Deep Learning

Outline

What is Deep Learning?

- Define
- Learning Types

Artificial Neural Networks

- Building blocks
- Fundamentals of learning

Examples and demo

- Transfer Learning
- C# / ML.NET / Tensorflow

About me

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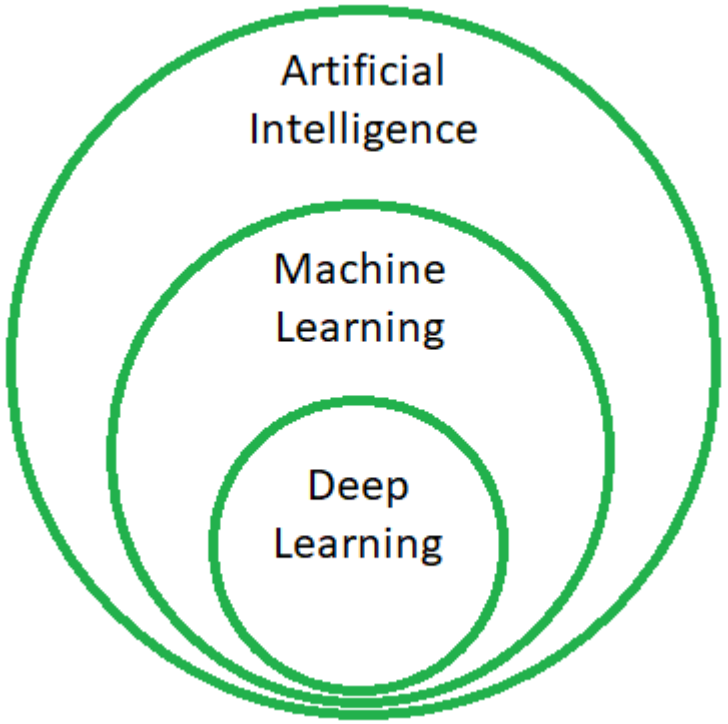
What is Deep Learning



Learns by experience

Learns by ~~experience~~ data

Gets specific instructions

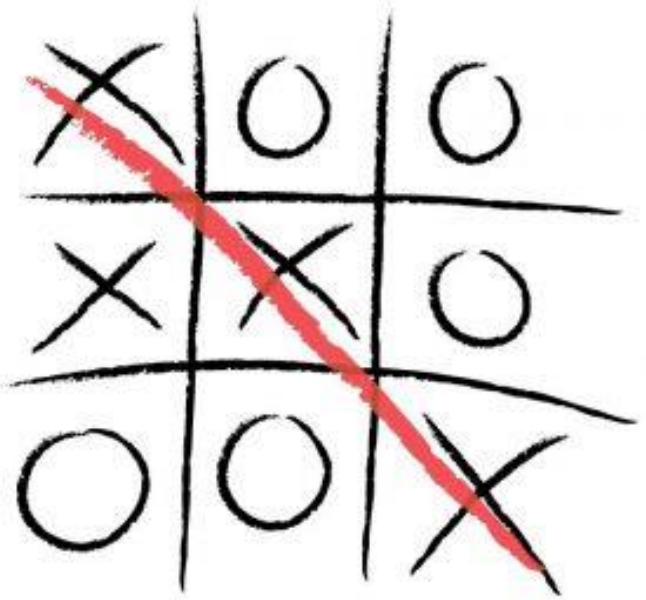
Application of artificial intelligence (AI) that provides systems the ability to learn and improve from data ("experience") without being explicitly programmed

Learning?

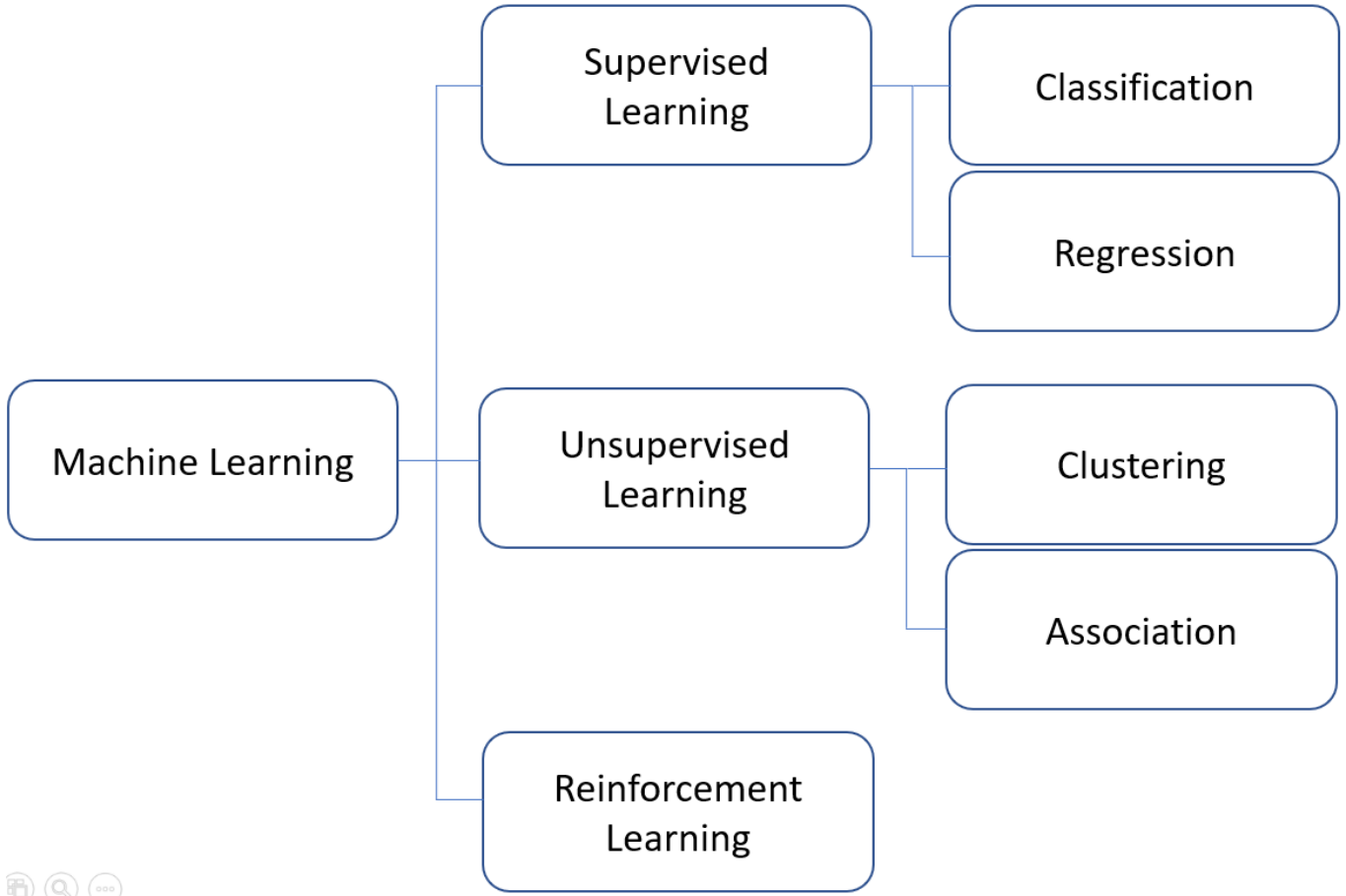
Many problems that require “thought” to figure out is a problem deep learning can learn to solve.

Learning to do a task vs “learning”

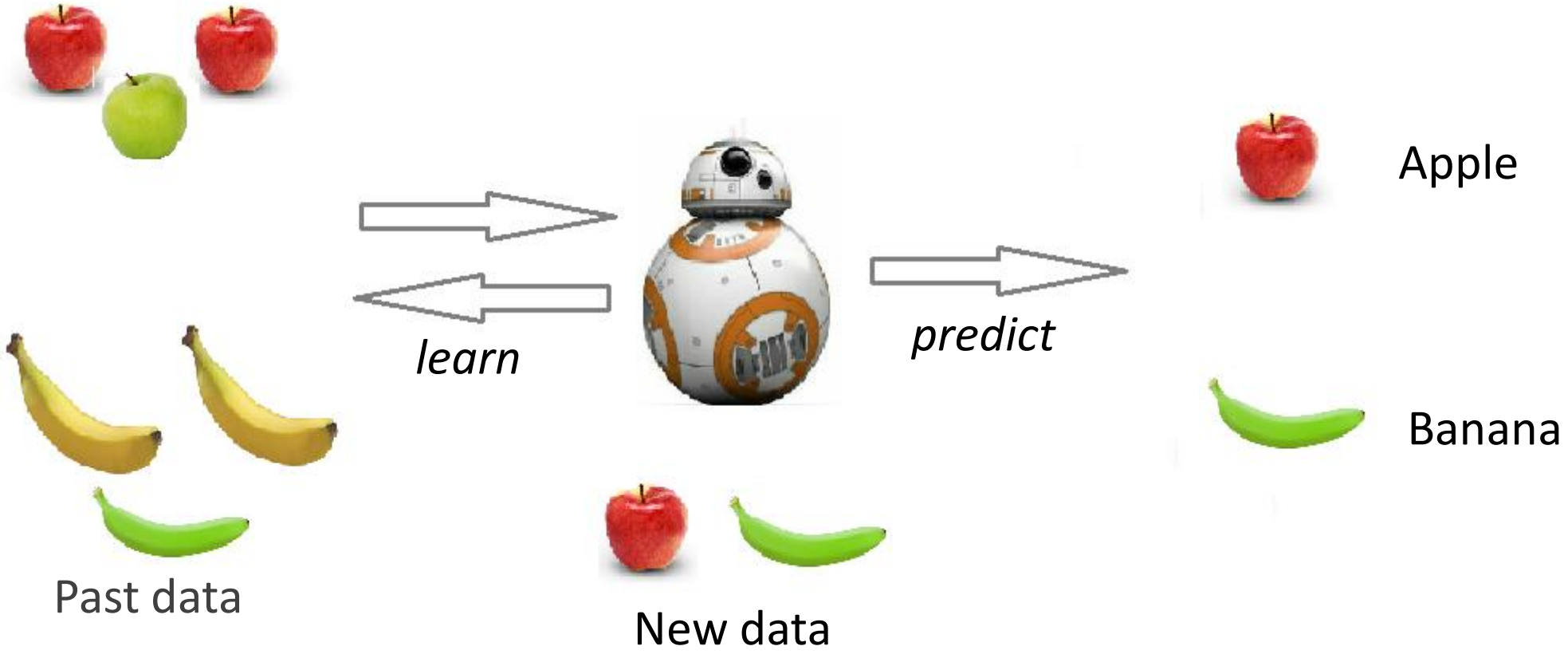
Narrow vs General vs Super Intelligence



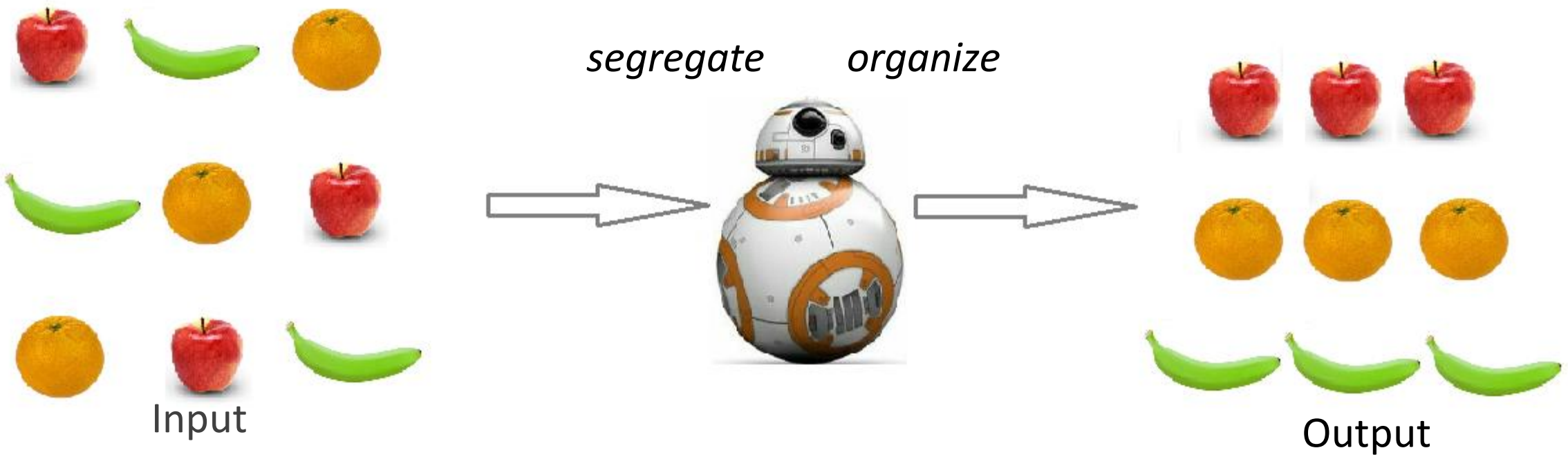
Learning types



Supervised Learning – make predictions



Unsupervised Learning – finding hidden patterns



Deep learning vs Machine learning?

DL is based on Artificial Neural Networks

Training and feature selection

- In traditional machine learning methods, features are provided
- In deep learning, the computer figures it out for itself

DL requires more sophisticated processing

DL currently believed to be the best shot at General Intelligence

Jeff Dean talk https://www.youtube.com/watch?v=QSaZGT4-6EY

I’m freezing out here!
I don’t know why they named this ice planet “Hoth”

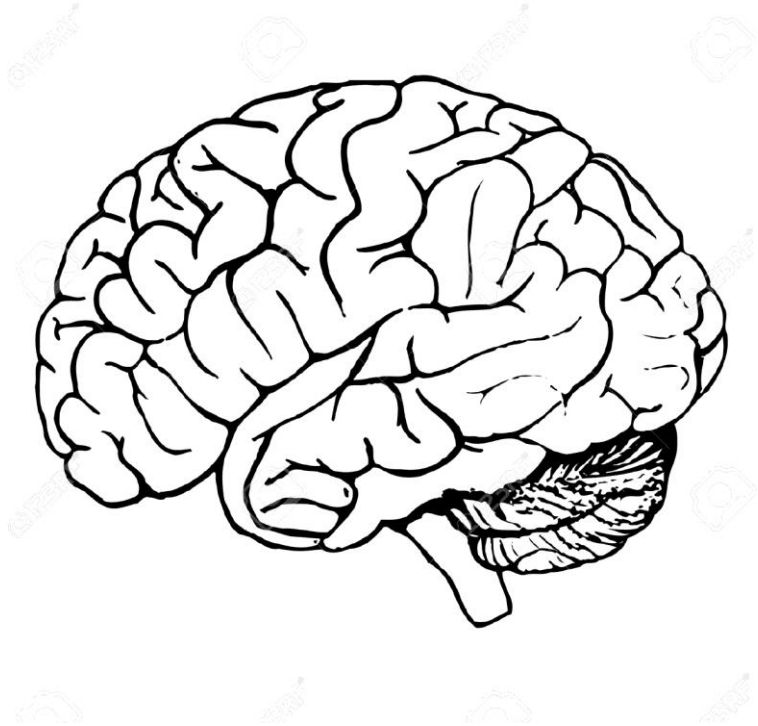
Yeah, they should have called it “Coldth”

Artificial Neural Networks

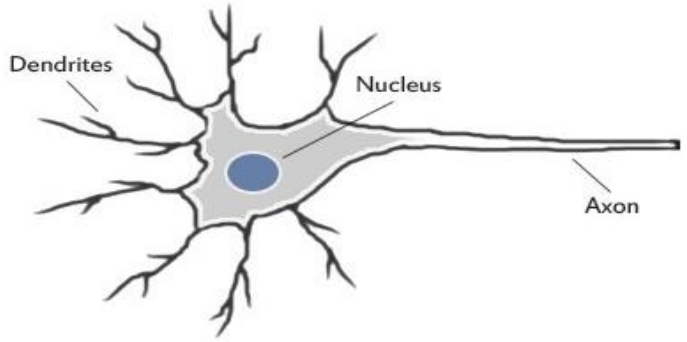
Inspired and somewhat modeled after human brain

Essentially two parts

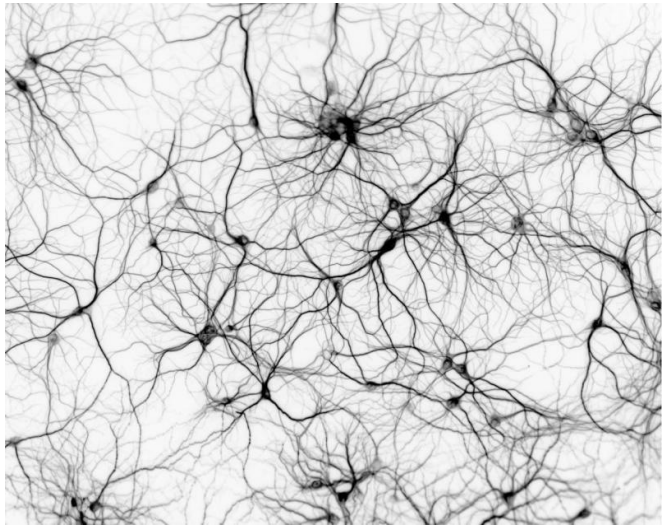
-Artificial neurons, and how they are connected

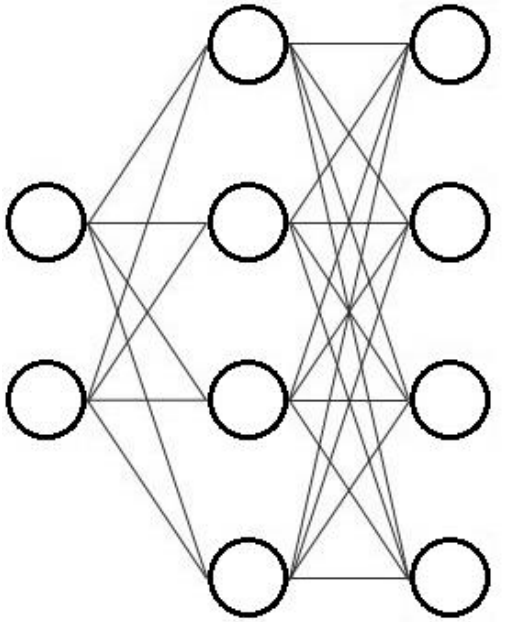


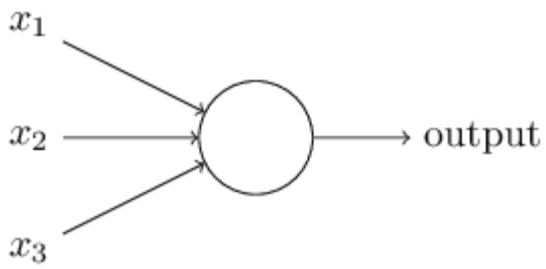
Neurons



Biological neuron





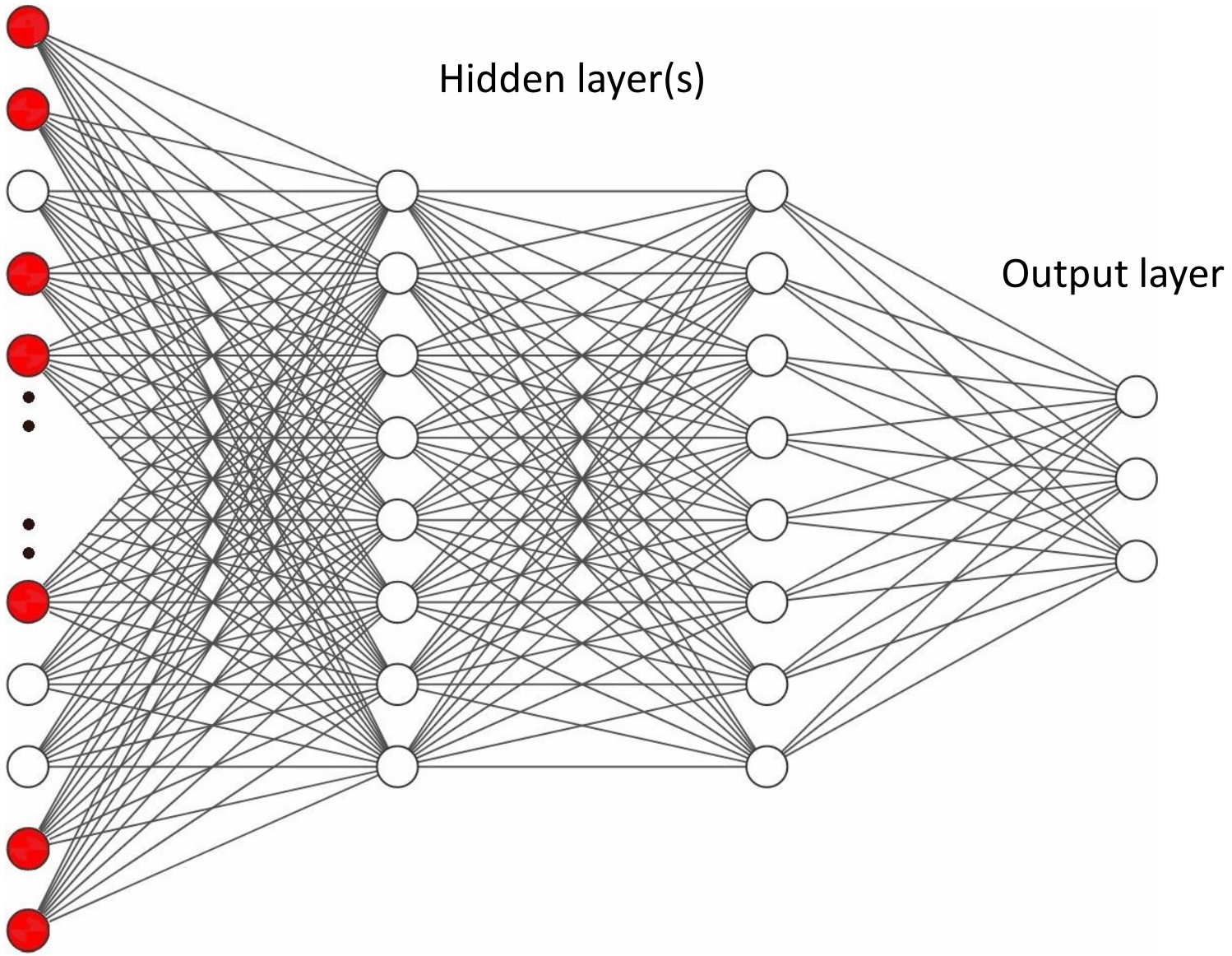


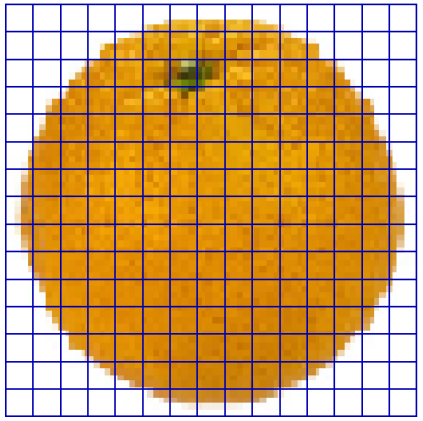
Artificial neuron

Input layer

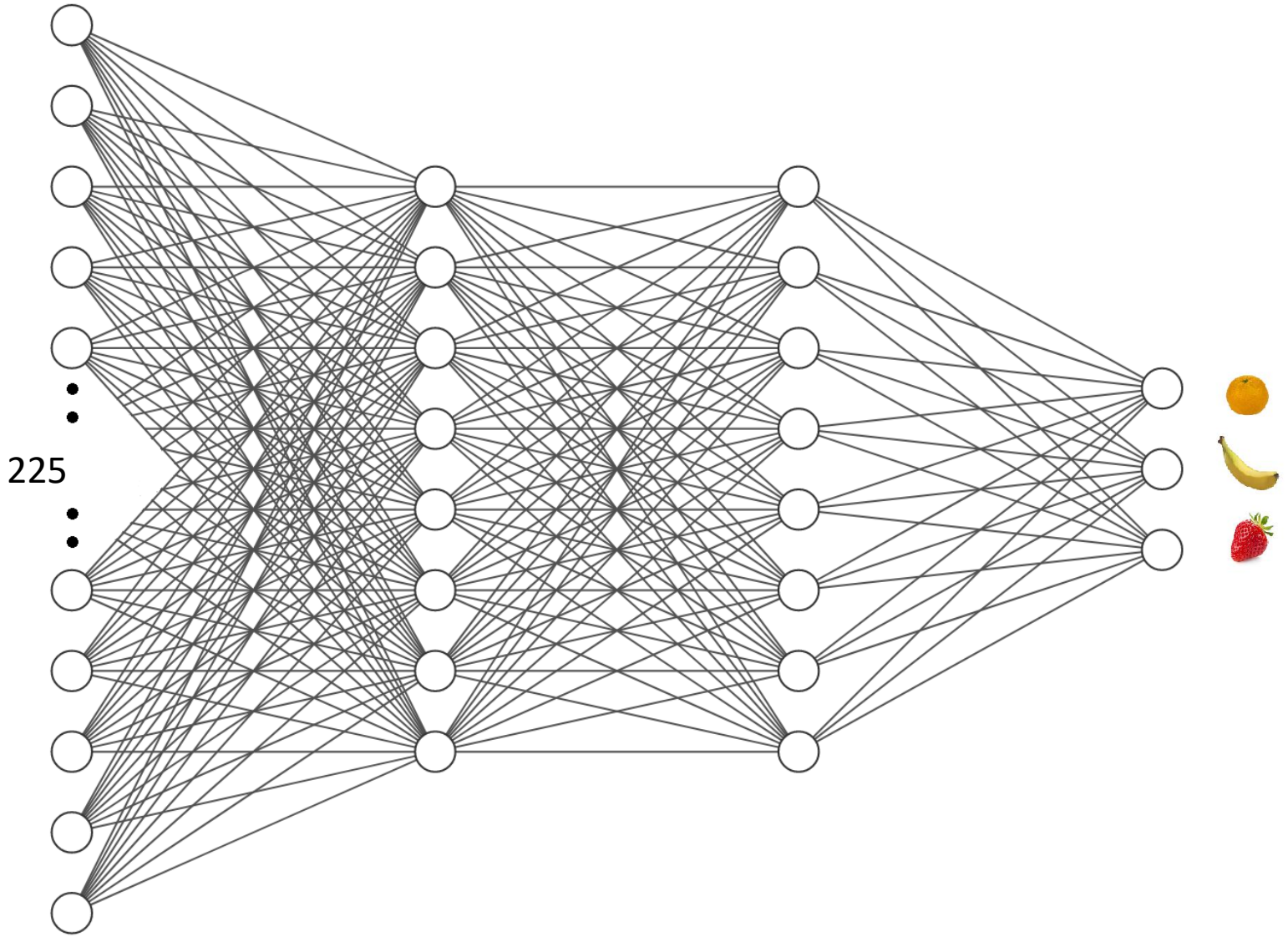
Hidden layer(s)

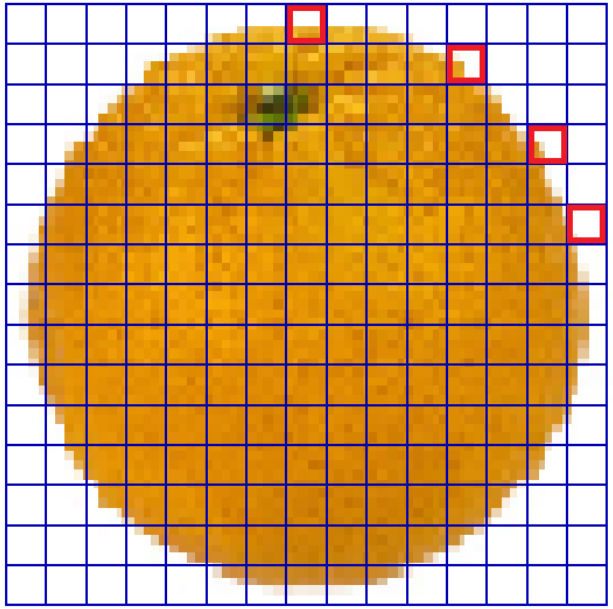
Output layer

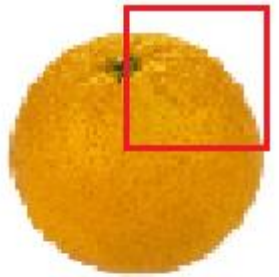

Input layer
Hidden layer(s)
Output layer

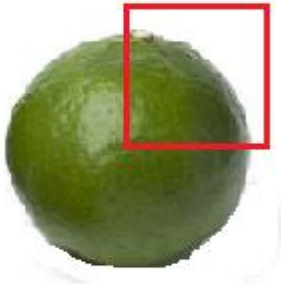


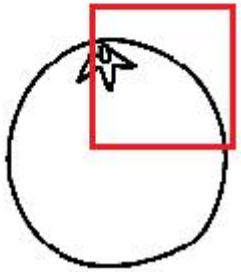
15 x 15 = 225 pixels

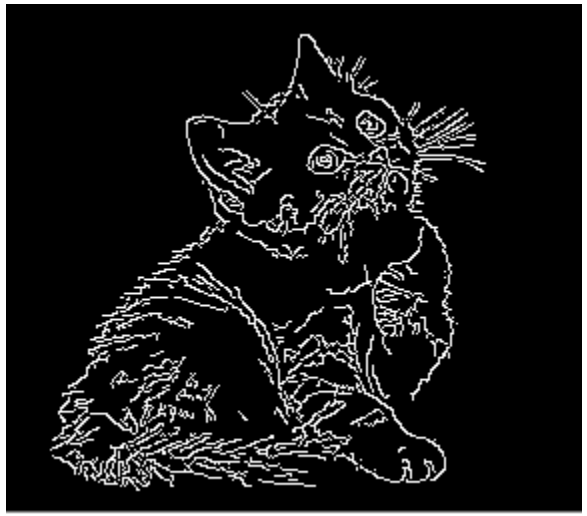


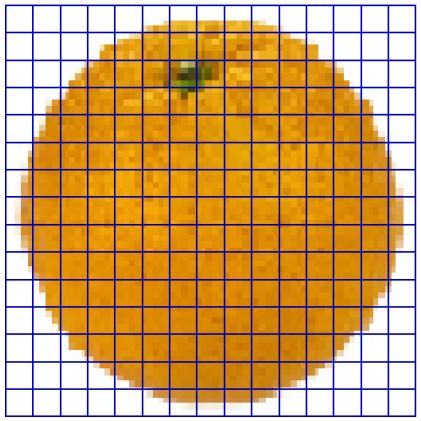












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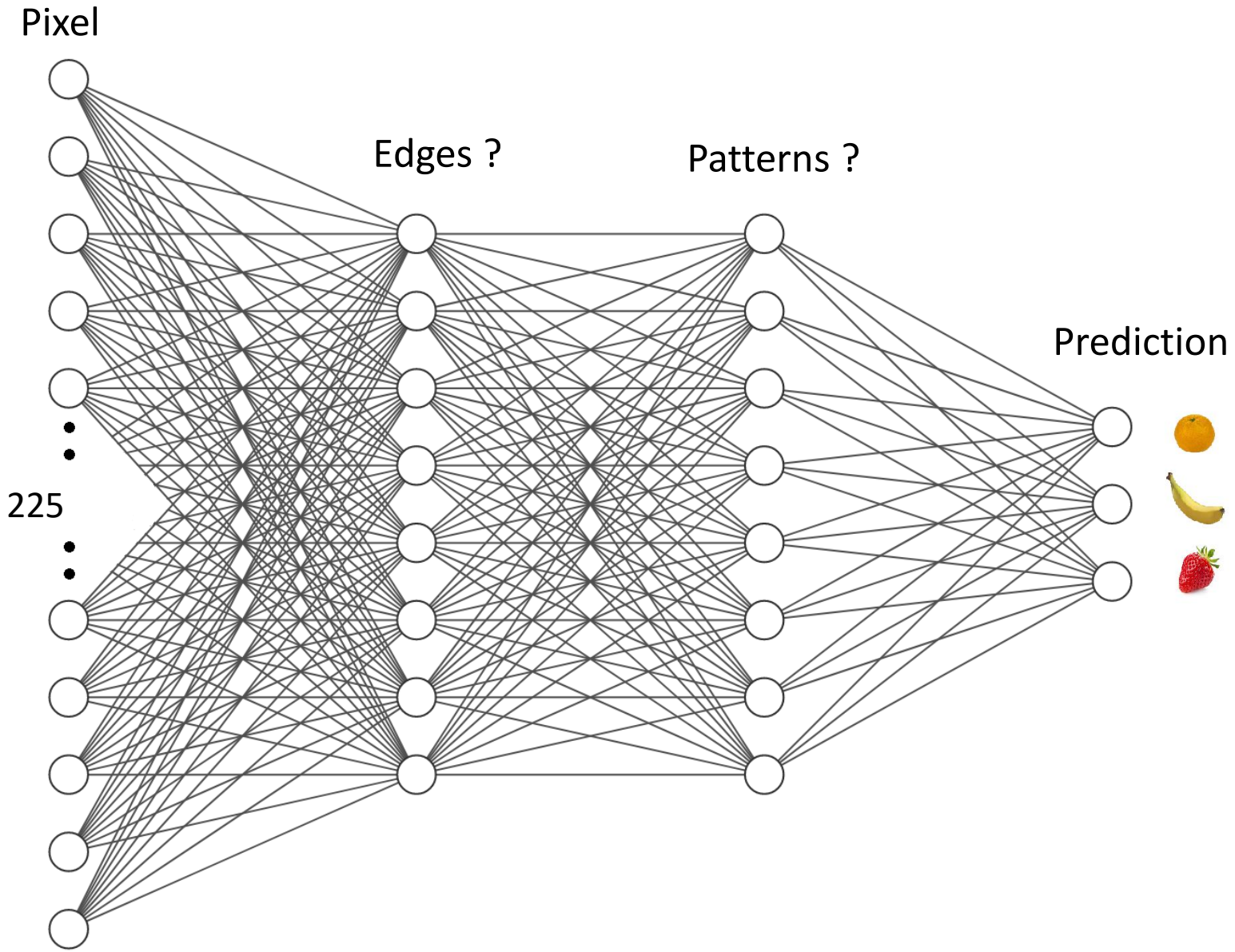
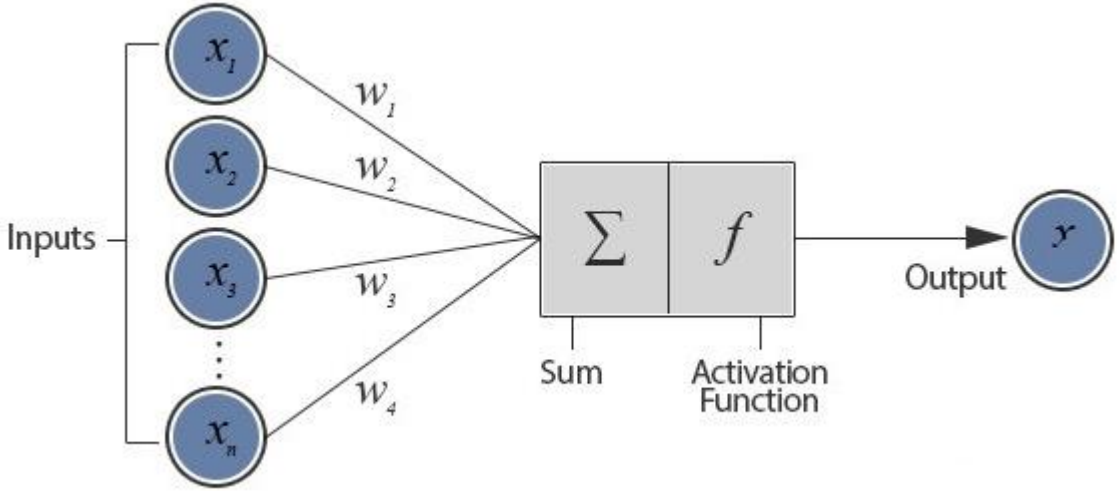


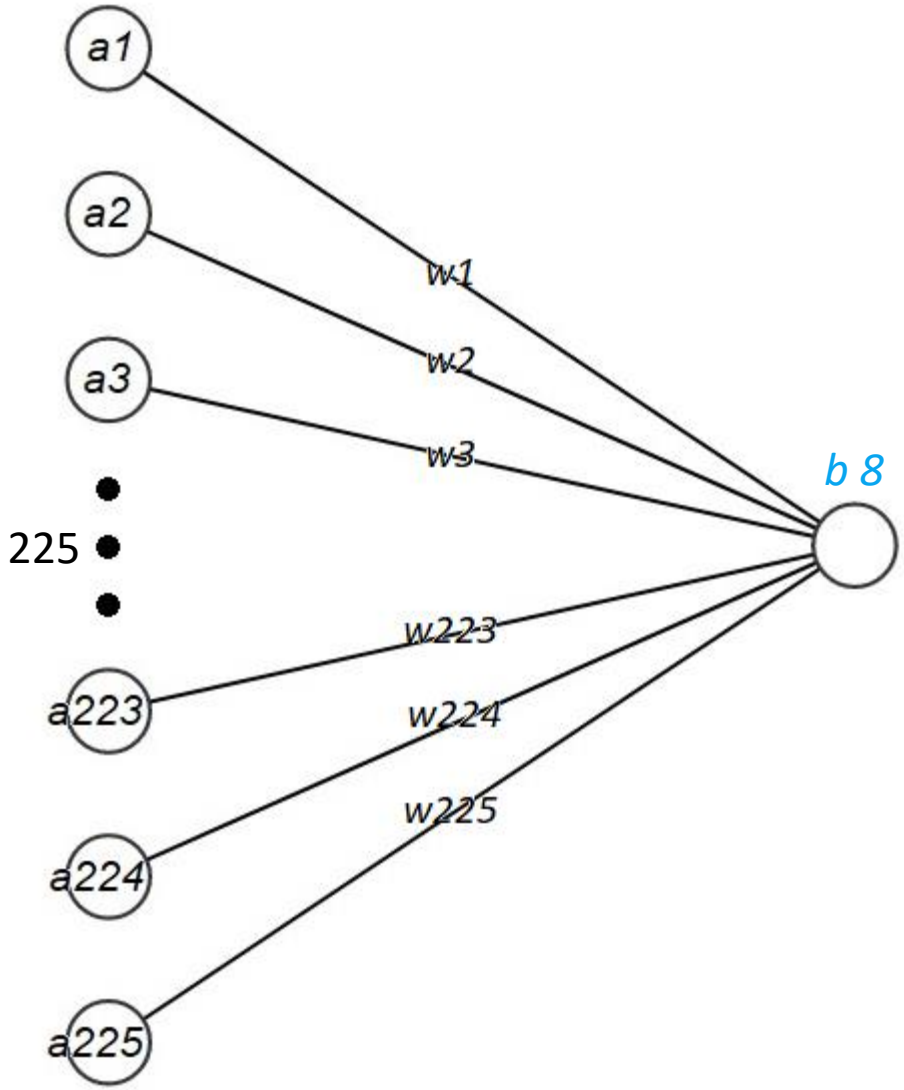
Activations

Levels of influence on the connection/output

- Weight – “strength” or how valuable a feature is
- Bias – degree of affinity for or against a feature

Activation function – decides if the neuron activates

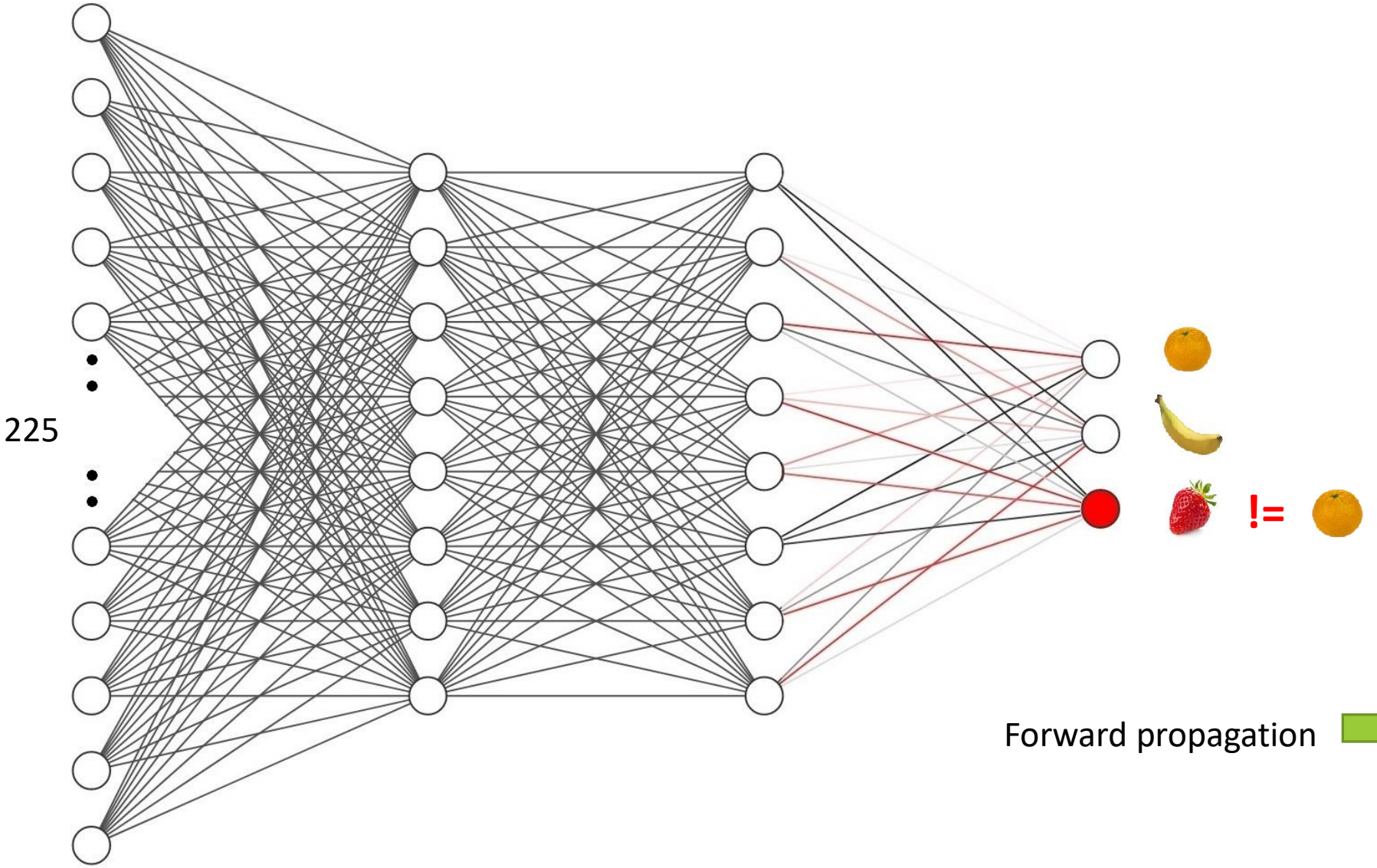




If (value >= 8)
activate

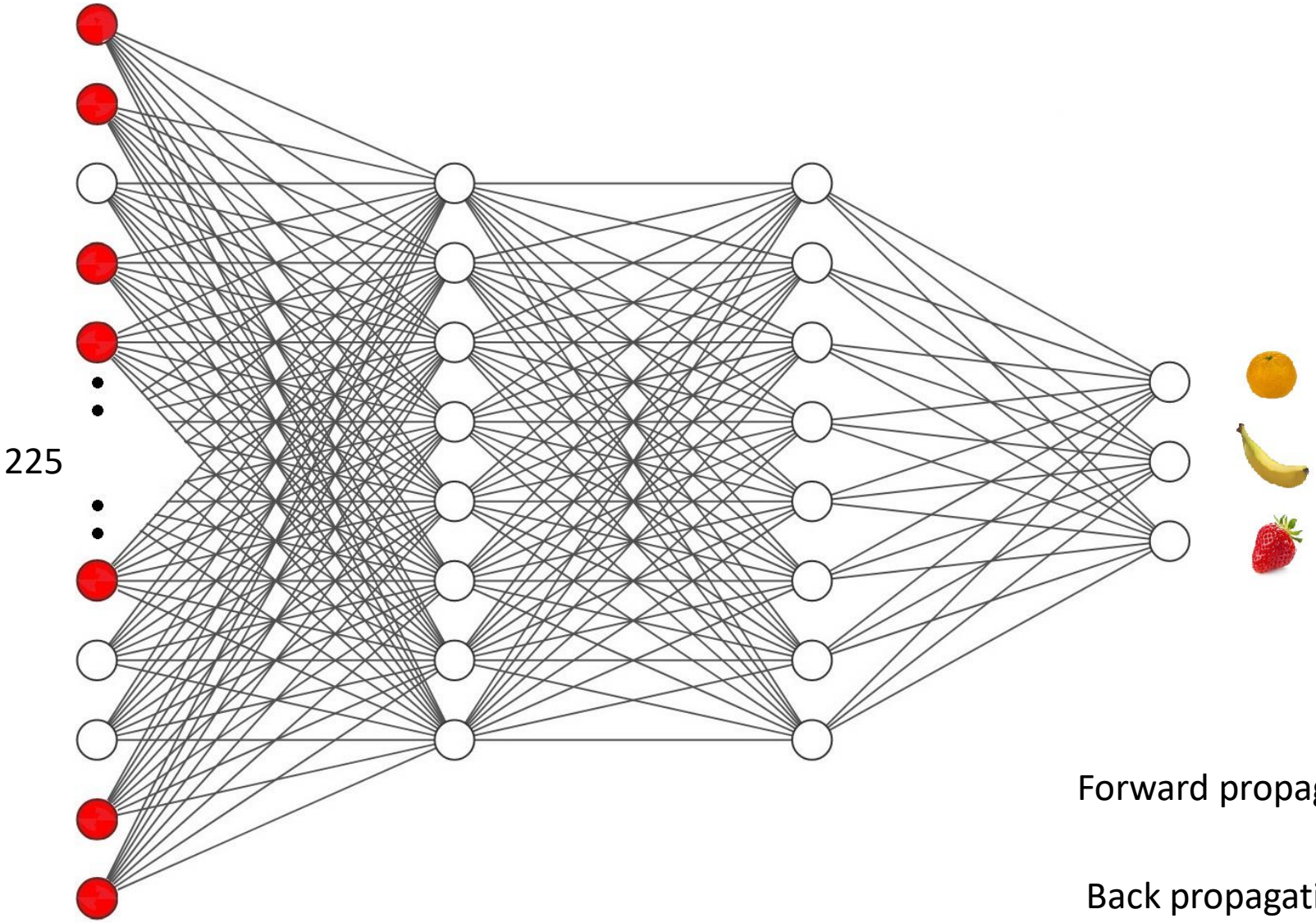
value = $(w1a1 + w2a2 + w3a3 \ldots + w225a225) + 8$

Training



Forward propagation

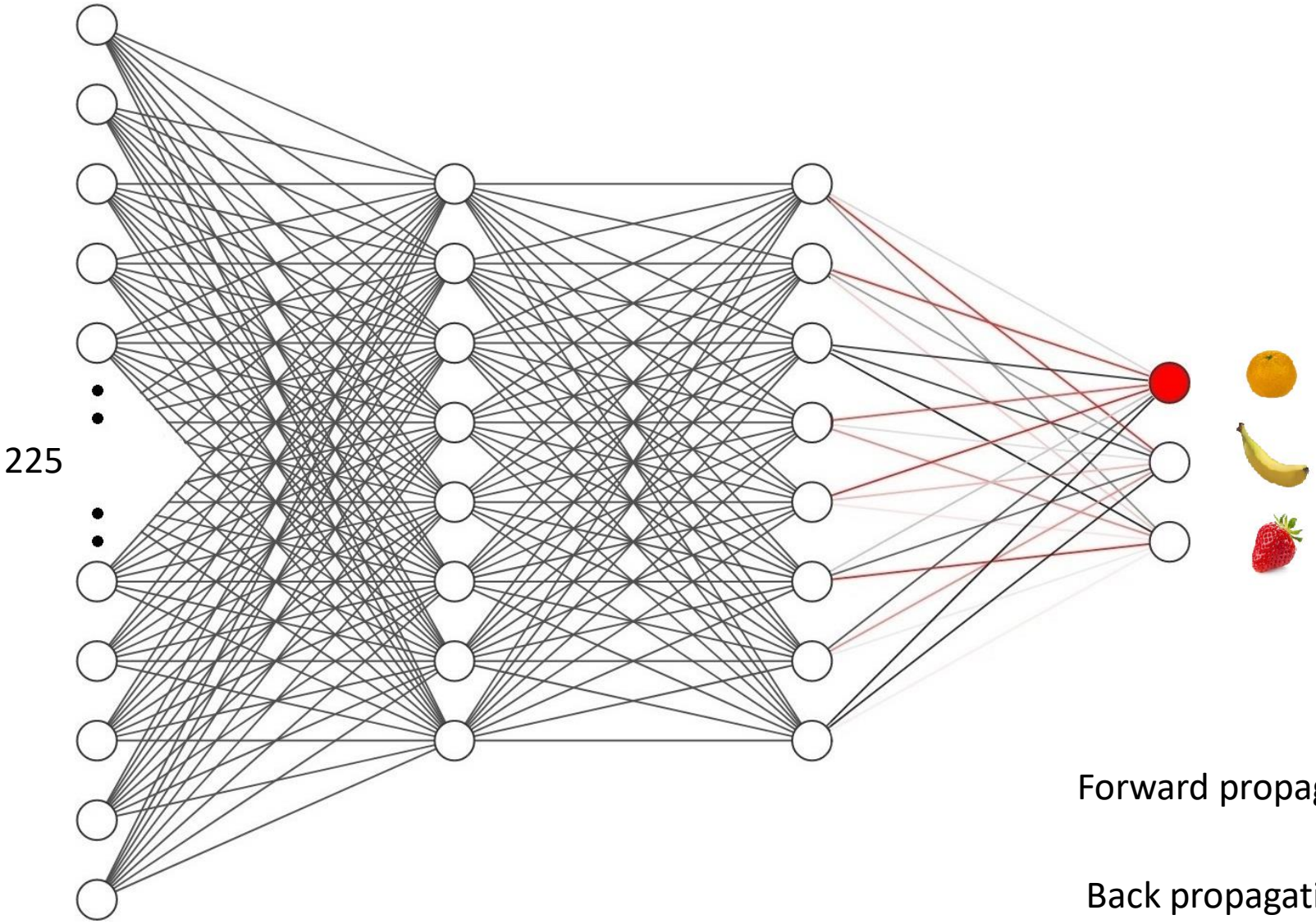
Training



Forward propagation

Back propagation

Training/Learning is all about finding the right weights and biases



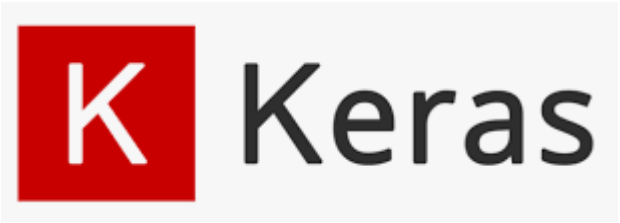
Forward propagation

Back propagation

Why were the movies released in the order of episode 4, 5, 6 and then episodes 1,2, and 3?

In charge of scheduling, I was!

Tools



Deep Learning Demo

- Transfer learning
  - Tensorflow, ML.NET

- Image creation - https://affinelayer.com/pixsrv/index.html
- Facial construction - https://thispersondoesnotexist.com/

Summary

- ✓What is Deep Learning?
  - ✓Define
  - ✓Learning Types
- ✓Artificial Neural Networks
  - ✓Building blocks
  - ✓Fundamentals of learning
- ✓Examples and demo
  - ✓Transfer Learning
  - ✓C# / ML.NET / Tensorflow

For more information

URList - https://www.theurlist.com/kalal-dl

Michael A. Nielsen - http://neuralnetworks anddeeplearning.com/chap1.html

ML.Net - https://dotnet.microsoft.com/apps/machinelearning-ai/ml-dotnet

Jeff Dean talk - https://www.youtube.com/watch?v=QSaZGT4-6EY

3Blue1Brown – Neural Networks - https://www.youtube.com/watch?v=aircAruvnKk

Build ANN From Scratch - https://www.freecodecamp.org/news/building-a-neural-network-from-scratch/

Transfer Learning - https://www.tensorflow.org/tutorials/images/transfer_learning

Introduction to AI - https://www.coursera.org/learn/ai-for-everyone

This slide deck – https://github.com/mdkalal/DeepLearning

TECH Masters

www.TechMasters-TC.com

Tuesdays, 7:45-9:00 am, Improving Enterprises, Bloomington

Thank you!

Feedback welcome

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