W8 Assignment – Machine Learning 3
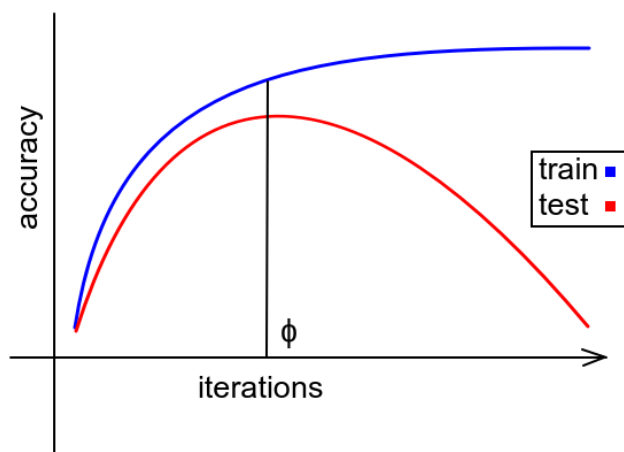
Computational Linguistics

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1 Overfitting

The following graph shows the development of the accuracy of a model as the number of iterations of the Gradient Descent algorithm increases.

The accuracy of the model on both the training and the test set are presented for various numbers of iterations. The point Φ indicates the iteration from which the red graph starts to increase again.

Based on this graph, it is possible to say that... (choose *TRUE* or *FALSE*)

a) As the iterations increase, the model keeps fitting better and better the test set

answer: _____

b) From around the iteration Φ, the model starts to overfit

    `answer:` _____

c) As the iterations increase, the model keeps fitting better and better the training set

    `answer:` _____

d) When training the model, we should repeatedly calculate the performance of the model both on the training and on the test set, so that we can find the point when the model starts overfitting

    `answer:` _____

e) The performance of the model on the test set always better than the performance of the model on the training set

    `answer:` _____

f) As the model overfits, it loses its ability to generalize to new (unseen) data

    `answer:` _____

g) The "best" model (i.e., the model that we would like to keep) is at or around the iteration Φ

    `answer:` _____

2 Artificial Neuron

2.1 Threshold

The image below shows the output of an artificial neuron for several different inputs $X0$ and $X1$. The activation function of this neuron is such that it will output 0 if its input is below a certain threshold Φ; and it will output 1 if its input equals or is above the threshold Φ.

X1

X1					
4	1	1	1	1	1
3	0	1	1	1	1
2	0	0	1	1	1
1	0	0	0	1	1
	1	2	3	4	5 X0
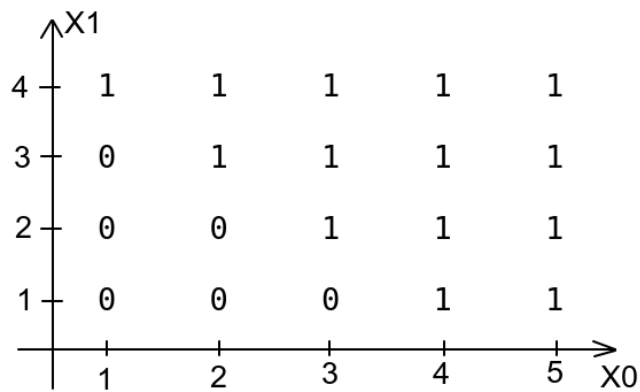
Consider that $W0 = 1$ and $W1 = 1$, and assume that the threshold is an integer number. What is the threshold Φ of this neuron?

◯ 1 ◯ 2 ◯ 3 ◯ 4 ◯ 5 ◯ None of the others

2.2 Threshold + weights

The image below shows the output of an artificial neuron for several different inputs $X0$ and $X1$. The activation function of this neuron is such that it will output 0 if its input is below a certain threshold Φ; and it will output 1 if its input equals or is above the threshold Φ.
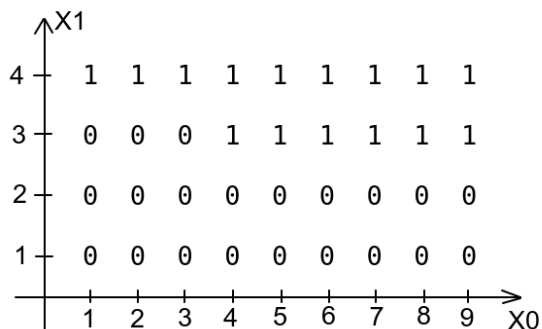
X1

X1									
4	1	1	1	1	1	1	1	1	1
3	0	0	0	1	1	1	1	1	1
2	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
	1	2	3	4	5	6	7	8	9 X0

Consider that $W0 = 0.2$ and $W1 = 1.5$, and assume that the threshold is an integer number. What is the threshold Φ of this neuron?

◯ 1 ◯ 2 ◯ 3 ◯ 4 ◯ 5 ◯ None of the others

3 POS Tagging

3.1 Coding

Consider the following piece of code:

```python
import nltk
sentence = "I like bacon with chocolate"

tagged = nltk.pos_tag(sentence)

[p[1] for p in tagged]
```

What is this code doing? (choose the correct alternative)

- Outputting all the words of the sentence

- Making a list with the POS tags, out of order, associated to each of the words in the sentence

- Making a list containing all the pairs (word, POS tag) associated, in order, with each of the words in the sentence

- Making a set with all the POS tags associated to each of the words in the sentence

- Making a list with the POS tags, in order, associated to each of the words in the sentence

- Getting only the second element of the sentence and putting it in a list

answer: _____