Quadratic Programming Project

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Project – Implement a Small Support Vector Machine

\[ W(\alpha) = \sum_{i=1}^{m} \alpha_i - \frac{1}{2} \sum_{i,j=1}^{m} y_i y_j \alpha_i \alpha_j K(x_i, x_j) \]

\[
\sum_{i} \alpha_i y_i = 0 \\
C - \alpha_i - \mu_i = 0 \\
y_i(w^T x_i - b) - 1 + \xi_i \geq 0
\]
Project – Implement a Small Support Vector Machine

• Linear kernel (x.y or x.y + 1)
• SMO algorithm (Solution 1)
• Use an existing quadratic programming package given known constraints (Solution 2)
• Gradient descent (Solution 3)
• **Implement at least two of the three solutions**
• Compare results with a SVM method (e.g., SVM light)
• Report weights of data points, weight vector, support vectors (on boundary or slack variable is not 0), and $b$
• Report the accuracy on the training data
• Report the accuracy on some withheld test data
Data Set

- [http://www.csie.ntu.edu.tw/~cjlin/libsvmtools/datasets/binar
diabetes](http://www.csie.ntu.edu.tw/~cjlin/libsvmtools/datasets/binary/diabetes)
- First 10, 20, 30, ..., 50, all data points
- Visualize how weights change during SMO optimization if you would like
- You may use other data sets too if the diabetes data does not work. ([http://archive.ics.uci.edu/ml/](http://archive.ics.uci.edu/ml/))
Timeline of this project and the remaining of the semester

- Nov. 21, discussion of Project 5
- Dec. 3, presentation of plan of Project 5
- Dec. 5, deep learning lecture
- Dec 10, presentation of results of Project 5
- Dec. 12, reading assignment of deep learning due
- No final presentation