INTRODUCTION TO ARTIFICIAL INTELLIGENCE
Lab 2 – Classification

1) NAÏVE BAYES FOR BINARY DATA: Given are 10 objects O1-O10 characterized with 3 binary attributes A1-3. Each object is classified as either "0" or "1". When do you think an object is classified as "1"? Firstly, compute unconditional and conditional probabilities. Then, try to predict to which class all three new objects ([1, 1, 0], [1, 1, 1], and [0, 0, 1]) belong. Use Naïve Bayes classifier and compute appropriate probabilities.

	A1	A2	A3	Cl
O1	0	0	1	0
O2	1	0	0	1
O3	1	0	1	0
O4	0	1	0	1
O5	1	1	0	1
O6	0	0	0	0
O7	0	0	1	0
O8	1	0	0	1
O9	1	0	1	0
O10	1	1	1	0

P(Cl = 0) =
P(Cl = 1) =

P(A1=1 | Cl = 0) =

P(A2=1 | Cl = 0) =

P(A3=1 | Cl = 0) =

P(A1=1 | Cl = 1) =

P(A2=1 | Cl = 1) =

P(A3=1 | Cl = 1) =

P(Cl = 0 | [1, 1, 0]) =

P(Cl = 1 | [1, 1, 0]) =

P(Cl = 0 | [1, 1, 1]) =

P(Cl = 1 | [1, 1, 1]) =

P(Cl = 0 | [0, 0, 1]) =

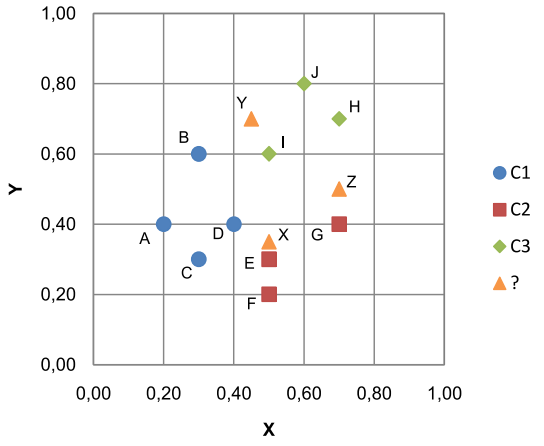
P(Cl = 1 | [0, 0, 1]) =

2) K-NN ALGORITHM: Given are 10 objects A-J characterized with real-valued attributes X and Y. Each object is assigned to one class C1, C2, or C3. There are 3 not classified objects: X, Y, Z. Use K-NN algorithm to predict their classes. Firstly, apply the simple-voting procedure for K=1, 2, and 3. For K=3, mark the nearest neighbors in the plot. In case of ambiguity, put "?" in the table. Use Euclidean distance. However, no calculation needs to be performed. Simply compare the distances in the plot. Secondly, apply K-NN with K=3 using a weighted-voting procedure. For this reason, compute an average distance between neighbors belonging to the same class and the object to be classified. The smallest average distance wins.

	X	Y	Cl
A	0.2	0.4	C1
B	0.3	0.6	C1
C	0.3	0.3	C1
D	0.4	0.4	C1
E	0.5	0.3	C2
F	0.5	0.2	C2
G	0.7	0.4	C2
H	0.7	0.7	C3
I	0.5	0.6	C3
J	0.6	0.8	C3
X	0.5	0.35	?
Y	0.45	0.7	?
Z	0.7	0.5	?

Simple-voting			
Object	K=1	K=2	K=3
X			
Y			
Z			

Weighted-voting	
Object	K=3
X	
Y	
Z	



3) CONFUSION MATRIX: There are 100 objects in a data set: 50 objects belong to class C1, while the remaining 50 belong to class C2. 20 objects were selected to make a test set: 10 objects from C1 and 10 objects from C2. While testing, 6 objects were wrongly classified as C1 and 3 objects were wrongly classified as C2. Complete the confusion matrix. Compute precision and recall for each class.

		Actual	
		C1	C2
Predicted	C1	7	6
	C2	3	4

Precision for C1 =
Precision for C2 =

Recall for C1 =
Recall for C2 =