Q1, Q2: (omitted)
Q3: Use Instance Based learning scheme IBk for $k=1$ and $k=3$ (both with no distance weighting and with weight $=1 /$ distance). Report on the confusion matrix obtained in each case and explain the role of $k$ and the difference between no distance weighting and weight =1/distance.
open the training dataset



## open the test dataset



KNN: the number of nearest neighbors
distanceWeighting: Some attribute will be more important than others. and it is usually reflected in the distance metric by some kind of attribute weighting.

## $\mathrm{K}=1$, no distance weighting



## $K=1$, weight $=1 /$ distance



## $\mathrm{K}=3$, no distance weighting



## $K=3$, weight $=1 /$ distance


$\mathrm{K}=1$, no distance weighting
Given a new instance in the test dataset, the new instance is compared with those instances in the training set using the distance metric and only the nearest one is used to assign the class to the new one.

1. Less Information (only one instance)
2. No information on the importance of the neighbors (no weighting on the attribute)
$K=1$, weight $=1 /$ distance
So, as the distance is getting larger, the weighting makes the attribute take smaller effect on the classification.
3. Less Information (only one instance)
4. Information on the importance of the neighbors (weighting=1/distance) No improvement on this case.
$\mathrm{K}=3$, no distance weighting
Given a new instance in the test dataset, the new instance is compared with those instances in the training set using the distance metric and only three nearest instances are used to assign the class to the new one.
5. More Information (three instances)
6. No information on the importance of the neighbors (no weighting on the attribute)
Improvement on this case
$K=3$, weight $=1 /$ distance
7. More Information (three instance)
8. Information on the importance of the neighbors (weighting= $1 /$ distance)

So, as the distance is getting larger, the weighting makes the attribute take smaller effect on the classification.
Perfect classification on this case.

