

CS 4410 Intro to Machine Learning

Final Exam Fall 2024

Exam time: 75 Minutes

Total Marks: 40

Name:

ID:

Date:

You can also use question sheet to write your answers.

Q1 [15 points] Briefly define and differentiate between following (if possible with an example):

- (a) Bias and Variance
- (b) Validation Set and Test Set
- (c) Feature Selection and Feature Extraction
- (d) Bagging and Boosting
- (e) LDA and PCA

Q2 [5] Observe following user rating data for various items. Predict the rating of item 6 by user 5. Show all your steps.

user	item1	item2	item3	item4	item5	item6	item7
user1	5	3	4	1	?	?	?
user2	5	3	4	1	5	2	5
user3	5	?	4	1	5	3	?
user4	1	3	2	5	1	4	2
user5	4	?	4	4	4	?	4

Q3 [6] Observe Following Boolean Expression:

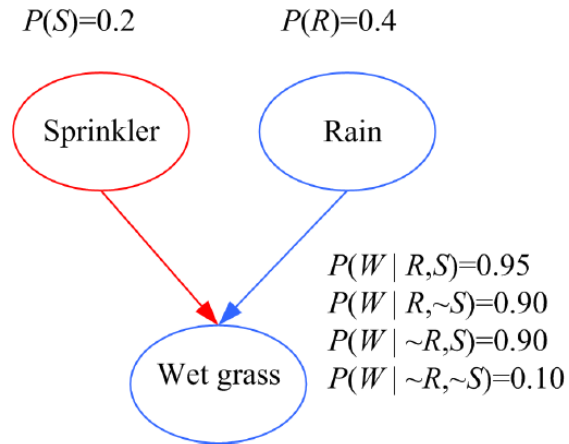
$(x_1 \text{ AND } \tilde{x}_2) \text{ OR } (\tilde{x}_1 \text{ AND } x_2) \text{ OR } (x_3 \text{ AND } \tilde{x}_4) \text{ OR } (\tilde{x}_3 \text{ AND } x_4)$

Can you design a single layer perceptron? Explain. If not, design a multilayer perceptron for the above expression.

Q4 [3] What is the purpose of a Kernel function ? Explain. Provide an example of a Kernel.

Q5 [4] Observe following Bayesian Network:

Given that the grass is wet and that it has rained, what is the probability of sprinkler being on ?



Q6 [4] What is clustering ? In K-means clustering scheme, how would you pick a value of K ?

Q7 [3] Describe atleast three Fixed Combination Rules to combine different learners.