Problem 1

1. The root attribute is Stripes. Below are the calculations of the entropy.

Because the entropy for Stripes is largest, that is , the root attribute will be Stripes to obtain maximum information gain.

1. Below is the decision tree

**STRIPES**

/ \

No Yes

/ \

**COLOR COLOR**

/ / \

Purple Purple Red

/ / \

*NOT POISONOUS POISONOUS NOT POISONOUS*

Problem 2

For and the similarity measure , three nearest neighbor of would be :. Therefore .

Problem 3

The examples map from to coordinates as follows:

maps to and

maps to and

maps to and

maps to and

From the mapping and results above it is obvious that will be positive when and negative when . Therefore the maximum margin separator is the line , with the margin equals to 1. The separator corresponds to the axes in the original space – this can be thought of as the limit of a hyperbolic separator with two branches.

Problem 4

To calculate the squared Euclidean distance in the projected space we have

With the kernel trick

We have

That is, we can compute the squared Euclidean distance in feature space between any two points in the original space without explicitly computing the mapping but instead using the kernel function.

Problem 5

To implement , we first consider :

To consider

1. :
2. :

That is, we will have to implement a neural network for .

