**Exercise 5: Theory + SVM**

Or Livne – 203972922

Roy Rubin – 201312907

Text, letter

Description automatically generated

1. Q1 – kernels and mapping fucntions
   1. Finding the mapping function:
      * Reminder: a function K is called a kernel if there exists a mapping function so that the following holds:
      * Note: in ex.1.a., K is defined over which means that x and y are vectors of size 2.
      * Using the hint:

So what we are actually looking for is:

* + - Definition of :
    - Proof:

I note that something still doesn’t add up because x and y are 2d vectors.

* 1. I am not sure … Monomial ? full variational? Or something ?
  2. How many multiplications are saved ?
     + Note that is an inner product of two vectors of dimension 10 (!)
     + Note that is a multiplication of vectors of dimension 2 (!)
     + The number of multiplications in the higher dimension is: 100 ?? (should be exact)
     + The number of multiplications in the original dimension is: 8 ??

Graphical user interface, text, application

Description automatically generated

1. Q2 - Solving with LaGrange multipliers:
   * + Finding the maximum and minimum points for the function f under the constraint g: we will extract from the equation: which is equivalent to:

Meaning we can extract:

* + - Finally, we will solve a 3-way equation with the help of the original given constraint:

This will give us 2 values. We will extract them, and use them to find the min and max points:

* + - We received:
    - When analyzing the function f, we note that the possible point that will maximize f will occur when x is positive and y is negative, and the possible point that will minimize f will occur when x is negative, and y is positive.
    - So, the maximum point of the function f will occur when:
    - The maximum point of the function f will occur when:

Text, letter

Description automatically generated

1. Q3 – PAC Learning: …

Graphical user interface, text, application

Description automatically generatedA screenshot of a computer

Description automatically generated with medium confidence

1. Q4 – Confidence
   * + The correct error percentage is: …. What ?

Text

Description automatically generated

Text

Description automatically generated From inside the notebook:

1. Q5 – SVM with jupyter notebook
   * + My chosen C values: [0.0005, 0.001, 0.002, 0.005, 0.01, 0.1, 10]
     + Final graph in comparison to needed graph:

Chart, line chart

Description automatically generated