
PLURALSIGHT

Introduction to Artificial Intelligence

Welcome!

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Instructor, Pluralsight

Agenda

- Today:
  - Unsupervised Learning
  - Deep Learning with Neural Networks
- The rest of the week:
  - Reinforcement Learning
  - Applications and Capstone Project



Today's Schedule

9:00 am - 12:00 pm PT Deep Learning with Neural Networks I

- Lecture
- Lab

9:50 am - 10:00 am PT Break

Lunch 12:00 - 1 PM PT

1:00 - 2:50 PM PT Deep Learning with Neural Networks II

- Lecture
- Lab

Break 2:50 - 3:00 pm PT

3:00 - 5:00 PM PT Intro to Reinforcement Learning

- Lecture
- Lab

How we're going to work together

- You'll have a copy of the course materials shortly
  - We'll be using Jupyter notebooks again

- You'll be following along in the notebook and..
  - doing coding exercises/labs inside the notebook as well

Today's Key Learning Objectives

- Develop intuition for how a Neural Network is trained and makes predictions
- Be able to build an example neural network with keras
- Define what reinforcement learning and its terminology
- Practice a reinforcement learning approach for a contextual bandits problem

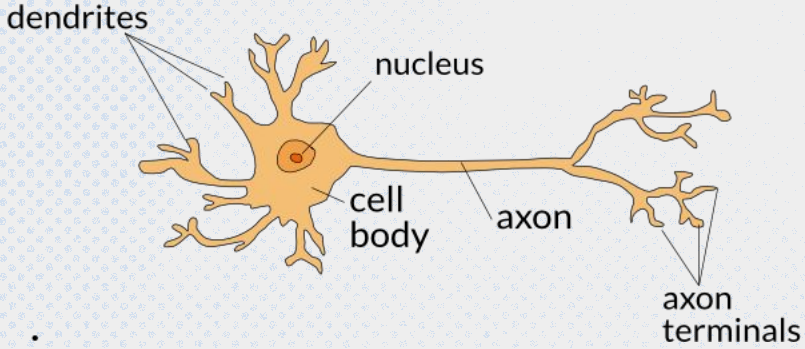
Neural Networks

Fast Facts

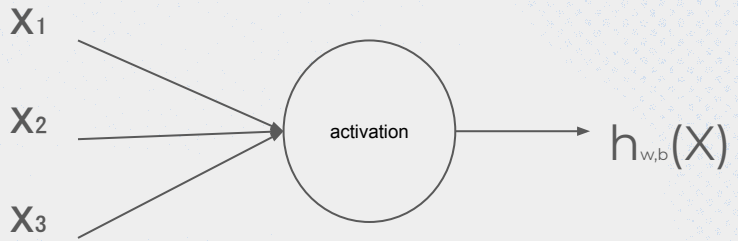
- Neural Nets have been around since the 1940s, but were not heavily used for their first 60 years
- Advancements in computer hardware & software for working with neural nets make them the pre-imminent machine learning approach today
- Applied to almost any machine learning task
- Can outperform humans for certain tasks previously thought impossible for a computer to do

Why are they called Neural Networks?

- While neural networks were first proposed by mathematicians, they get their name from their passing similarity to a neuron
- Neurons take multiple inputs, run them through an activation function, and pass an output:

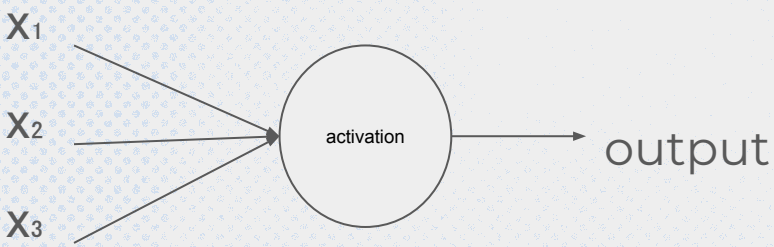


Perceptron



The Perceptron looks familiar, doesn't it?

- For the binary classification problem, the single perceptron looks very similar to our old friend, logistic regression:



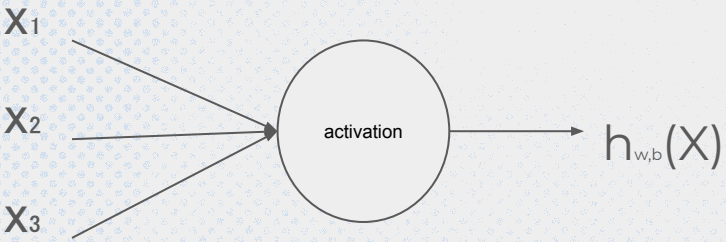
Perceptron

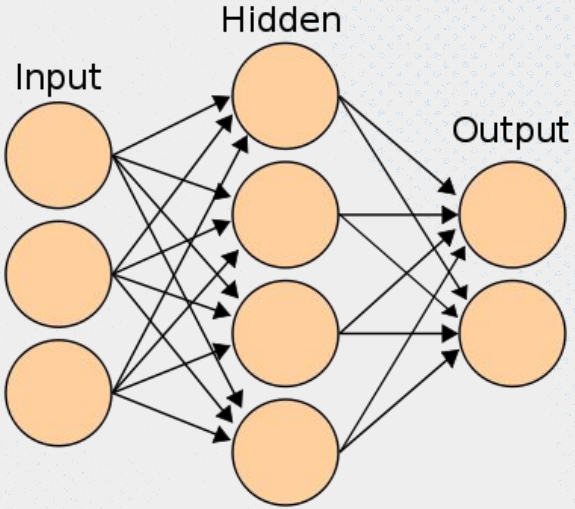
output
- 1 if $\frac{1}{1+e^{-(ax_1+bx_2+c)}} \geq 0.5$
- 0 if $\frac{1}{1+e^{-(ax_1+bx_2+c)}} < 0.5$

Network implies more than one, right?

- Similar to our brain, neural networks are made up of many neurons connected to each other in various ways
- Each Neural Network has at least 3 layers: input, hidden, and output
- You can choose # layers

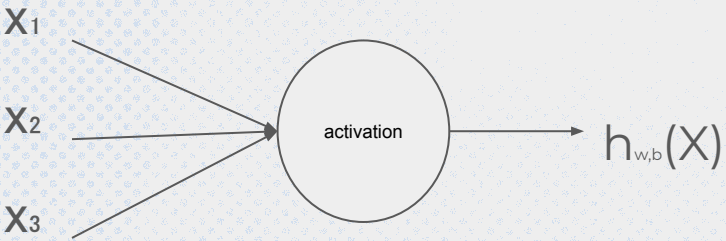
  & # perceptrons





Layers, Nodes, and Capacity

- Capacity is the term for how complex a pattern or relationship a given model can express.
- It's closely related to the bias-variance tradeoff in that a model with low capacity could have high bias and be underfitting data and underperforming in the evaluation step
- Which model would have greater learning capacity?



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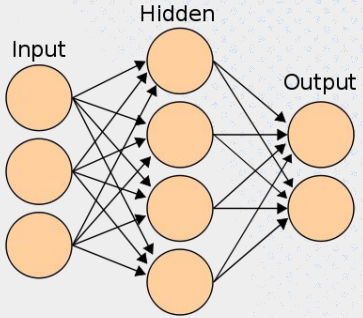
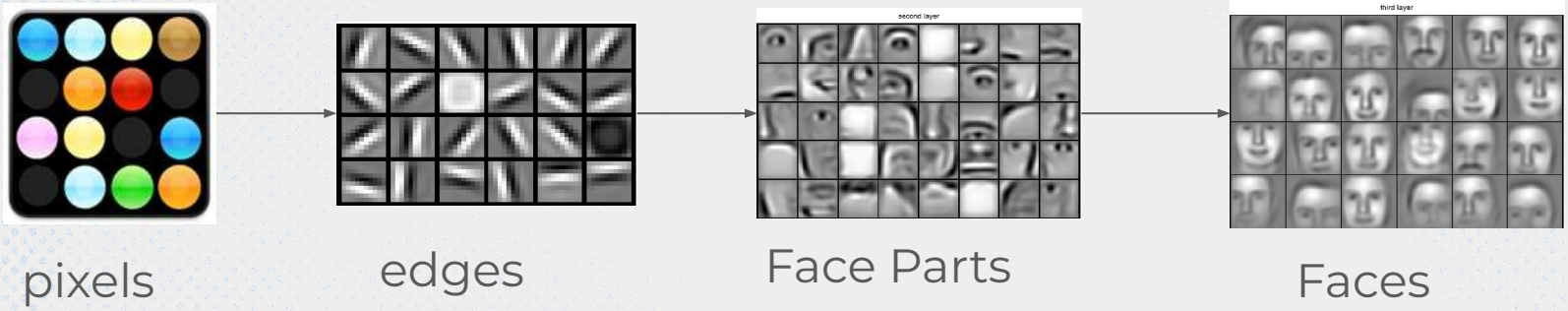


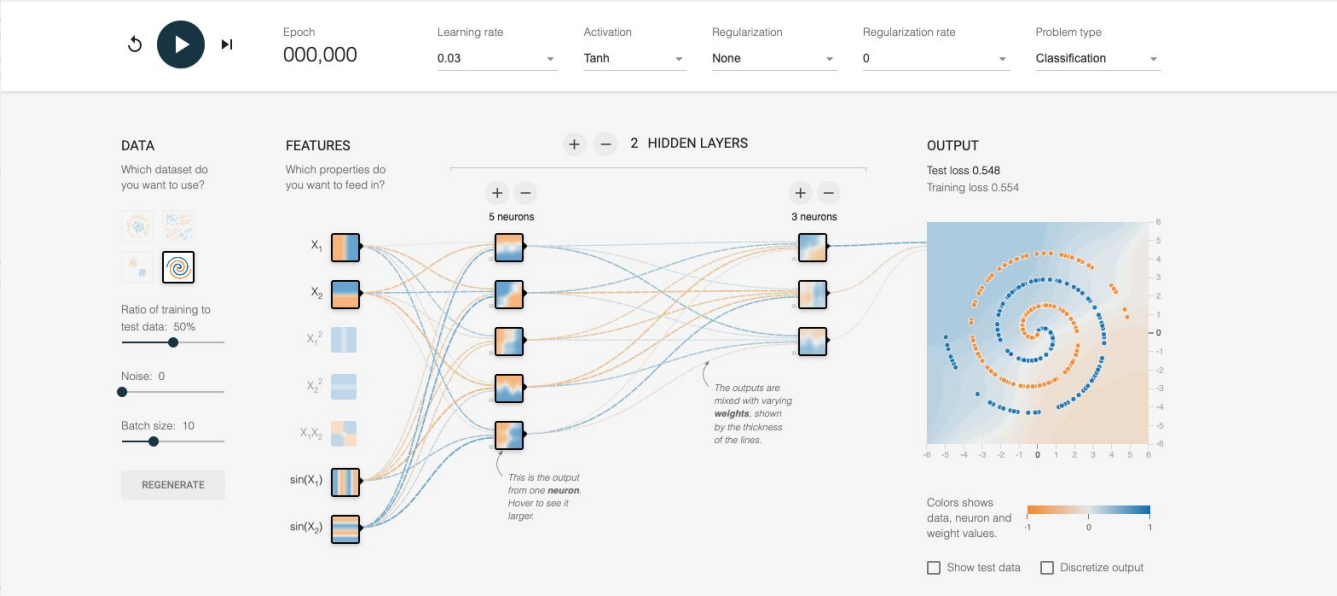
Why add layers?

You can think of the additional layers as finding other useful features from the interactions of your initial input layers



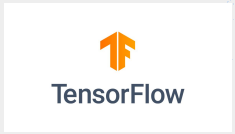
A Visual Example

- Go to [tensorflow playground](#) and illustrate a feed-forward neural network



Common Deep Learning Libraries

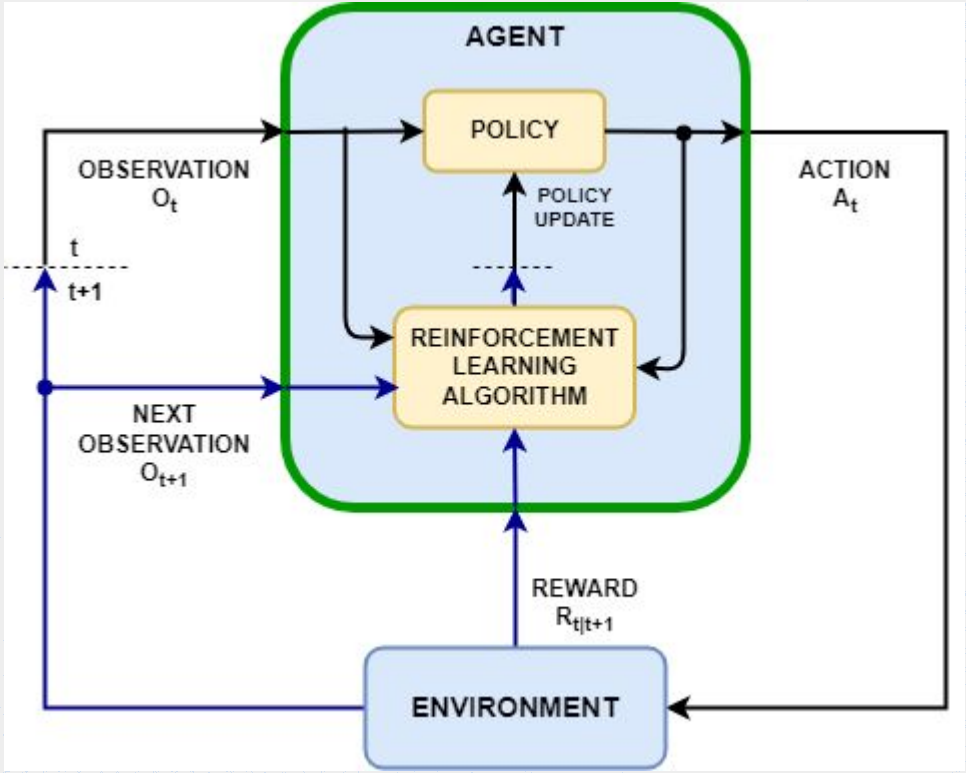
- Pytorch (meta / facebook) and tensorflow (google) are the 2 most popular deep learning frameworks for python
- Keras simplifies development and is therefore useful in our introductory course



Reinforcement Learning

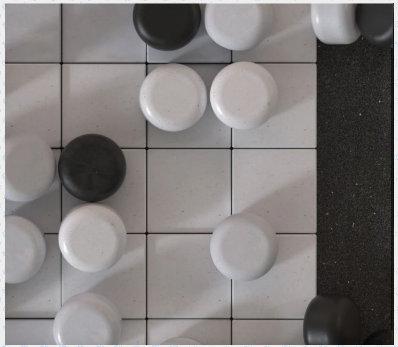
Reinforcement Learning: an area of machine learning that trains an agent to take a suitable action to maximize reward in a particular situation

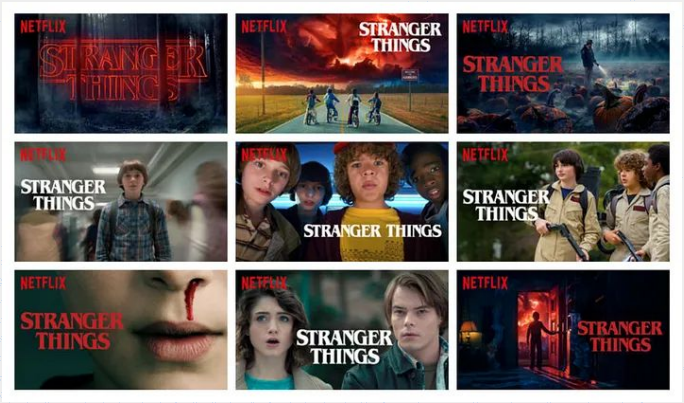
Agents?

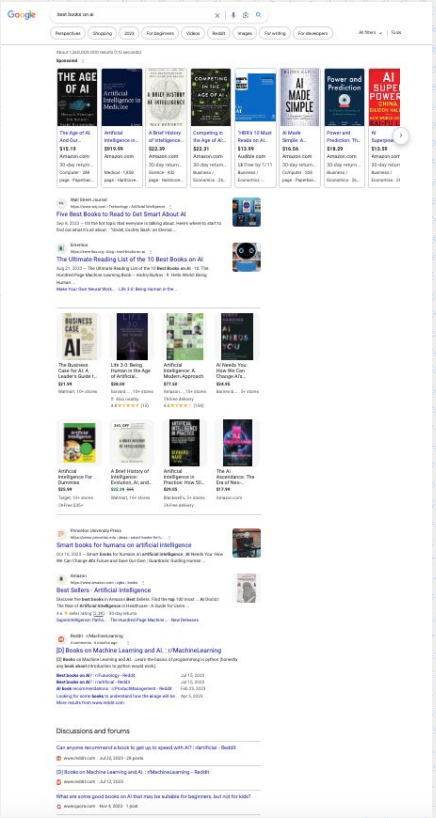


Examples of reinforcement learning

- Netflix Thumbnail Optimization
- New web pages in google search
- Alpha go







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Questions?

Thank you!

If you have any additional questions, please ask!If