Indian Institute of Technology Kanpur
CS771 Introduction to Machine Learning, 2017-18-a

QUESTION 1

Assignment Number: 2
Student Name: Talla Aravind Reddy
Roll Number: 14746
Date: October 8, 2017

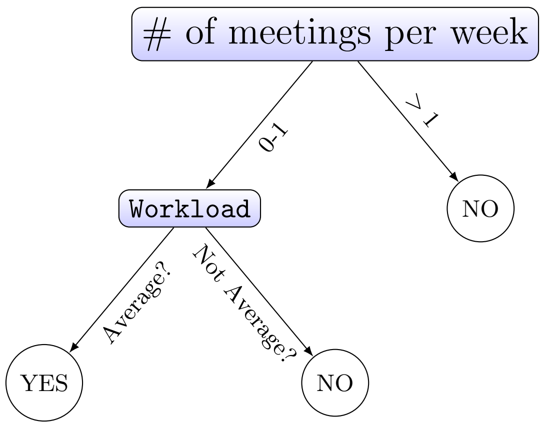
1 Name:

No.
Because whether a professor is a good advisor or not does not depend on their name.
Therefore, although there might be a correlation between some function of the name(for example whether the first letter is after 'g' or before 'g' in the alphabet) and the good/not good advising, it is only limited to the data set we have and it would not be true if we had a very large dataset.
Therefore, we should ignore this attribute while building our decision tree.

2 Perfect classification of given dataset:

No.
Look at the 4th and 6th entries of the given dataset.
Both of them have the same values for all the important attributes(i.e all except name) yet they have different values for whether the advisor is Good/Not Good.
Therefore, any classification algorithm we come up with can only be correct for either entry 4 or entry 6 but not both simultaneously(if it is a deterministic algorithm).
In this case, randomised algorithms might give correct results for both entries in some runs of the algorithm. But they are not perfect since they give wrong results also in other runs.

3 Decision Tree:



3.1 Information gain values:

At root node, information gains for
$Size = 0.067, Like = 0.031, Workload = 0.061, Meetings = 0.251 \implies Meetings$

For depth one node, where # meetings = 0-1, information gains for
$Size = 0.114, Like = 0.035, Workload = 0.439 \implies Workload$

3.2 Further splitting:

For root node's children, # meetings > 1 is not split into $2-3$ and > 3 because all the entries which fall into these categories are classified in the 'No' class.
For Workload's children, the 'Average' child has all values as YES(for average workload 3/3) and the 'Not average' child has majority NO values(6 out of 8).

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QUESTION 2

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This is for Question 2

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QUESTION 3

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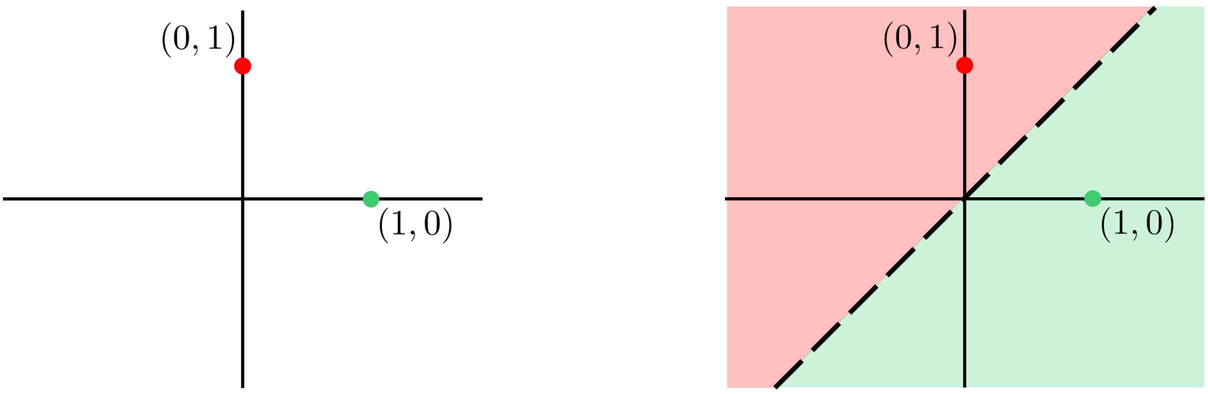

Figure 1: Learning with Prototypes: the figure on the left shows the two prototypes. The figure on the right shows what the decision boundary if the distance measure used is $d(\mathbf{z}^1, \mathbf{z}^2) = \left\|\mathbf{z}^1 - \mathbf{z}^2\right\|_2$, for any two points $\mathbf{z}^1, \mathbf{z}^2 \in \mathbb{R}^2$. The decision boundary in this case is the line $y = x$.

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QUESTION 4

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