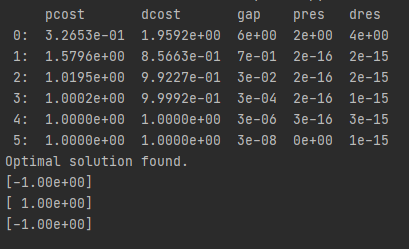
1. Consider the following proof
   1. Property of matrix Q
   2. Property of matrix Q mean for the standard QP problem
   3. Usefulness of (b)
      1. Since we are looking for a that minimize the , and since the function is convex, by finding the absolute minima will make you find the answer.
2. Given the standard QP problem, explain what each component represents.
   1. u
      1. this is the part that has bias and weights that QP solver is trying to optimize.
      2. this is useful since this will give us the hyperplane.
   2. Q
      1. that represents coefficients of quadratic term.
      2. Useful since this is the one that changes the optimal value u that we are looking for
   3. p
      1. that represents coefficients of linear term.
      2. Same as Q, this can change the optimal value u that we are looking for since it is the coefficients
   4. A
      1. that specifies the linear inequality constraints.
      2. We use this vector, constructed from this equation , where A is equivalent to this part that has to be solved with c vector below in order to get u
   5. c
      1. which normally appear as 1 for each element.
      2. Similar to A vector, it represents 1 from the equation above, looks like this and used to solve for u with A vector.
3. Consider the dataset, manually solve the optimal hyperplane optimization problem
   1. Matrix Notation
      1. We know that
4. SVM using python
   1. Use CVXOPT to verify the toy dataset
      1. 
         1. Python code is submitted on Mimir
   2. From what I tested, increasing dimension cause the runtime cost to increase faster than increasing sample size. These are the two scenario that my computer started to slow down and took a minute to calculate.
      1. Sample\_size: 10 Dimension: 20000
         1. If you have less than 5000 dimensions, it will calculate the optimal solution quickly.
      2. Sample\_size: 10,000,000 Dimension: 2
         1. If you have less than 1,000,000 samples, it will calculate the optimal solution quickly.