APPLIED DATA SCIENCE II

Week 7: Neural Networks!

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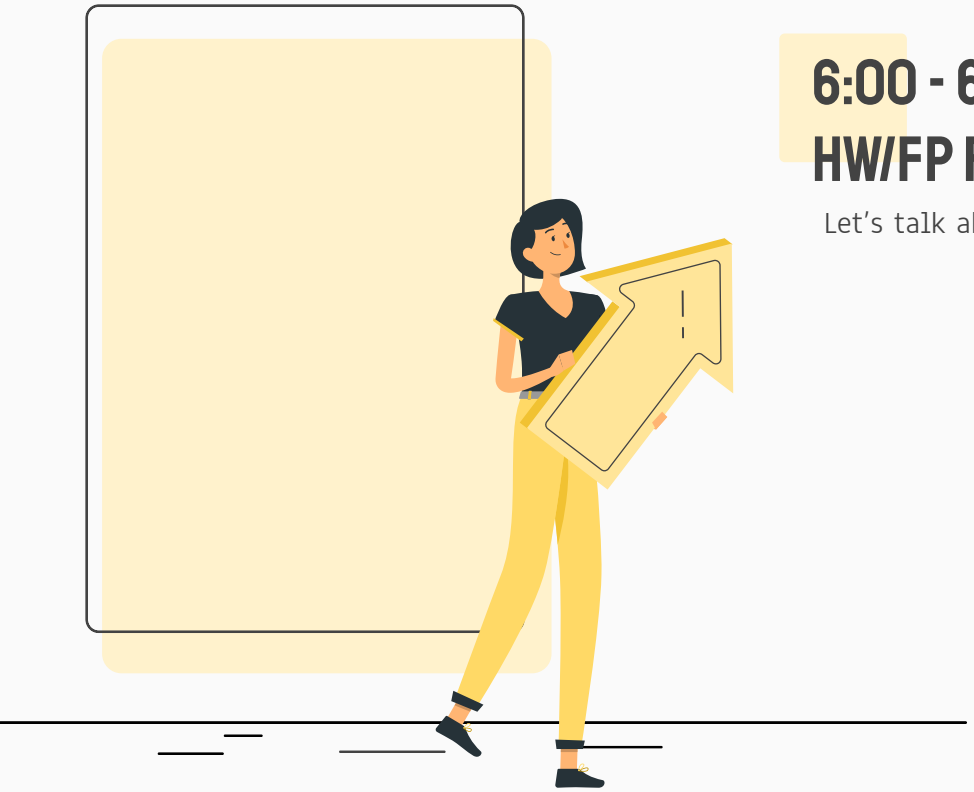
WI-22



6:00 - 6:30
HW/FP REVIEW!

Let's talk about it!

6:30-7:15
TOPIC + CODE!

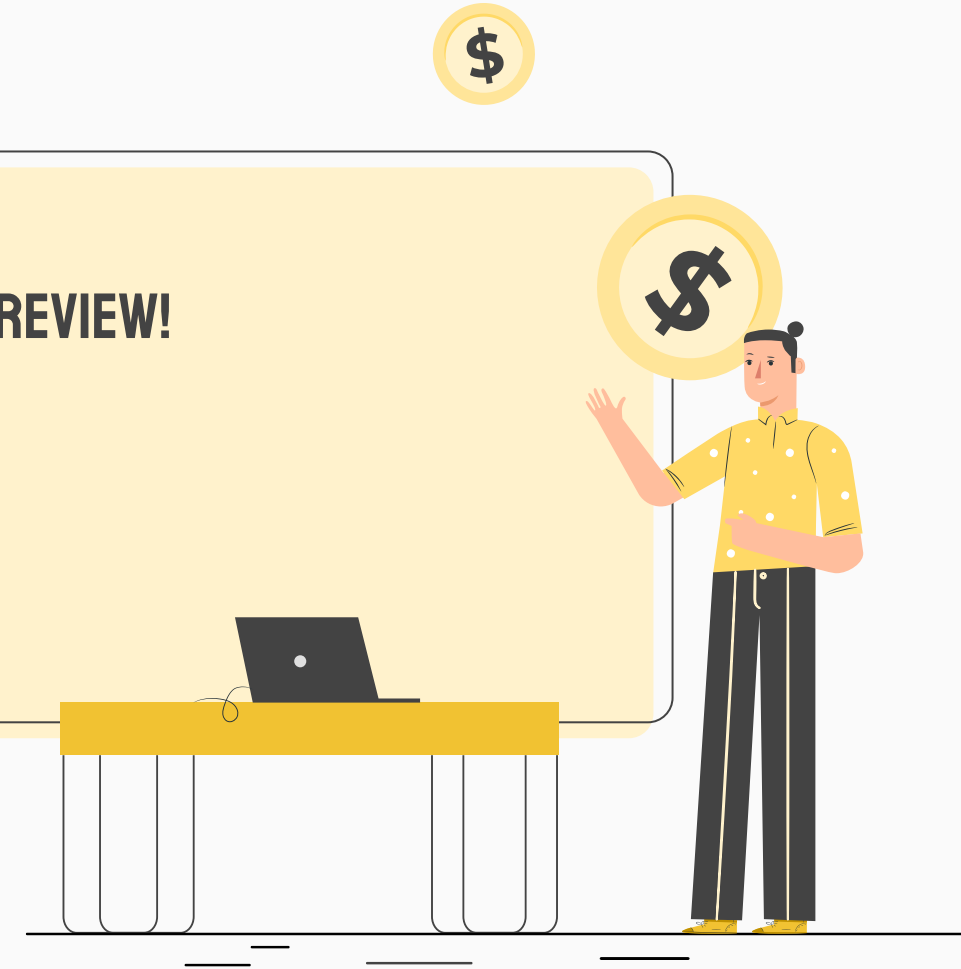
Let's take a brief look at neural networks

7:15-8:00
Q&A + WORK ON PROJECTS/CODE

Let's get kraken'

HW REVIEW!

FP REVIEW!



WHAT ARE THE FINAL PROJECT REQUIREMENTS?

Final Project Requirements:

- *You must use a skill that you learned in Applied Data Science II!*
  - *This could be a specific model type, could be the concept of training and splitting data or cross-validation, etc. Just must be a skill that you learned over the past few weeks!*

- *You must submit your write-up (code + commentary) in a way that is reproducible (i.e., you've got to submit the dataset too!).*
  - *There is no explicit length requirement - just make sure that you feel that you've done a thorough job.*

- *You must present you work to the class during our final class.*
  - *There is no explicit format - although some slides is probably the best way to do this. Plan to speak for about ~10 minutes with time for questions & answers!*

- *You must submit your final project before class begins on Tuesday, March 11th*

TOPIC OVERVIEW

DEEP LEARNING!

SO LET'S TALK ABOUT EVERYONE'S EXPERIENCE LAST WEEK

THIS WOULD HAVE BEEN THE MOST LIKELY OUTCOME OF OUR WORK THIS WEEK

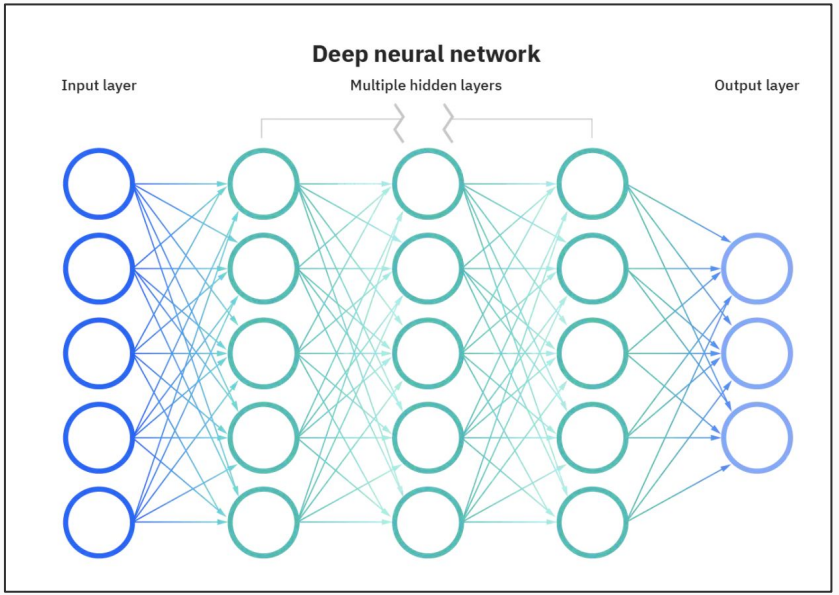
SO WE'RE GOING TO TAKE THIS LIGHT, GIVE AN OVERVIEW (WITH MEMES), AND THEN SET ASIDE MORE TIME FOR PROJECT WORK

WHAT IS DEEP LEARNING?

What makes this "deep learning"?

Neural networks, also known as artificial neural networks (ANNs) or simulated neural networks (SNNs), are a subset of machine learning and are at the heart of deep learning algorithms. Their name and structure are inspired by the human brain, mimicking the way that biological neurons signal to one another.

"Deep learning" and "neural networks" are basically interchangeable now - but theoretically, for it to be "deep learning" it has to have at least three layers of nodes.

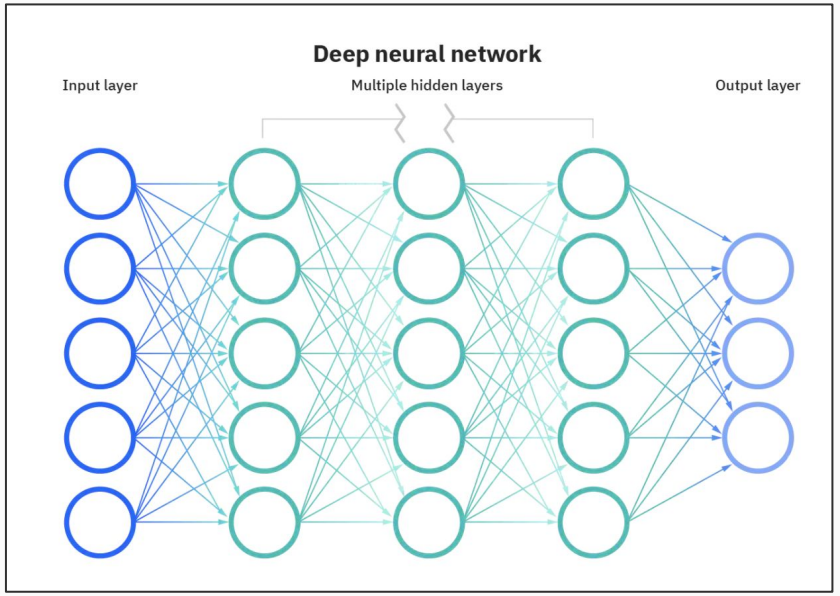


WHAT IS A NEURAL NETWORK?

So what is a “neural network”?

Neural networks are comprised of a node layers, containing an input layer, one or more hidden layers, and an output layer.

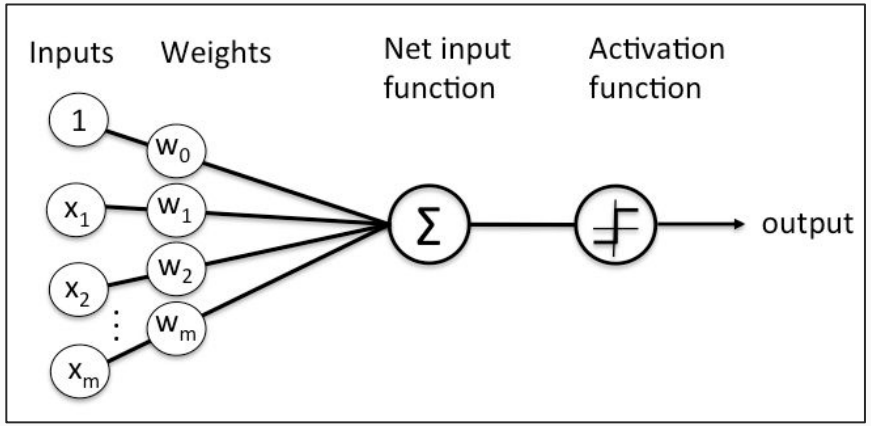
Each node, or artificial neuron, connects to another and has an associated weight and threshold. If the output of any individual node is above the specified threshold value, that node is activated, sending data to the next layer of the network. Otherwise, no data is passed along to the next layer of the network.



HOW DO THEY WORK?

Let's go deeper: what is a "node"?

A node is just a place where computation happens. It node combines input from the data with a set of coefficients ("weights"), that either amplify or dampen that input, thereby assigning significance to inputs with regard to the task the algorithm is trying to learn; e.g. which input is most helpful is classifying data without error? These input-weight products are summed and then the sum is passed through a node's so-called activation function, to determine whether and to what extent that signal should progress further through the network to affect the ultimate outcome, say, an act of classification. If the signals passes through, the neuron has been "activated."



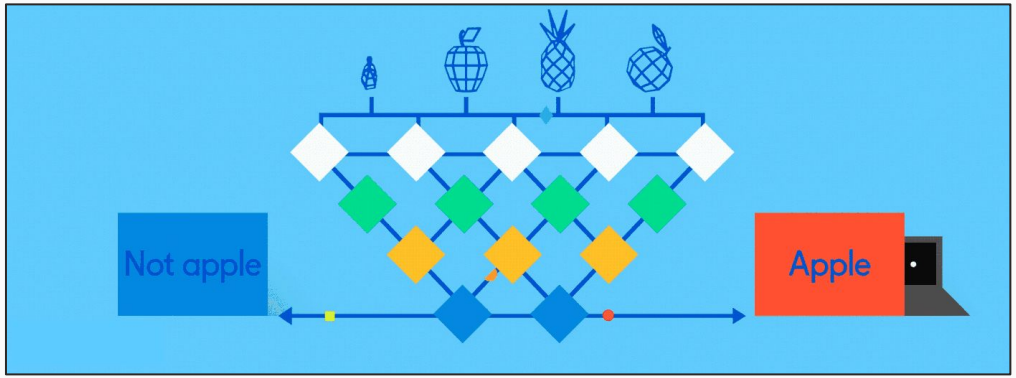
HOW DO THEY WORK?

Let's go deeper: what is an "activation function"?

Activation functions are a critical part of the design of a neural network.

The choice of activation function in the hidden layer will control how well the network model learns the training dataset. The choice of activation function in the output layer will define the type of predictions the model can make.

As such, a careful choice of activation function must be made for each deep learning neural network project. In our example, we're going to use "ReLU" (Rectified Linear Unit).



- *Let's do this together!*

Open up R!