Quadratic Programming Project

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Project – Implement a Small Support Vector Machine

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

\[
w - \sum_{i} \alpha_i y_i x_i = 0
\]

\[
\sum_{i} \alpha_i y_i = 0
\]

\[
C - \alpha_i - \mu_i = 0
\]

\[
y_i (w^T x_i - b) - 1 + \xi_i \geq 0
\]
Project – Implement a Small Support Vector Machine

- Linear kernel \((x.y \text{ or } x.y + 1)\)
- 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

- 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/)
Timeline of this project and the remaining of the semester

• Nov. 13, discussion of Project 5
• Nov. 15, presentation of plan of Project 5
• Nov. 20, deep learning lecture
• Nov. 22, presentation of results of Project 5
• Dec. 4, reading assignment of deep learning due, class is rescheduled to Dec. 11
• Dec. 11 (Wed), final presentation of all projects