Introduction to Machine Learning Midterm Exam

No :
Name:

1. dataset

X_1	X_2	D
2	1	a
1	3	a
0	-2	b
-1	-1	b

2. dataset

X_1	X_2	X_3	D
B	P	G	H
B	N	T	H
B	P	T	S
K	N	G	S

3. dataset

X_1	X_2	D
1	2	0
-1	3	1
0	1	1

1. By applying 1-NN on the first dataset, find the classes of (3,2) and (1,-1) data points. (Note that you can use Manhattan distance)
2. On the second dataset, by applying ID3 method, find the first branching criterion?
3. With Naive Bayes and the second dataset, find the class label of (B, P, G) data point.
4. For the third dataset, with Least Squares method, find the weights (w_1 and w_2) in the equation of $w_1 X_1 + w_2 X_2 = D$, and compute the MSE. (Note that all variables start at 0.5)
5. Let be a system with two inputs (X and Y) and one output (Z). The designed sugeno fuzzy inference system has some properties:
    a. X input can be between [-30 40], and we decide 2 fuzzy sets (trapezoid) as A_1 (0, 0, 0.5, 1), and A_2 (0, 0.5, 1, 1)
    b. Y input can be between [0 90], and we decide 3 sets (triangle) as B_1 (0, 0, 0.5), B_2 (0, 0.5, 1), and B_3 (0.5, 1, 1)
    c. Z output can be between [0 500], and we decide 3 singleton sets as C_1 (0), C_2 (0.5), and C_3 (1)
    d. Also we decide three rules as

    Rule 1.IF X is A_1 AND Y is B_1 THEN Z is C_1
    Rule 2.IF X is A_1 AND Y is B_2 THEN Z is C_2
    Rule 3.IF X is A_2 AND Y is B_3 THEN Z is C_3

    Compute the output value for X=5 and Y=30.