

Week 1

Neural Networks

Neural Networks intuition

Layers

Multiple Hidden Layers

Examples

Neural Network Model

Notations

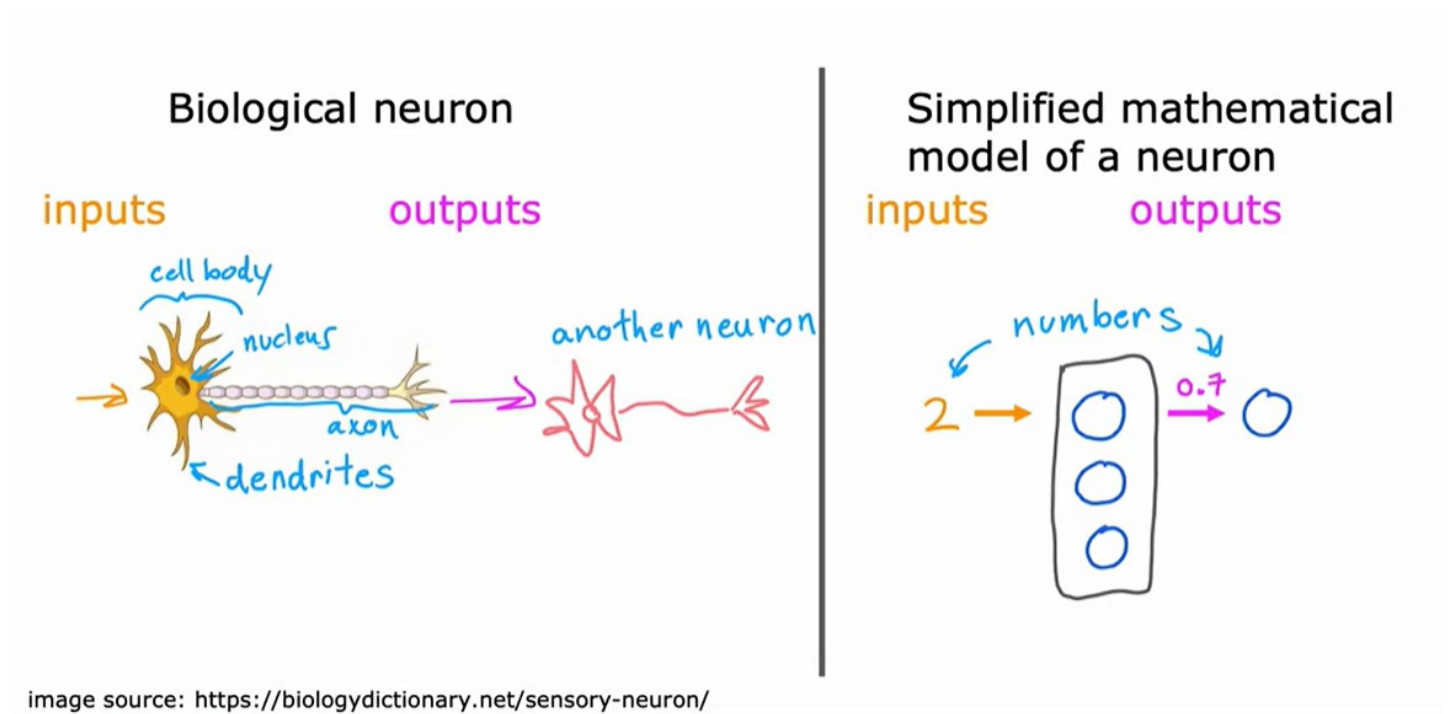
More Complex Neural Network

TensorFlow Implementation

Artificial General Intelligence (AGI)

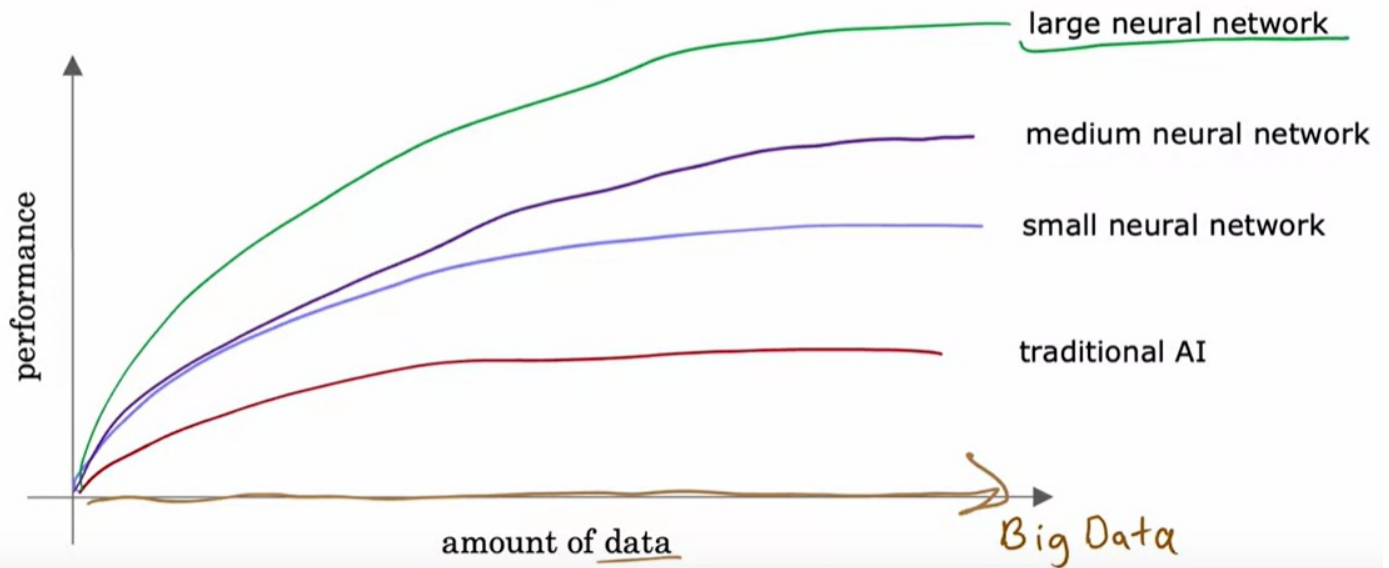
Neural Networks

Neural Networks intuition



- Traditional AI (Linear regression/Logistic regression) was unable to scale with large data

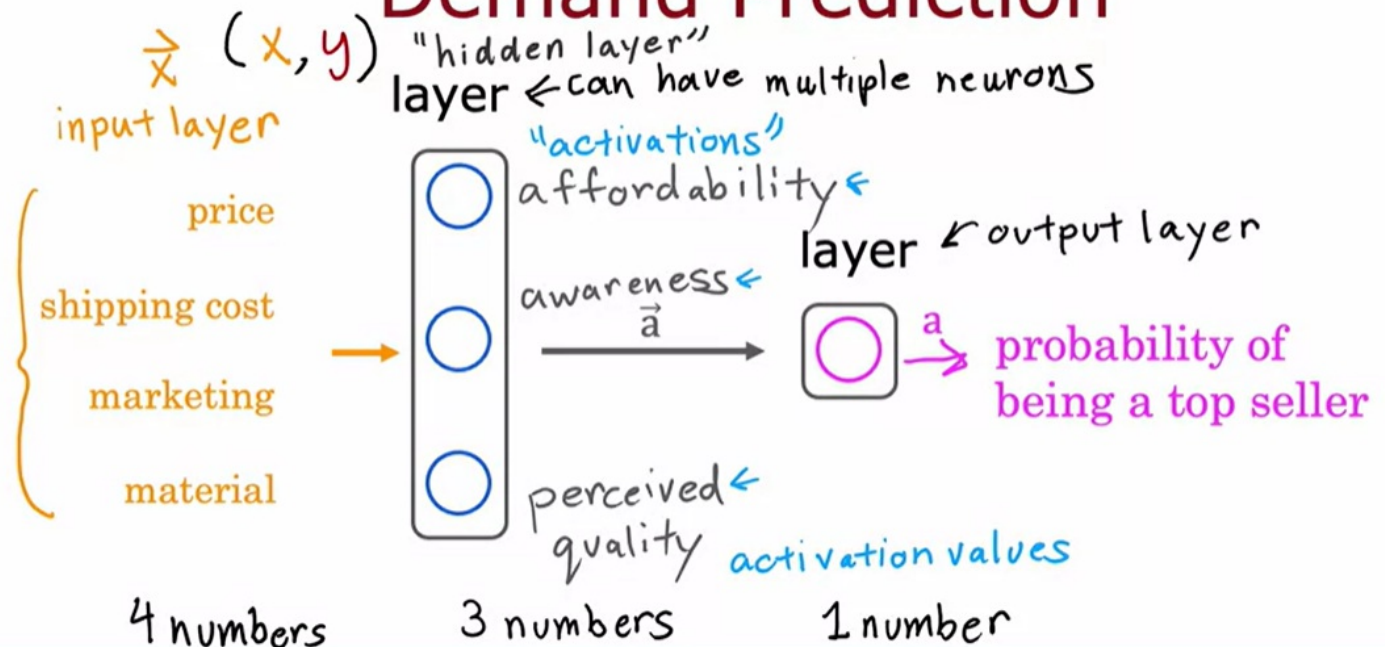
Why Now?



Layers

- Input layer, Hidden layer, Output layer
 - $x, a, y, x, a, y, x, a, y$
- From the example, 4 numbers from the input are fed into the hidden layer, which will compute 3 numbers, forming the activation values, then outputting a single number in the output layer
- Automated feature engineering → NN can learn its own features to make the problem easier for itself via some algorithm

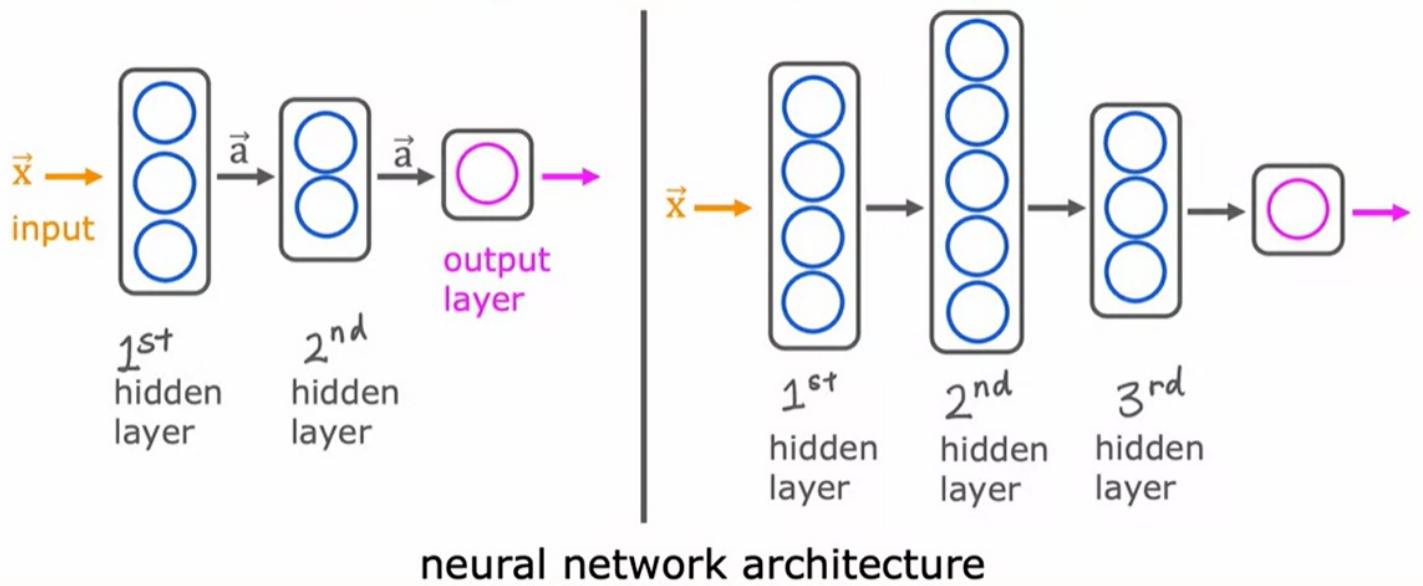
Demand Prediction



Multiple Hidden Layers

- Multilayer perceptron

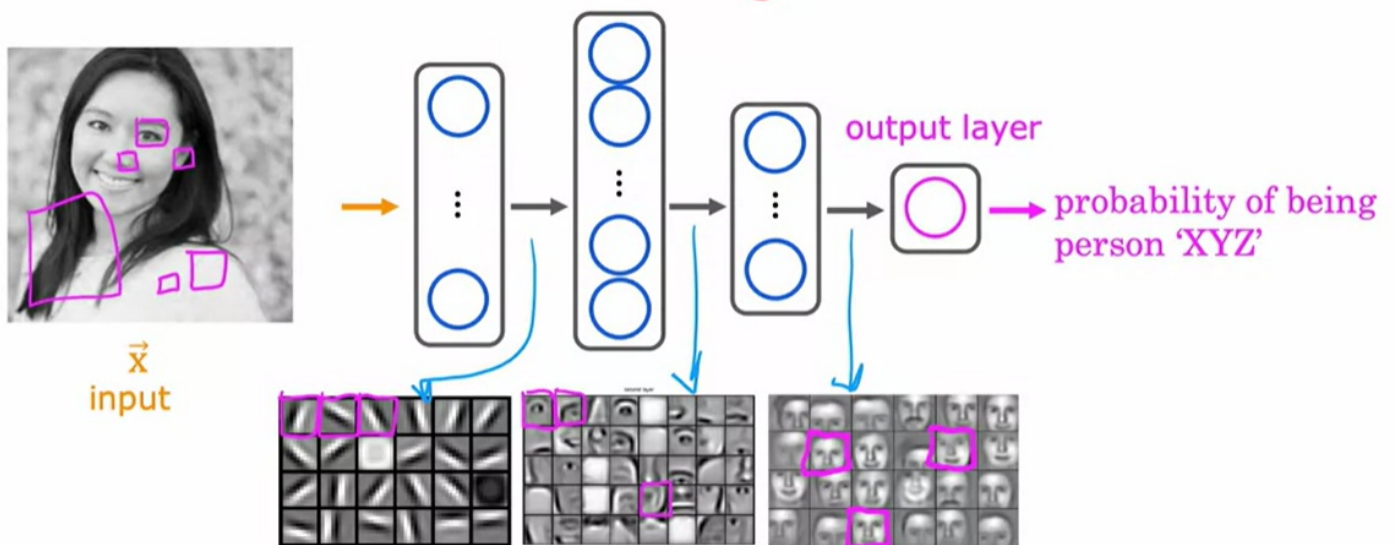
Multiple hidden layers



Examples

- Face Recognition
- Each layer is trying to identify a separate feature

Face recognition



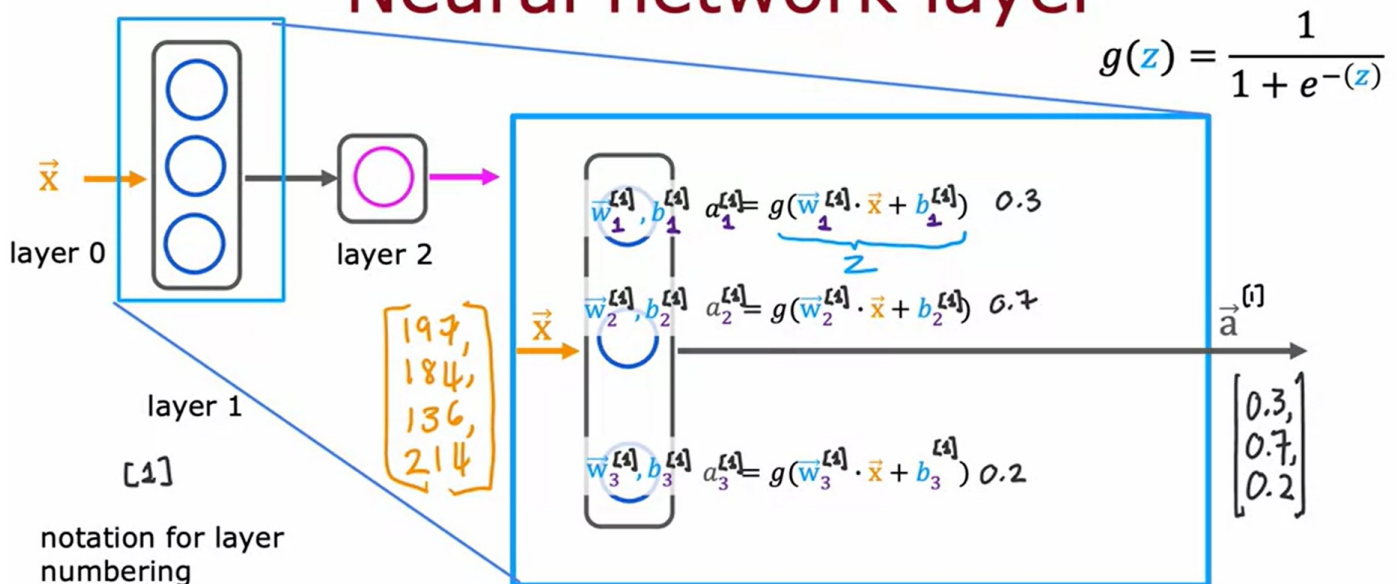
source: Convolutional Deep Belief Networks for Scalable Unsupervised Learning of Hierarchical Representations
by Honglak Lee, Roger Grosse, Ranganath Andrew Y. Ng

Neural Network Model

Notations

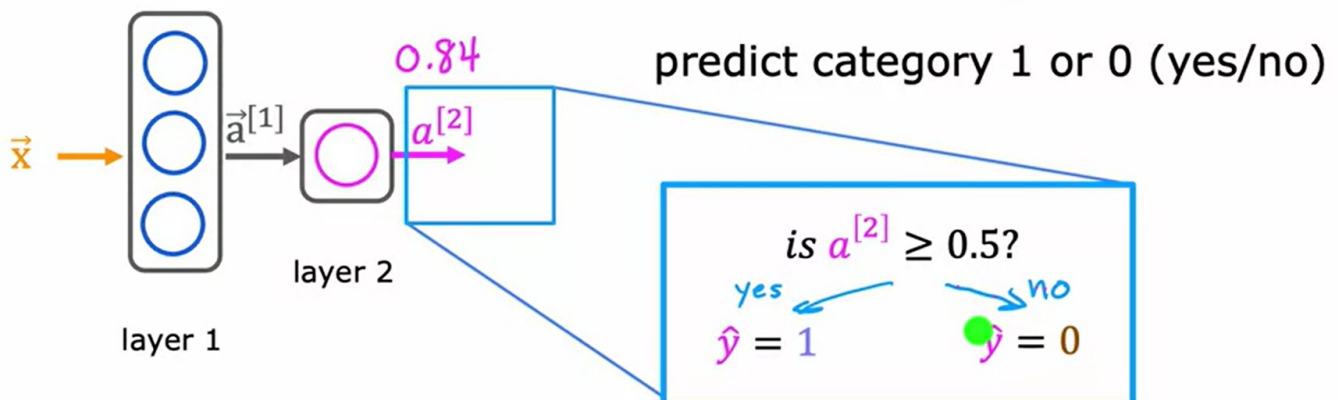
- Superscript [i] denotes the layer the variable is associated with

Neural network layer



- Optional step to classify final output

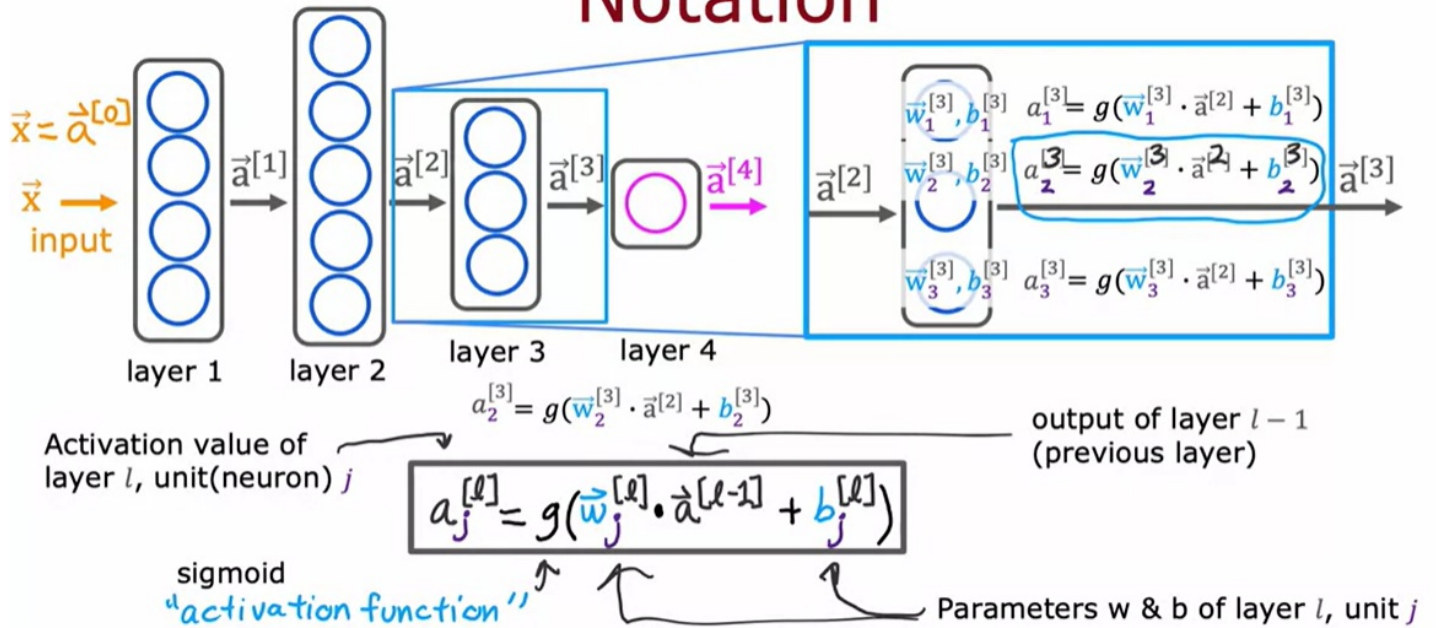
Neural network layer



More Complex Neural Network

- Forward propagation
- General formula to compute the activation value of layer l:

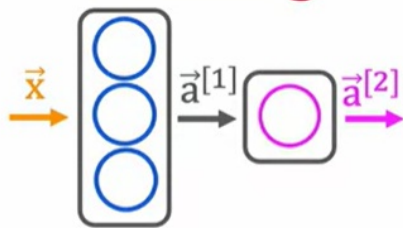
Notation



TensorFlow Implementation

Sequential() → Forward propagation

Building a neural network architecture



```
→ model = Sequential([
→   Dense(units=3, activation="sigmoid"),
→   Dense(units=1, activation="sigmoid")])
```

		y
200	17	1
120	5	0
425	20	0
212	18	1

```
x = np.array([[200.0, 17.0],
               [120.0, 5.0],
               [425.0, 20.0],
               [212.0, 18.0]])
# 4 x 2

targets y = np.array([1,0,0,1])

model.compile(...) ← more about this next week!
model.fit(x,y)

→ model.predict(x_new) ←
```

Artificial General Intelligence (AGI)

AI



ANI

(artificial narrow intelligence)

E.g., smart speaker,
self-driving car, web search,
AI in farming and factories

AGI

(artificial general intelligence)

Do anything a human can do