - “Deep Learning” by Ian Goodfellow, Yoshua Bengio, Aaron Courville

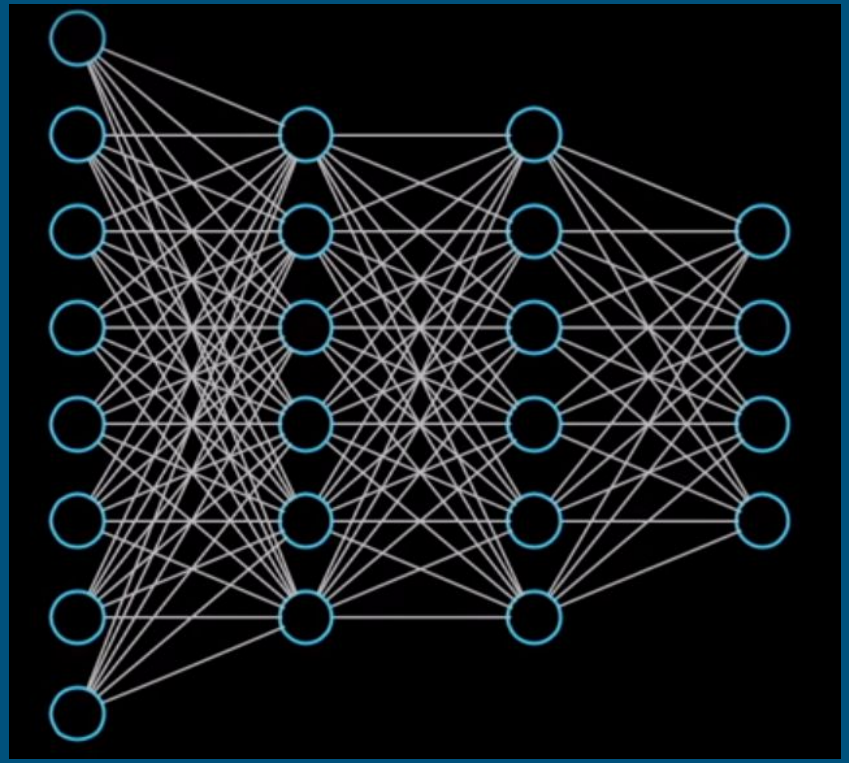
Blogs

- Computer Vision:
  - http://www.computervisionblog.com/
  - https://www.pyimagesearch.com/
  - https://www.learnopencv.com/
  - https://github.com/jbhuang0604/awesome-computer-vision
- Deep Learning:
  - http://karpathy.github.io/, https://medium.com/@karpathy
  - http://blog.echen.me/
  - https://openai.com/blog/ (AI, RL, & DL)
  - https://ai.googleblog.com/
  - https://github.com/ChristosChristofidis/awesome-deep-learning

Neural Networks

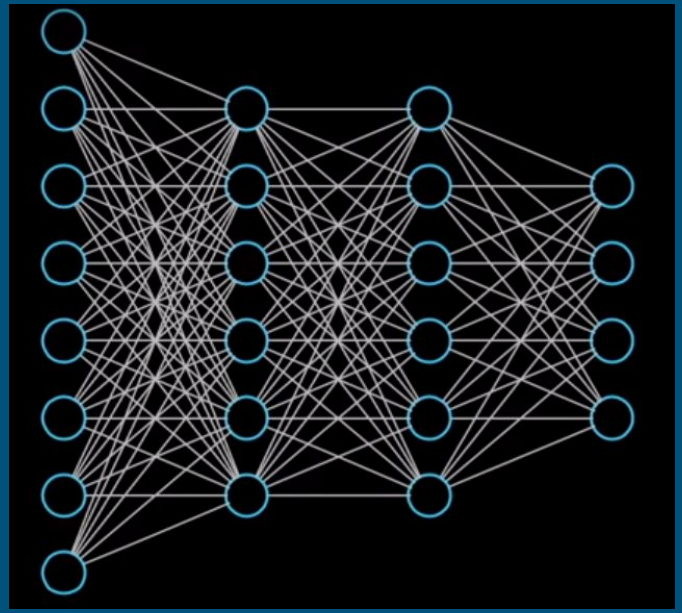
The Basics

What it looks like



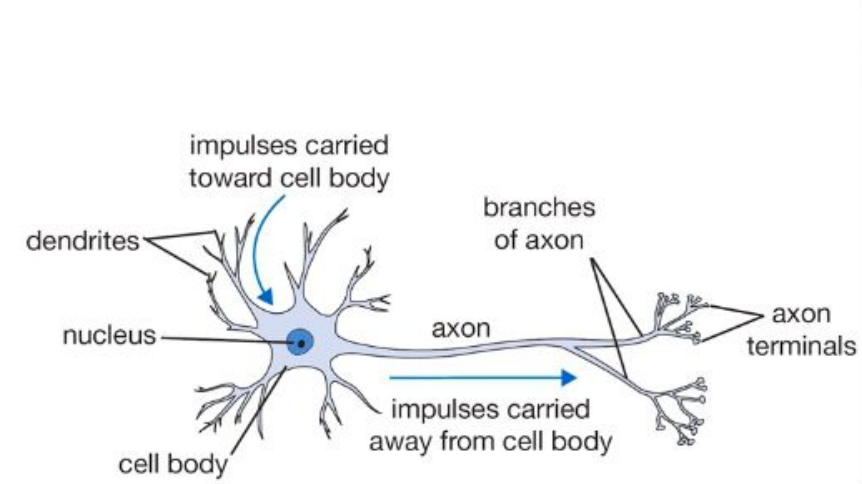
Source: 3Blue1Brown

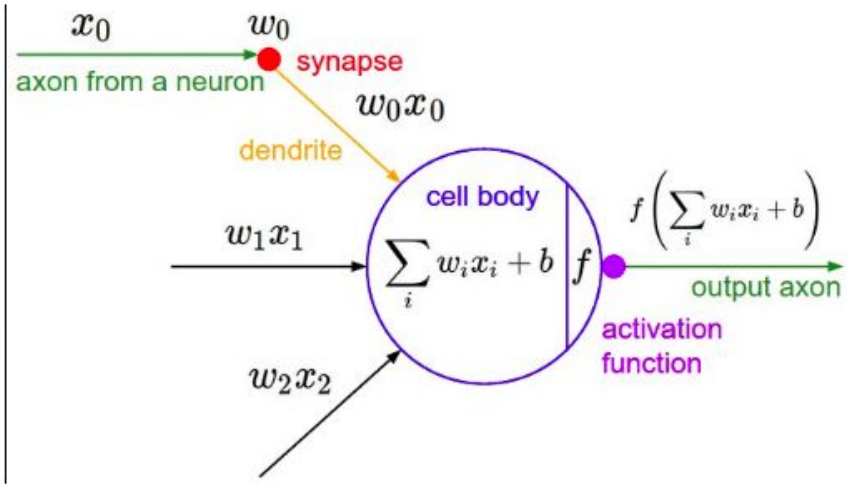
Forward Propagation



- Pictured: 2 hidden layers
- Propagation from one layer to the next is governed by firing of the neurons through **activation functions**

Neuron: Biological vs Computer-generated

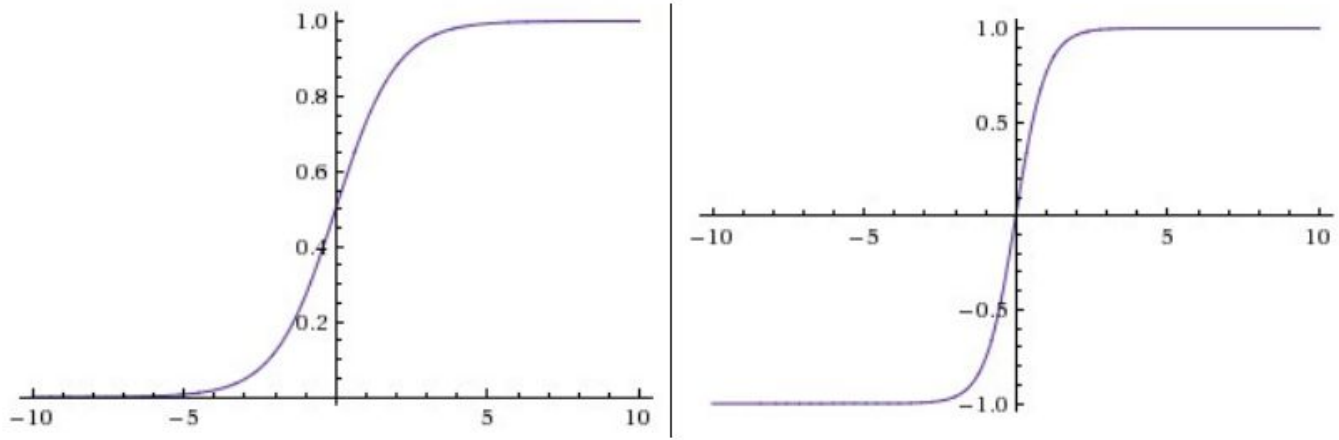




A cartoon drawing of a biological neuron (left) and its mathematical model (right).

Source: CS231n

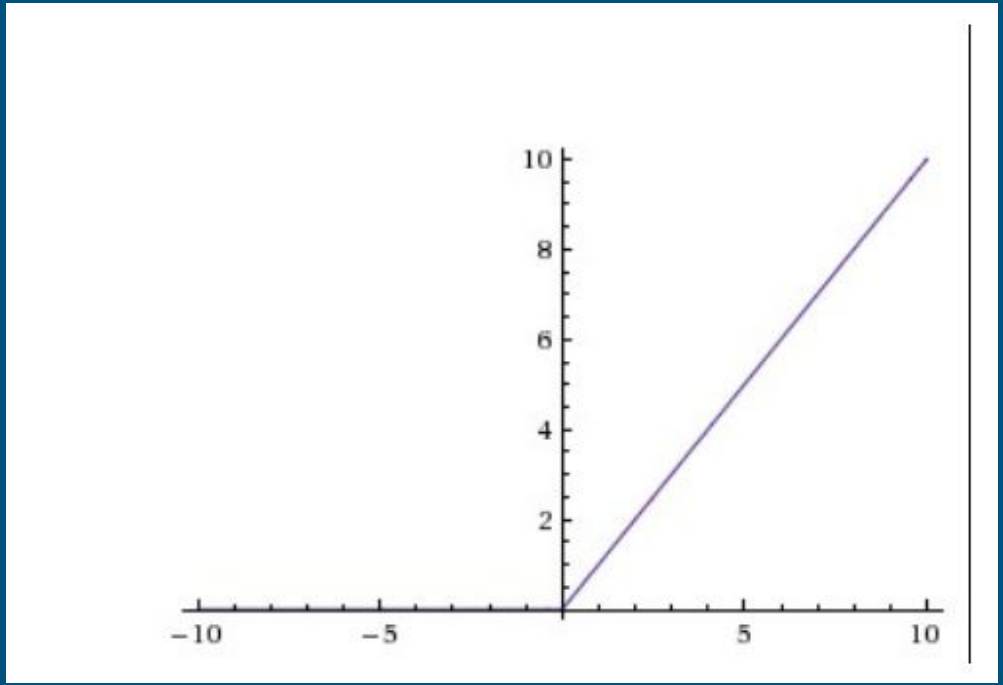
Activation Functions



Left: Sigmoid non-linearity squashes real numbers to range between [0,1] **Right:** The tanh non-linearity squashes real numbers to range between [-1,1].

Source: CS231n

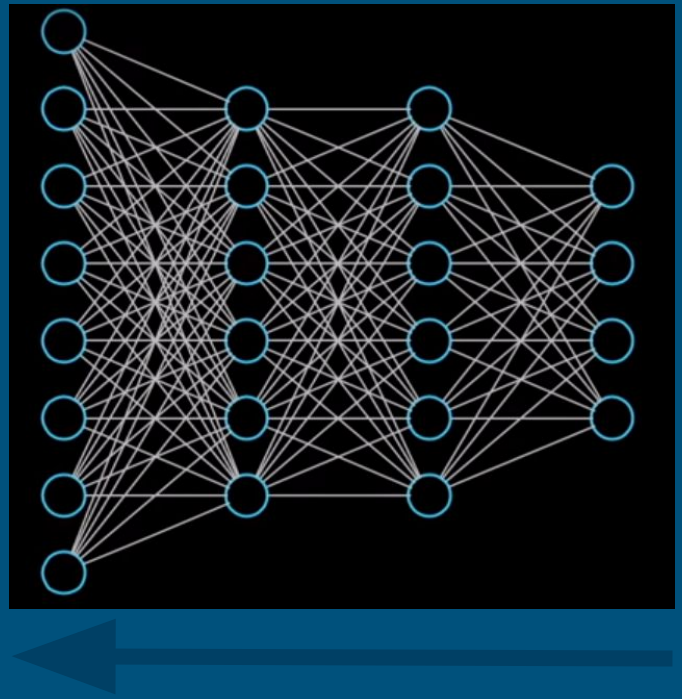
Activation Functions



Pictured: Rectified Linear Unit (ReLU)

Source: CS231n

Backward Propagation



- Pictured: 2 hidden layers
- Propagation from one layer to the next is governed by gradients/derivatives at each neuron

Coding Session

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Course Repository

About the Repository

- This is the repo:
  - https://github.com/techclubssn/DL-CV-2020
- All course materials will be uploaded here
  - PPTs, Codes, Assignment Information, etc.,
- Create a GitHub account and fork the DL+CV-2020 repository into your account
- All assignments must be submitted as a document
  - Use LaTeX (**recommended**, this link is the starting point of a series of guides explaining the basics of LaTeX) or
  - Use MS Word/other word processing software

Thank you!