# COMP 632: Assignment 2

Due on Wednesday, February 18 2015

*Presented to Dr. Doina Precup*

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# Question 1

## A)

For a function to be considered a kernel function the kernel matrix defined as $K_{ij} = K(x_i, x_j)$ must have two properties:

1. be symmetric

2. be positive semidefinite

As such, a Kernel matrix must abide by the following:

$$K_{ij} = K_{ji} \tag{1}$$

$$z^T K z \geq 0 \tag{2}$$

Where $z$ is an arbitrary vector.

## B)

As $l$ increases words will have a tendency of having higher scores when compared with itself then any other words. This will result in a diagonal matrix.
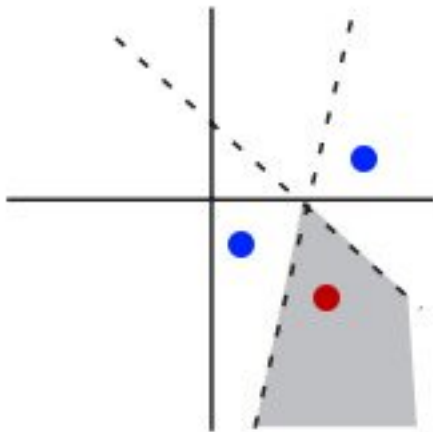
## C)

Yes.

## D)

# Question 2

## A)



## B)

The VC-dimension of this hypthesis class is 4. This is because it can successfully all configurations of 4 points. However, it would not be able to do so for all configuration of 5 points.

## C)

The VC-dimension of any type of boolean combination of 2 linear classifiers is also 4.

# Question 3

**A)**

$$P(K|x, h^K) = 1 - \sum_{i=1}^{K-1} h^i(x) \tag{3}$$

$$\log L(h) = \sum_{i=1}^{m} \log P(y_i|x_i, h) \tag{4}$$

$$\log L(h) = \sum_{i=1}^{m} \log \left( 1 - \sum_{j=1}^{y_i-1} h^j(x_i) \right) \tag{5}$$

**B)**

**C)**

# Question 4

**A)**

**B)**

**C)**

**D)**

**E)**