GENERAL ASSEMBLY

NEURAL NETWORKS

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Data Scientist @ Critical Juncture

LEARNING OBJECTIVES

- Understand various types of neural networks
- Applications of neural networks
- Apply a neural network model for regression
- Apply a neural network model for classification

COURSE

PRE-WORK

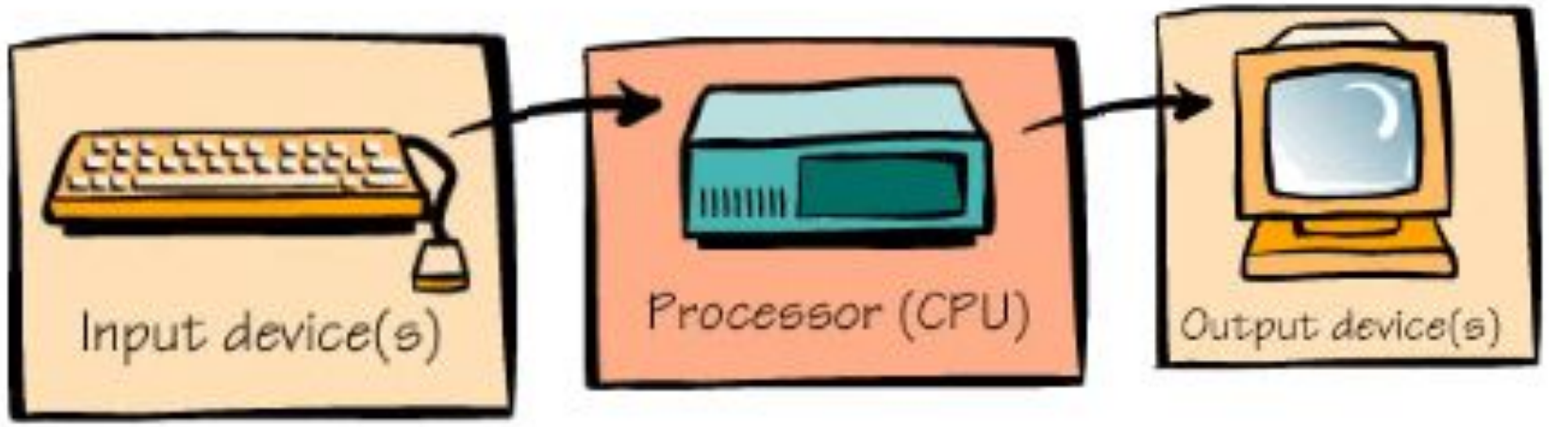
PRE-WORK REVIEW

- Understand Logistic Regression and link functions
- Be familiar with training and testing classifiers and regressors

OPENING

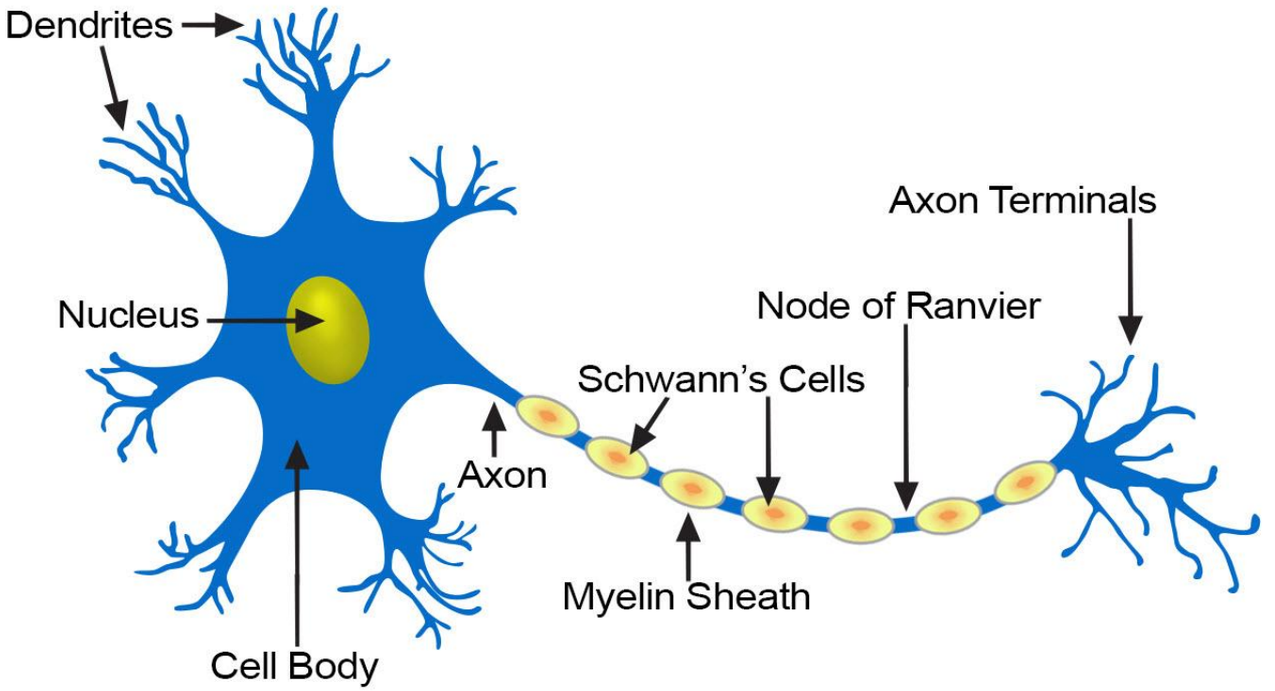
ARTIFICIAL NEURAL NETWORKS

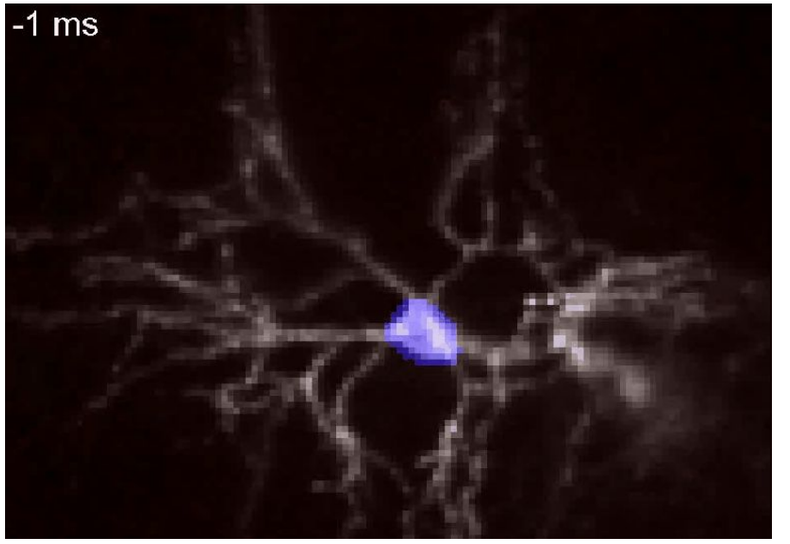
WHAT COMPUTERS DO



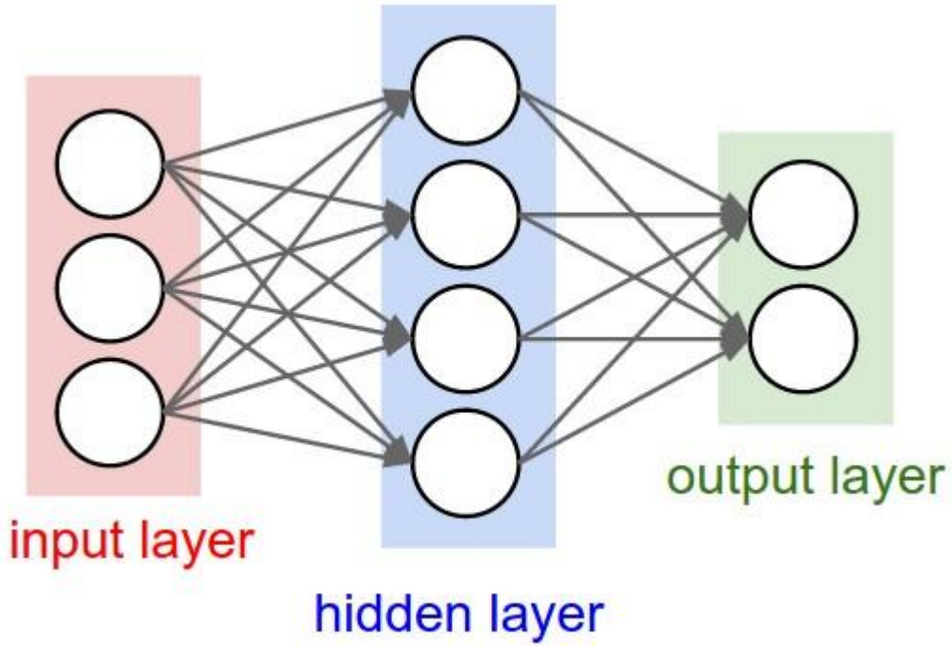
ARTIFICIAL NEURAL NETWORKS

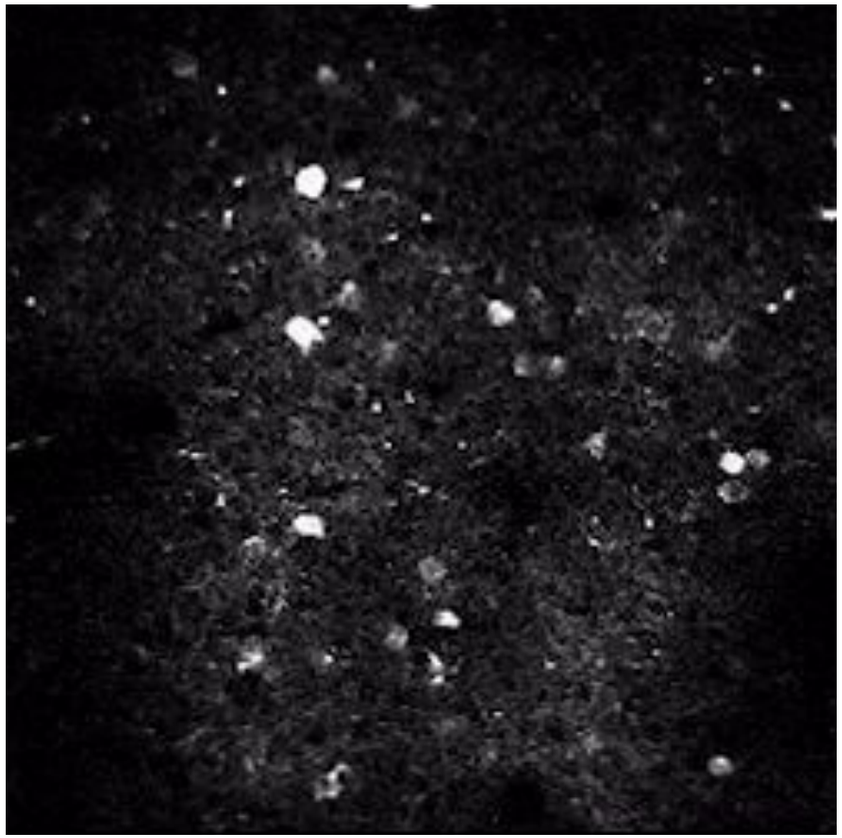
- The idea is to emulate the behavior of neurons





ARTIFICIAL NEURAL NETWORKS





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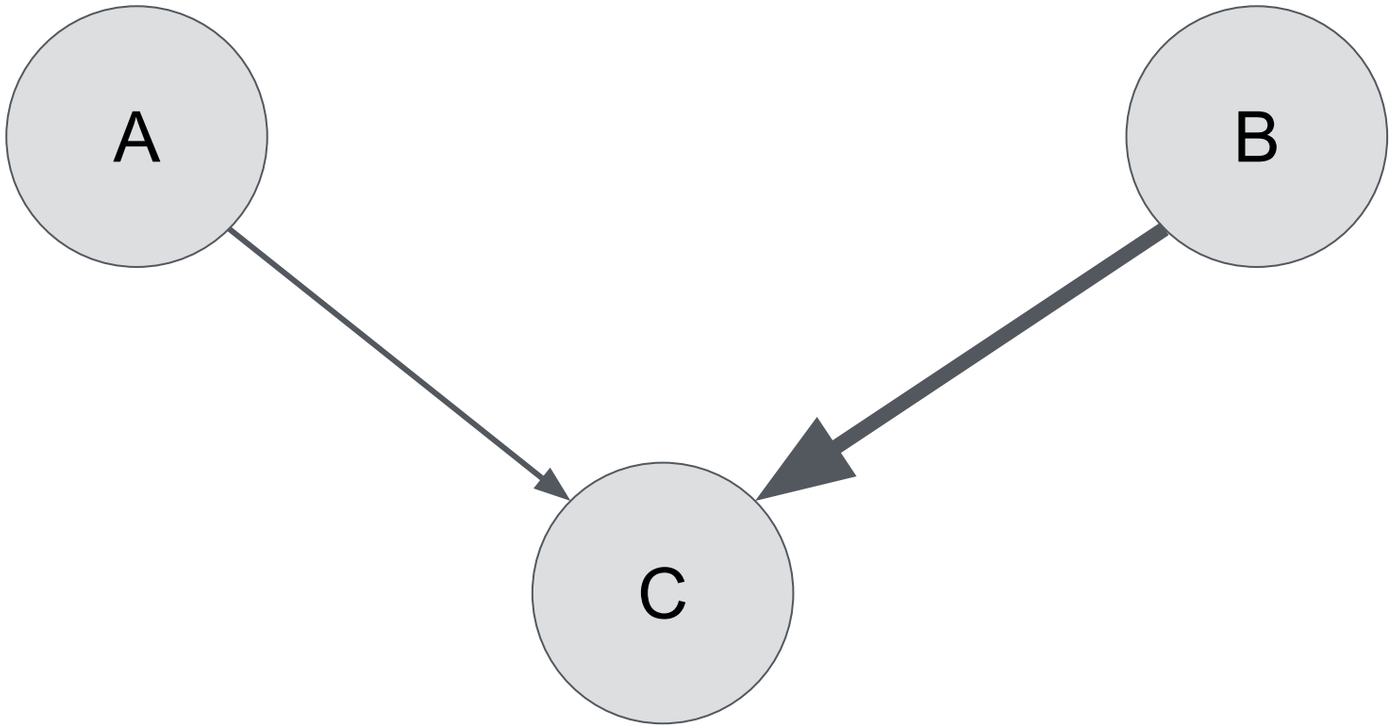
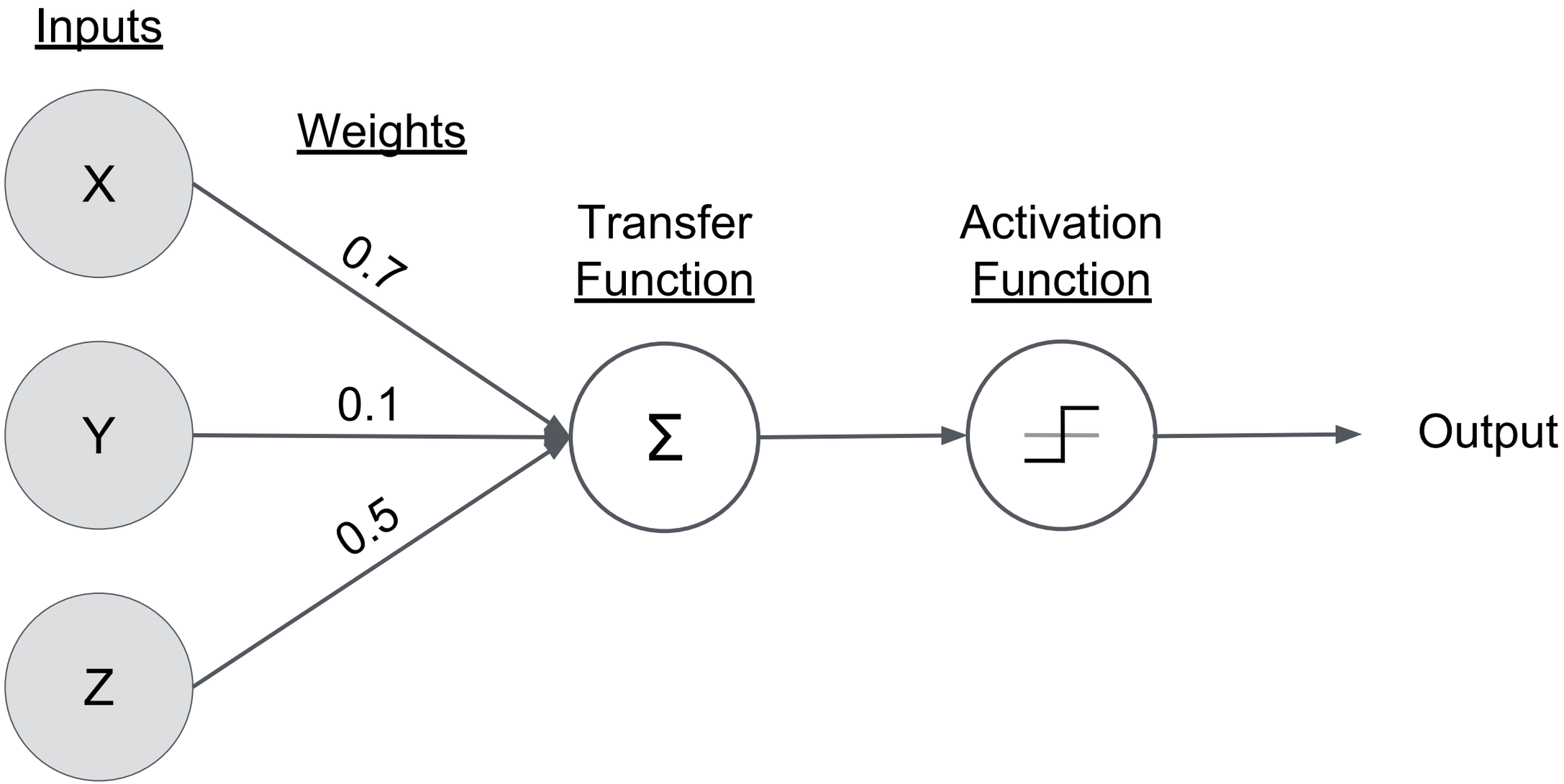
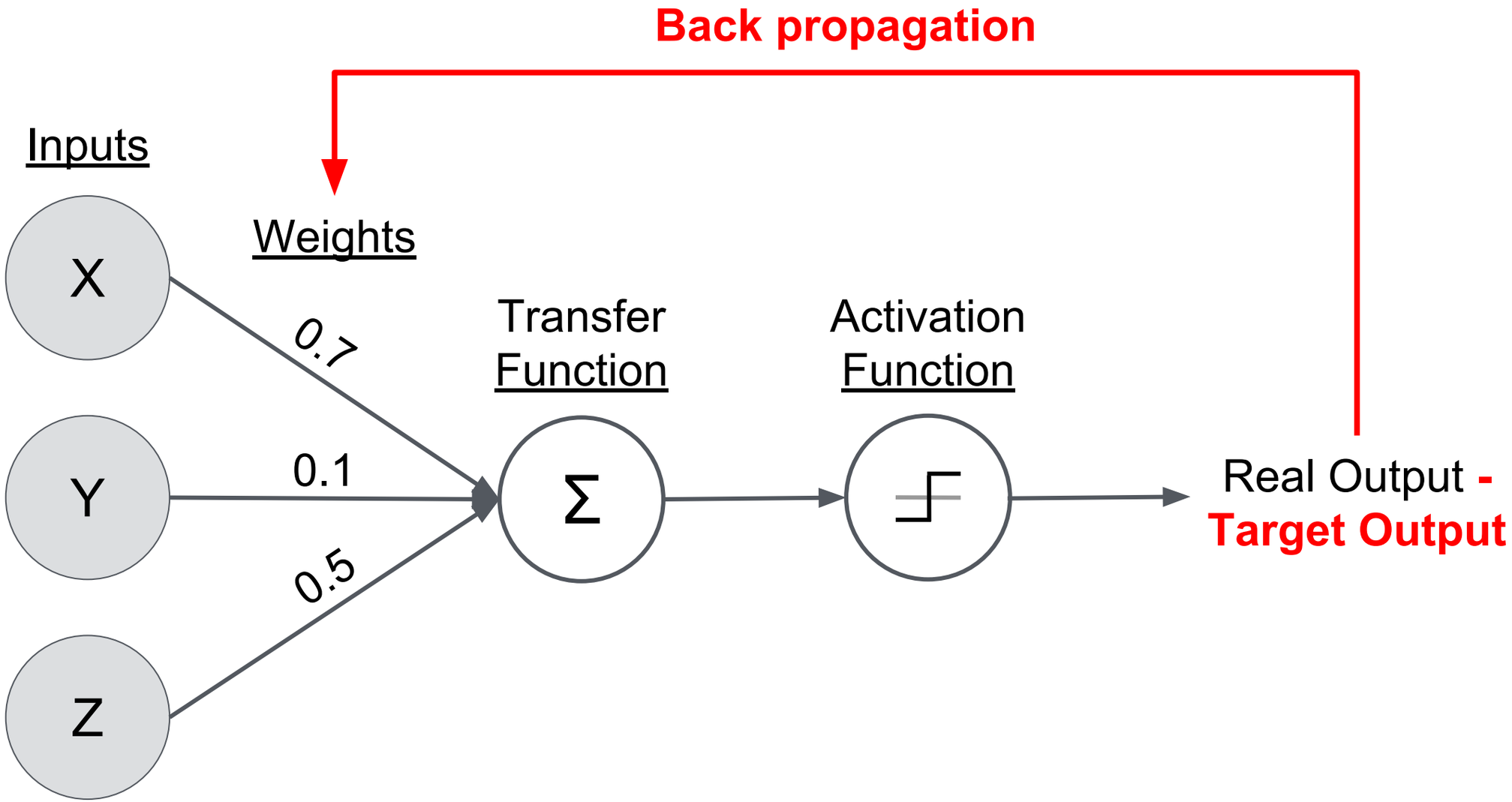


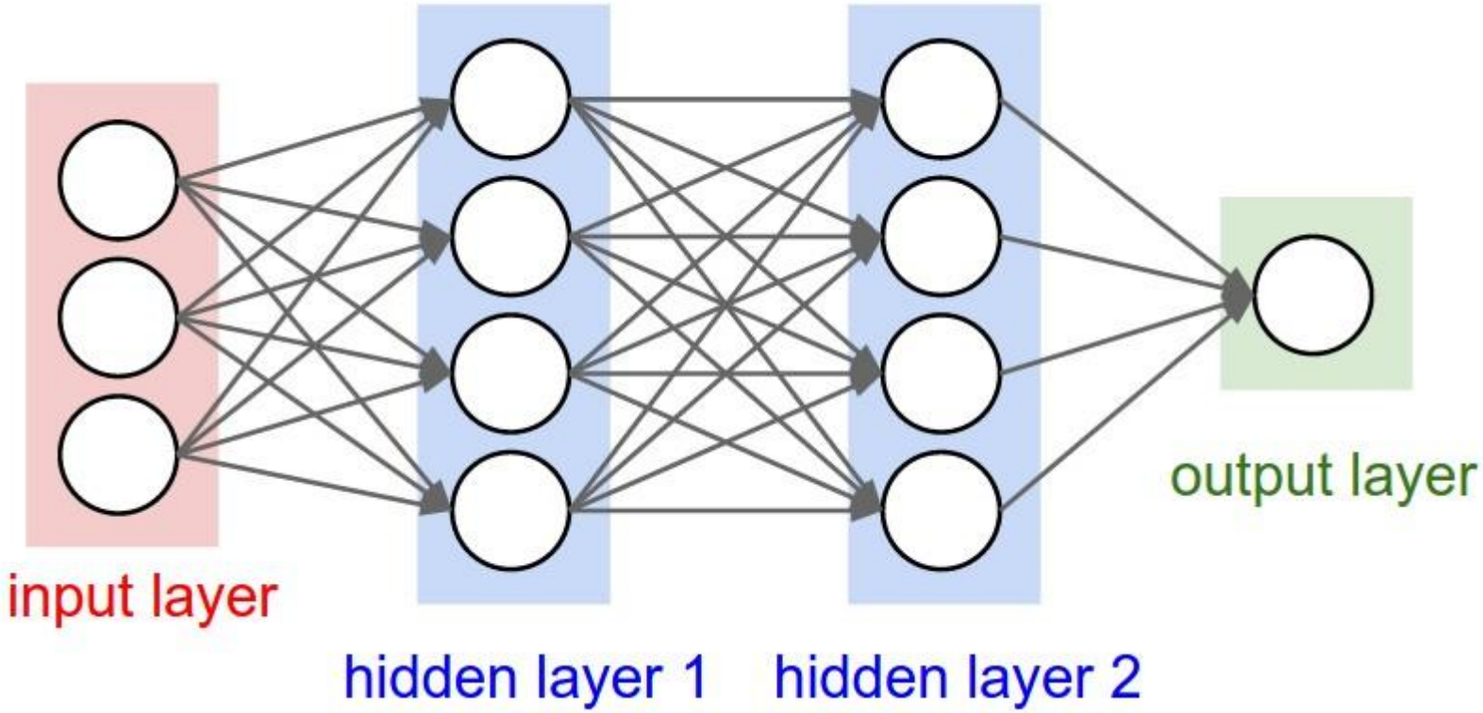
ARTIFICIAL NEURAL NETWORKS



ARTIFICIAL NEURAL NETWORKS

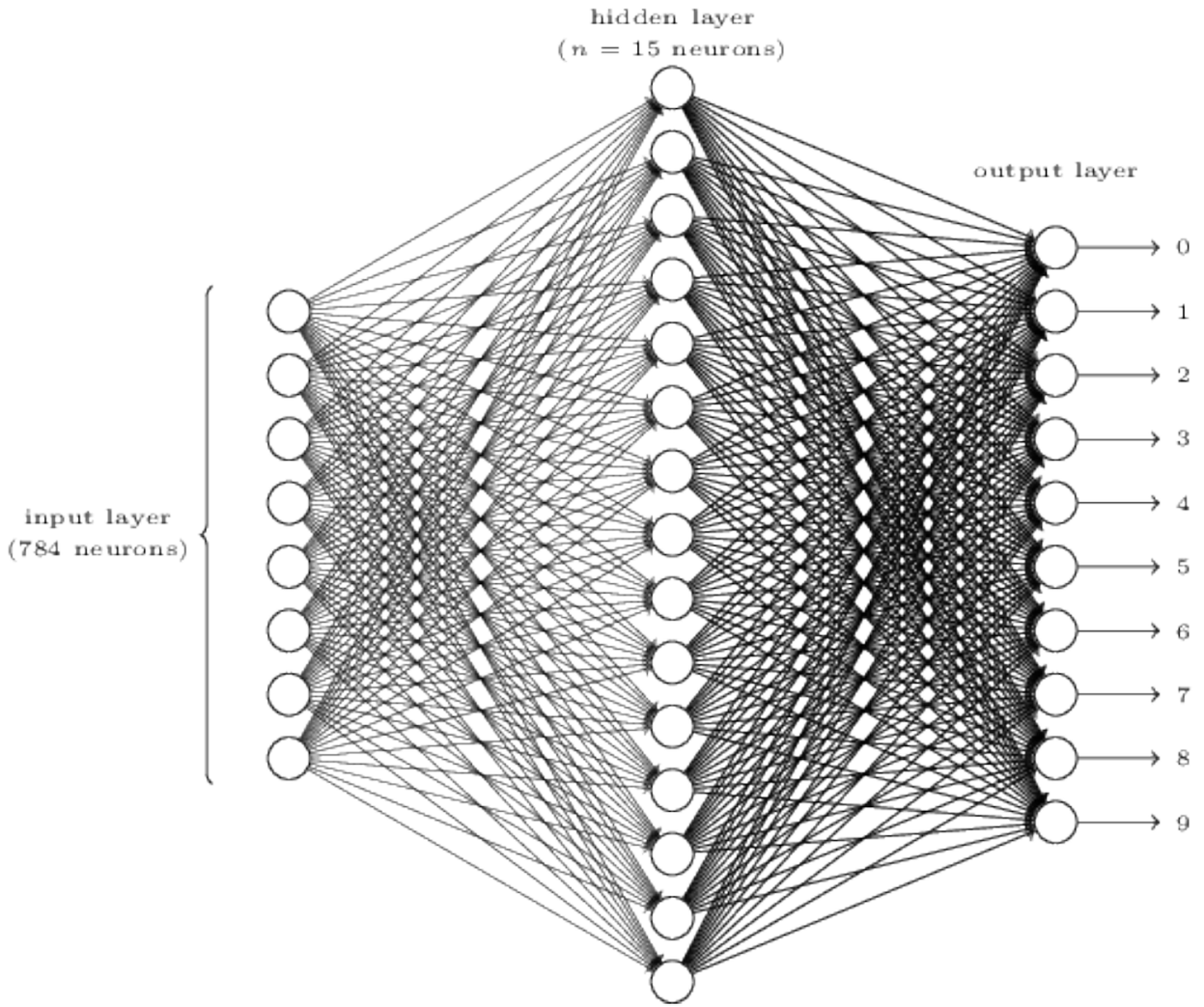


ARTIFICIAL NEURAL NETWORKS



http://cs231n.github.io/assets/nn1/neural_net2.jpeg

ARTIFICIAL NEURAL NETWORKS



http://neuralnetworksanddeeplearning.com/chap1.html

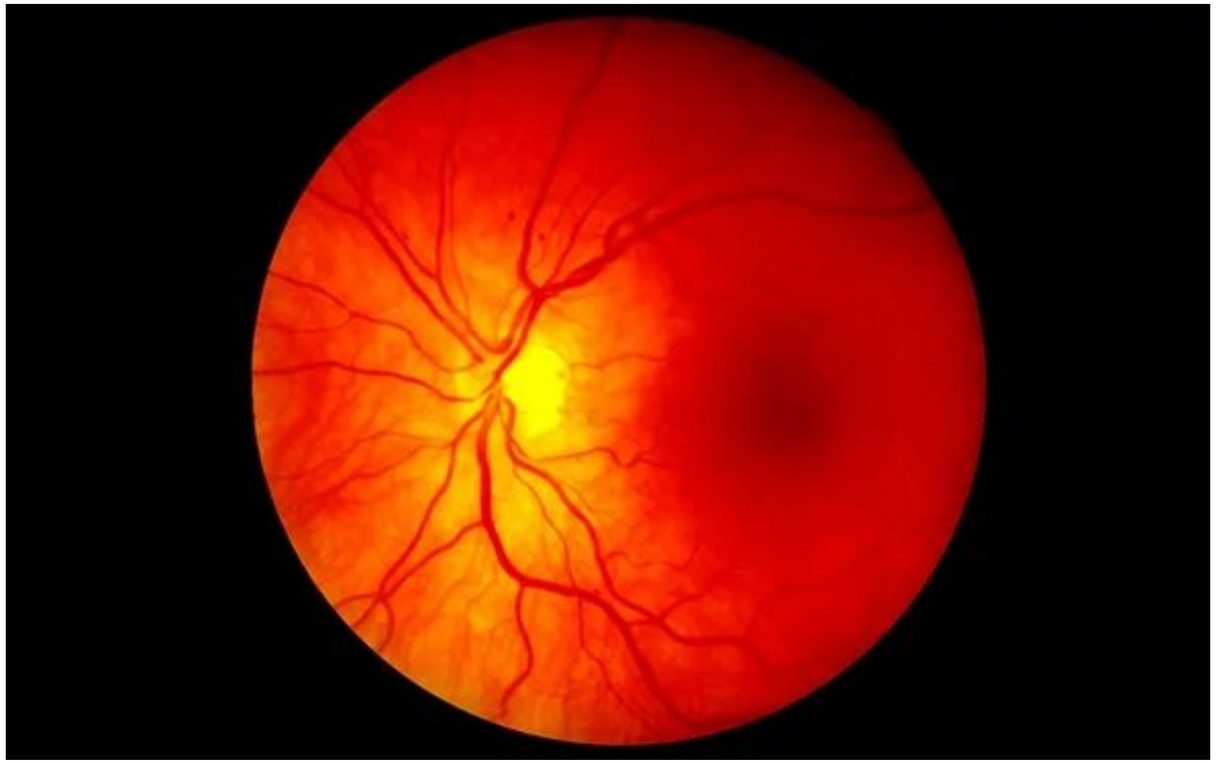
ARTIFICIAL NEURAL NETWORKS

General use case	Industry
Sound	
Voice recognition	UX/UI, Automotive, Security, IoT
Voice search	Handset maker, Telecoms
Sentiment analysis	CRM
Flaw detection (engine noise)	Automotive, Aviation
Fraud detection (latent audio artifacts)	Finance, Credit Cards
Time Series	
Log analysis/Risk detection	Data centers, Security, Finance
Enterprise resource planning	Manufacturing, Auto., Supply chain
Predictive analysis using sensor data	IoT, Smart home, Hardware manufact.
Business and Economic analytics	Finance, Accounting, Government
Recommendation engine	E-commerce, Media, Social Networks
Text	
Sentiment Analysis	CRM, Social media, Reputation mgt.
Augmented search, Theme detection	Finance
Threat detection	Social media, Govt.
Fraud detection	Insurance, Finance
Image	
Facial recognition	
Image search	Social media
Machine vision	Automotive, aviation
Photo clustering	Telecom, Handset makers
Video	
Motion detection	Gaming, UX, UI
Real-time threat detection	Security, Airports

https://deeplearning4j.org/use_cases.html

ARTIFICIAL NEURAL NETWORKS

- Medical images



ARTIFICIAL NEURAL NETWORKS

- Automatic Colorization with CNN

http://tinyclouds.org/colorize/

GUIDED PRACTICE

NEURAL NETWORKS IN PYTHON

NN IN PYTHON

- There are many NN libraries for python and other languages
- Python
  - Theano
  - Keras
  - Lasagne
  - TensorFlow
  - Py-torch
  - Scikit Learn support for NN coming soon
- Some of these libraries utilize **GPUs** for (much) faster training

NN IN PYTHON

- Next, we'll look at some examples in Keras
  - Regression
  - Classification

ACTIVITY: KNOWLEDGE CHECK

ANSWER THE FOLLOWING QUESTIONS

1. Let's practice using neural networks for classification. For each of the four datasets, experiment with the number of layers and neurons to find the best model
2. Also take a look at this visualization

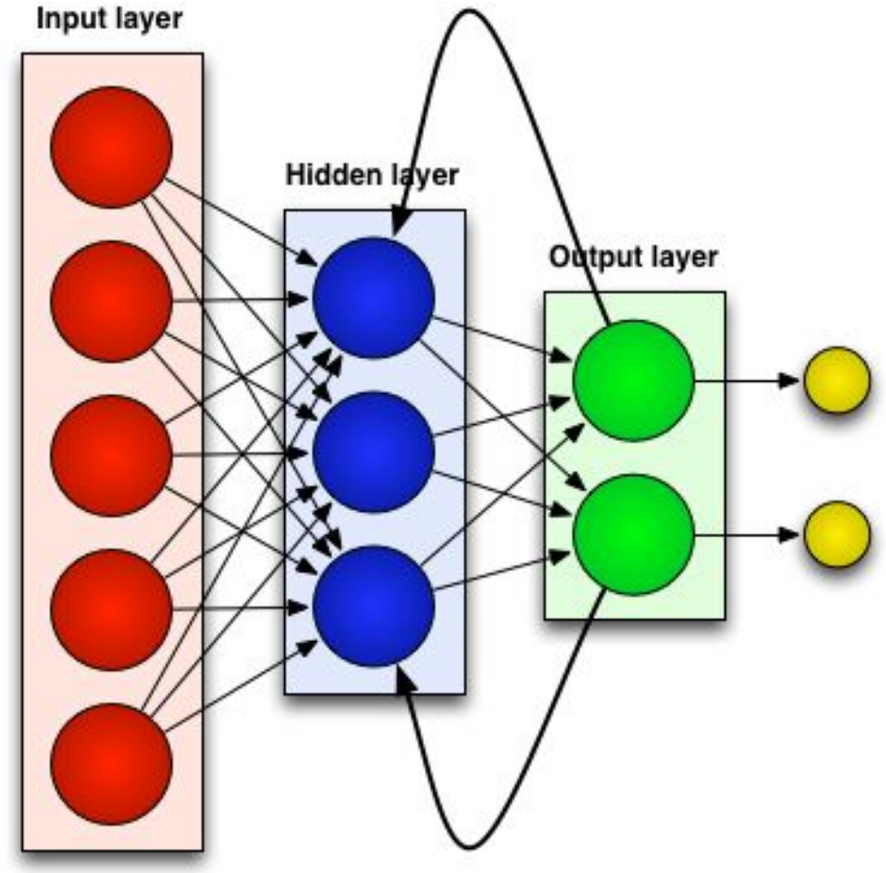
DELIVERABLE

Answers to the above questions

RECURRENT NEURAL NETWORKS

RECURRENT NEURAL NETWORKS

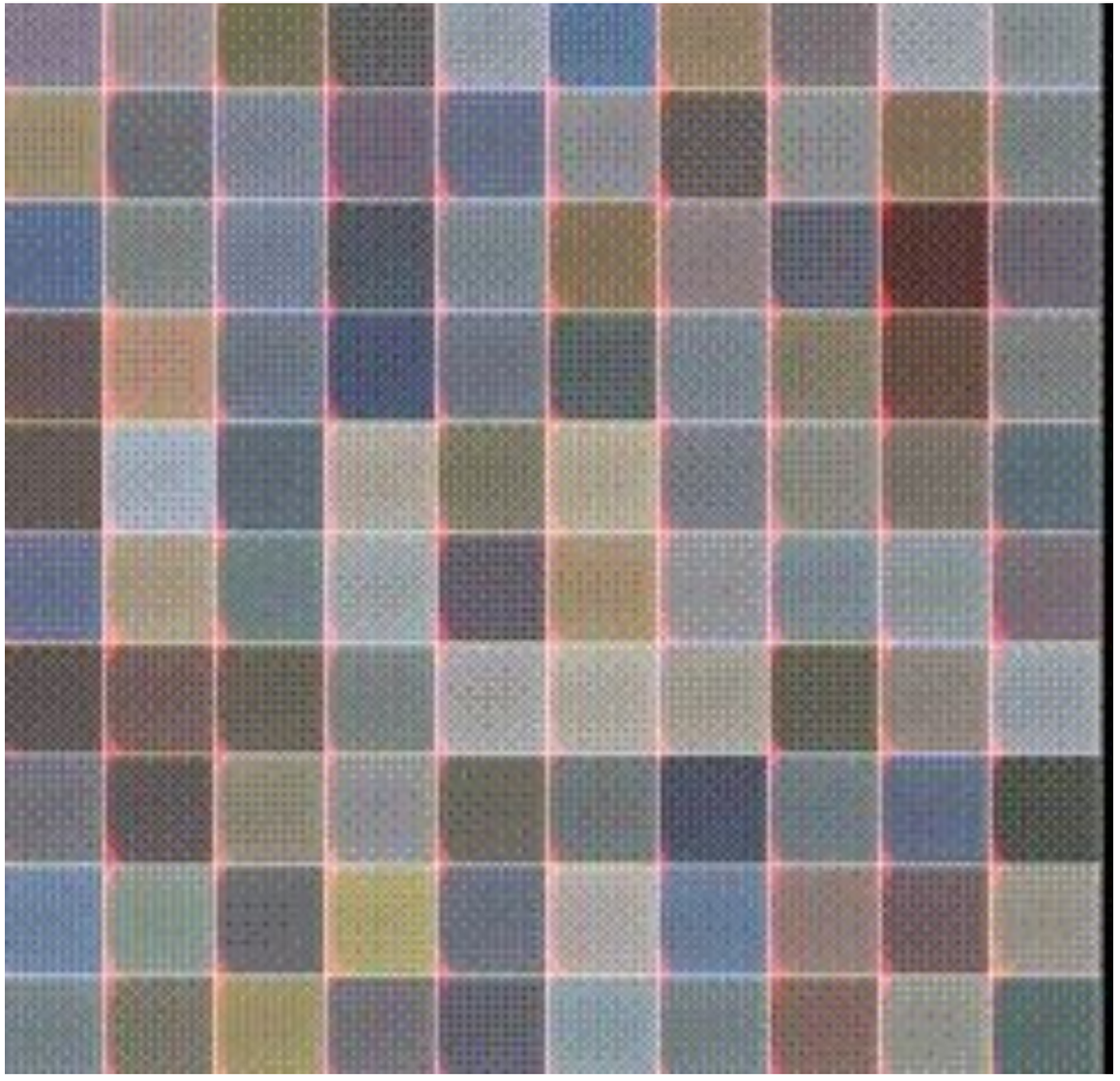
- Recurrent Neural Networks contain loops (source)



RECURRENT NEURAL NETWORKS

- Recurrent Neural Networks contain loops
- This implements feedback and gives neural networks “memory” or context
- Particularly good for predicting sequences, translating text, recognizing objects in images, speech translation
- Commonly referred to as **deep learning**, involving both feature extraction and modeling
- Nice intro here

RECURRENT NEURAL NETWORKS



CONCLUSION

TOPIC REVIEW

CONCLUSION: Neural Networks

Pros:

- Flexible
- Good for a variety of tasks
- Good for many types of data

Cons:

- Can require a lot of data
- Training may be slow
- Many parameters to tune
- Many layer types and activations
- Black Box model

BEFORE NEXT CLASS

BEFORE NEXT CLASS

DUE DATE

- Project: Final Project, Part 5!!

LESSON

Q & A

LESSON

EXIT TICKET

DON’T FORGET TO FILL OUT YOUR EXIT TICKET