Project 3

Each group should

- Submit one lab report per group containing procedures and results to Canvas by May 3, midnight. Follow the Report Guidelines in Project 1.
- Include a thoughtful and reflective paragraph from each team member summarizing what has been learned.
- Include a section describing the work done by each member of the group.
- Attach your well-documented code in the appendix of the report.
- You can use any programming language to do the project. MATLAB is preferred.

Linear classification for Handwritten Digits

In this project, you will continue to work on the handwritten digit recognition task from Project 1. Use the two best features found in Project 1 to represent each sample. Note, both the training and the test data for each object can be found on Canvas.

1. Implement the *batch perceptron algorithm* and the *single-sample perceptron algorithm*.
2. Apply each algorithm to the digit classification of 0 and 1. Plot the decision boundary on the feature space with ***training data*** labeled and discuss the results with different values of learning rates and initializations.
3. Evaluate the performance of the classifier for the ***training set*** and the ***test set***.
4. How does the batch perceptron compare to the single-sample perceptron procedure?
5. Implement the *Ho-Kashyap algorithm*. Repeat Steps 2 and 3 above.
6. Use MATLAB built-in function to train a SVM model using the training data. Then classify test data using the model trained. Compare the results by using different C- parameters and different kernel functions/parameters. In this step, you will also experiment with different features, first using the best two features selected from Project 1, then using all raw pixel values (28x28).
7. Repeat the above steps for the digit classification of 0 and 2.