NLP and Deep Learning
MAT3399

Lecture 3:
Feed Forward
Neural Networks

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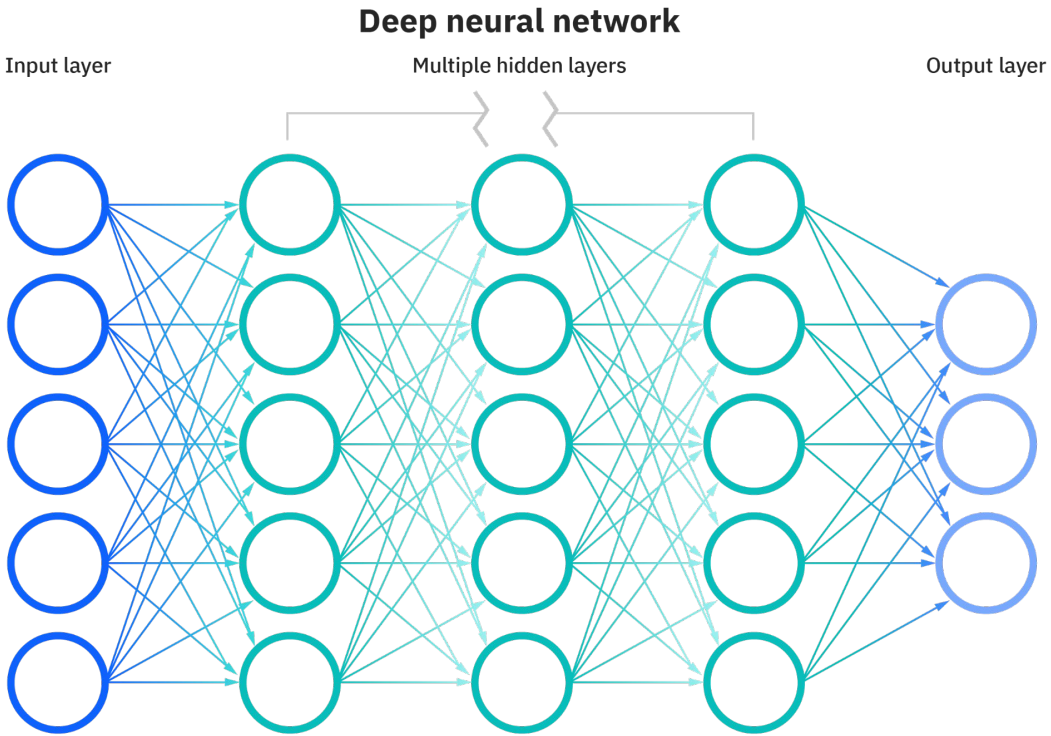
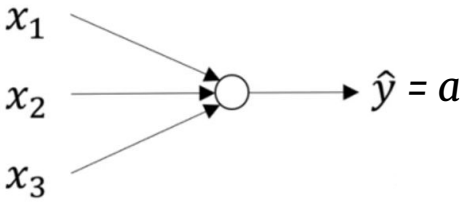
Content taken from Stanford CS244N

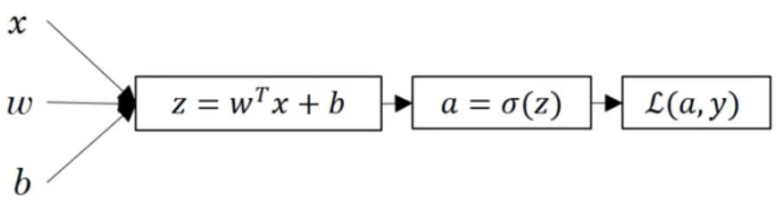
What is neural networks?

- Inspired by the human brain
- Comprises interconnected nodes or "neurons"
- Used for pattern recognition, classification, and more
- A key component in deep learning

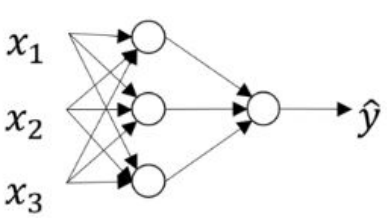


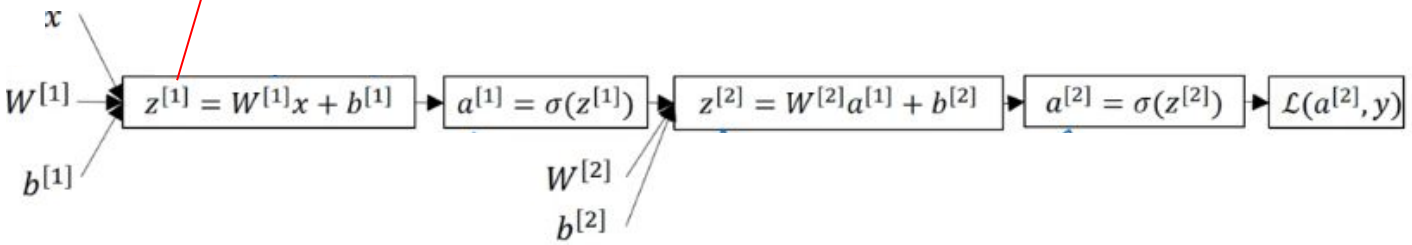
Logistic Regression vs Neural Networks





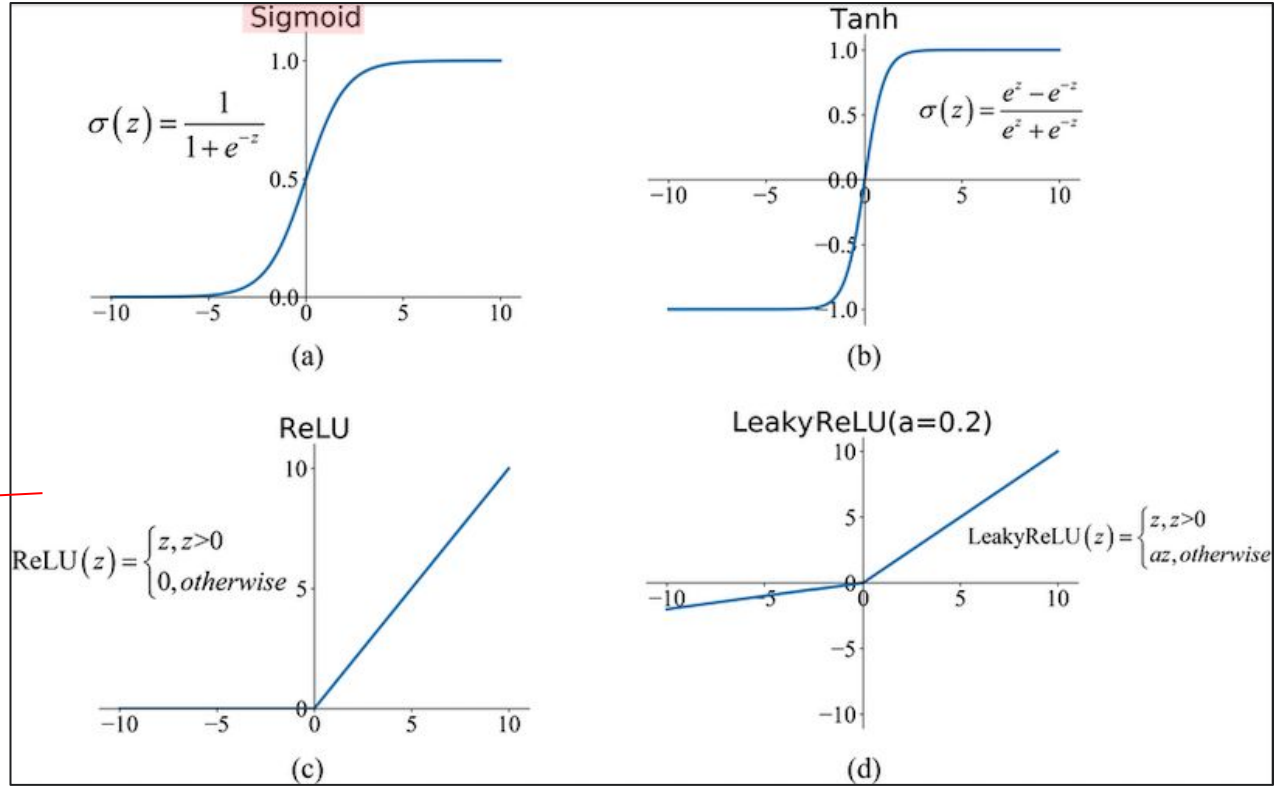
[i] indicates the i-th layer





Can you figure out the size of ***W*** and ***b*** in a neural networks?

Activation functions



Commonly used

Why do we need activation functions?

Parameters vs Hyperparameters

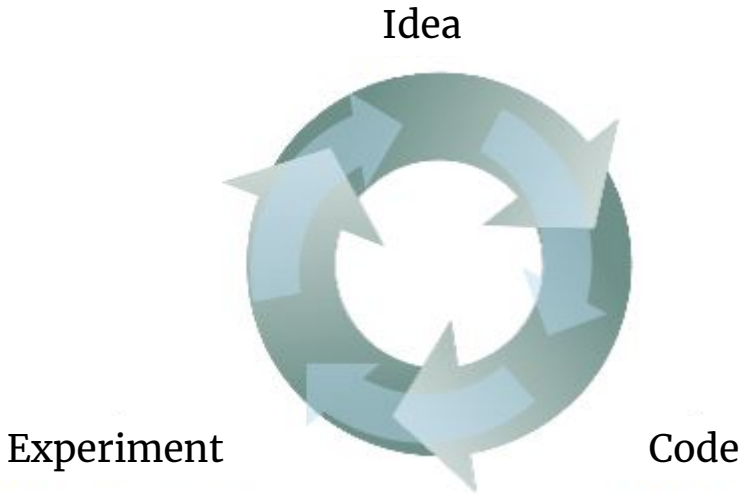
Parameters: $W^{[1]}$, $b^{[1]}$, $W^{[2]}$, $b^{[2]}$,...

Hyperparameters:

- Learning rate
- Number of epochs
- Number of hidden layers
- Number of hidden units for each layer
- Activation function
- .....

Question: How to choose hyperparameters?

Answer:



Text classification problem

Today we are building an FFNN model for sentiment data

```
Wow... Loved this place.        1
Crust is not good.      0
Not tasty and the texture was just nasty.       0
Stopped by during the late May bank holiday off Rick Steve recommendation and loved
it.     1
The selection on the menu was great and so were the prices.     1
Now I am getting angry and I want my damn pho.  0
Honeslty it didn't taste THAT fresh.)   0
The potatoes were like rubber and you could tell they had been made up ahead of time
being kept under a warmer.      0
```

What are the steps?

Deep Learning with Keras

```
pip install tensorflow
```

We can build a FFNN by using these APIs:

- Sequential
- layers.Dense

Sample code for a simple FFNN:

```
model = tf.keras.Sequential()
model.add(tf.keras.layers.Dense(8, activation="relu"))
model.add(tf.keras.layers.Dense(1))

model.compile(optimizer='sgd', loss='mse')
model.fit(x, y, batch_size=32, epochs=10)
```

API doc

Coding Exercise

- Implement a feed forward neural networks using keras library
- Train that feed forward neural networks for a text classification task
- Try to improve your model using different hyperparameters or different word representations

Download dataset here

Reminder

Assignment 1 due next week (10% final score) (Deadline: 13h00 04/10/2023)
Submit your work to Google Classroom