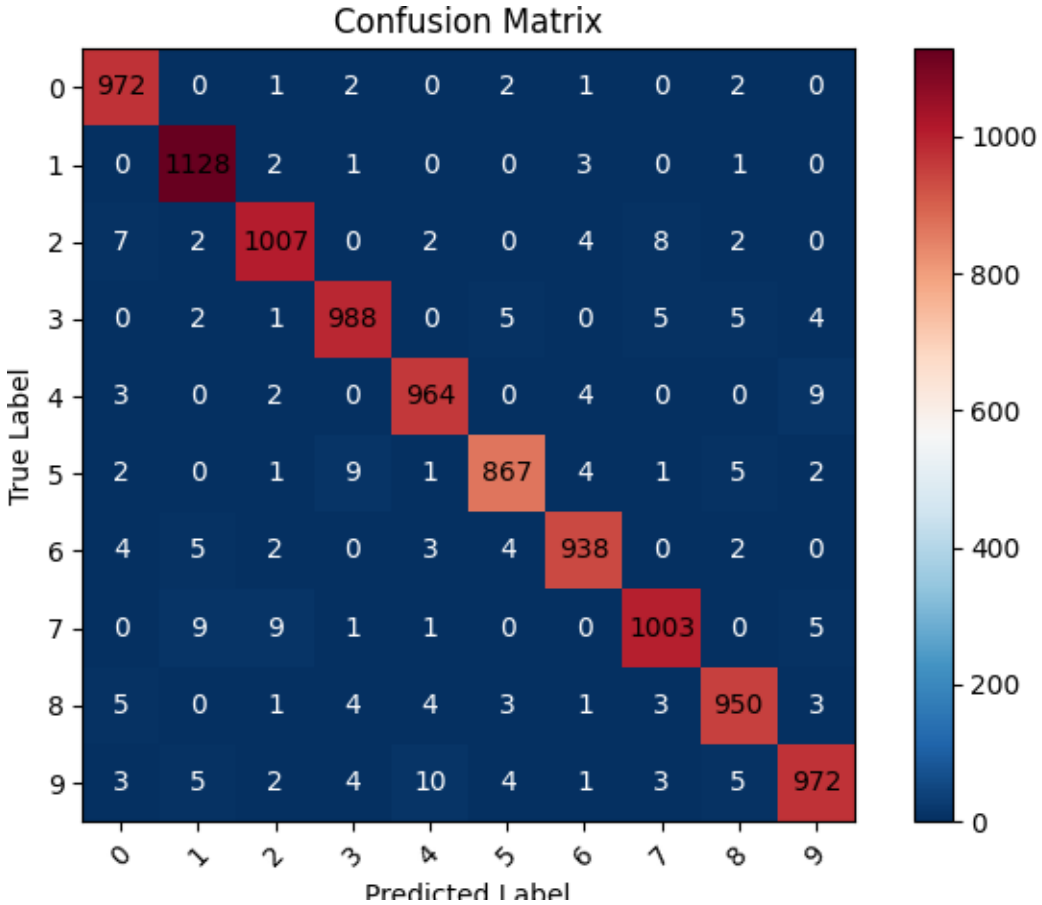
# Analysis Document Reviewing the Process of Training a Support Vector Machine Model and a K Nearest Neighbor Model for Predicting numbers using the MNIST dataset.

In this study, we trained two machine learning models using the MNIST dataset, which includes 60,000 training samples and 10,000 testing samples of handwritten digits ranging from 0 to 9. Given the extensive size of this dataset, the largest we have handled to date, it's not surprising that we achieved excellent accuracies.

For our Support Vector Machines (SVM) model, we achieved a remarkable testing accuracy of 97.89%. This high level of accuracy is primarily attributable to the vast dataset available. After several iterations, we determined that the "poly" kernel function was the most effective for our model, yielding the highest accuracy. Initially, we used a "linear" kernel, but soon found that it was inadequate due to the dataset's non-linear separability. Additionally, we generated a confusion matrix for this model, which is presented below.




The table reveals that the numbers 7 and 9 were the most challenging digits to predict accurately. The shape of the number 7 often led to confusion with the numbers 1 and 2, likely

due to outliers and similar visual features. Similarly, the number 9 was frequently mistaken for a 4 because of their close shapes.

Our K Nearest Neighbor (KNN) model demonstrated a comparable accuracy, achieving 97.05%. Through extensive testing, we found that setting k = 3 provided the optimal results for this model. We have also compiled a confusion matrix to illustrate these findings, which is included below for further examination.