

2 Experimental Outcomes:

2.1 (a) Changing the loss hyperparameter in LinearSVC (hinge vs squared hinge)

Table 1: Effect of Loss Hyperparameter

Loss Hyperparameter	Training Time	Test Misclassification Rate
Hinge Loss	19.44174492	0.0103
Square Hinge Loss	34.579272	0.00812

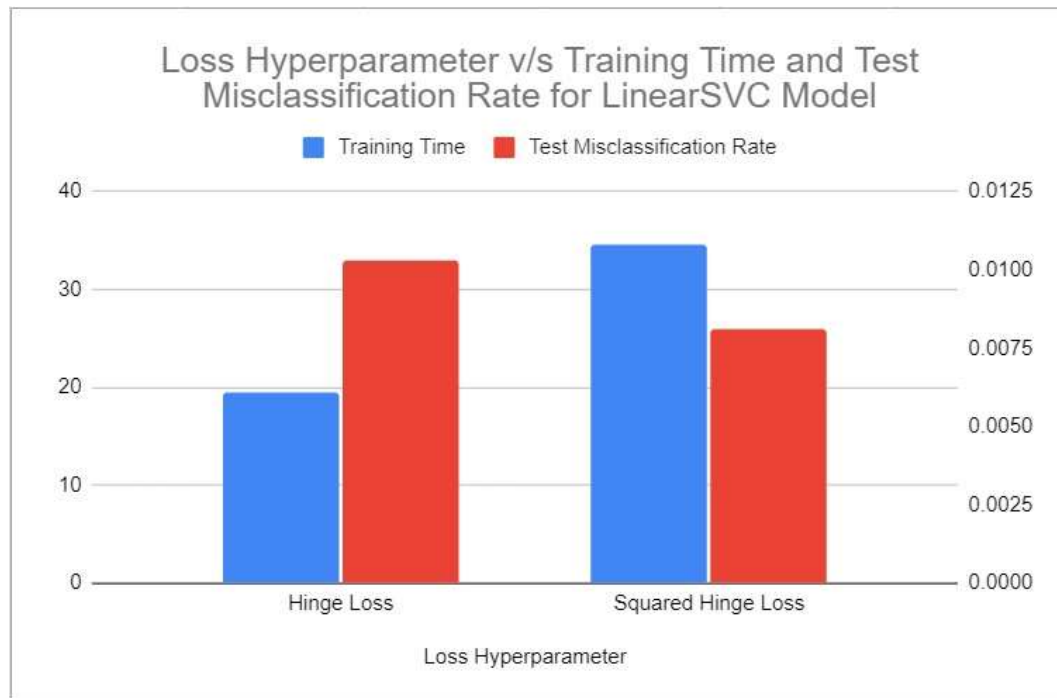


Figure 1: Effect of Loss Hyperparameter

Observation: In general, training with squared hinge loss is expected to take longer than training with hinge loss. This is because squared hinge loss involves computing squared terms, which are generally more computationally intensive compared to hinge loss, which involves only linear terms. The squared hinge loss function penalizes outliers more heavily compared to hinge loss, which can lead to a more complex optimization problem. Consequently, the optimization process may require more iterations to converge when using squared hinge loss, leading to longer training times.

2.2 (b) Setting C in LinearSVC and LogisticRegression to high/low/medium values

Table 2: Effect of C Values on LinearSVC Model

C Values	Training Time	Test Misclassification Rate
0.01	4.55374648	0.0135
0.1	13.22803983	0.0101
1	18.9645034	0.00816
10	18.07491058	0.00792
50	18.00416077	0.00846
100	18.337205	0.00826
500	17.92924791	0.00864
1000	18.17217189	0.0092

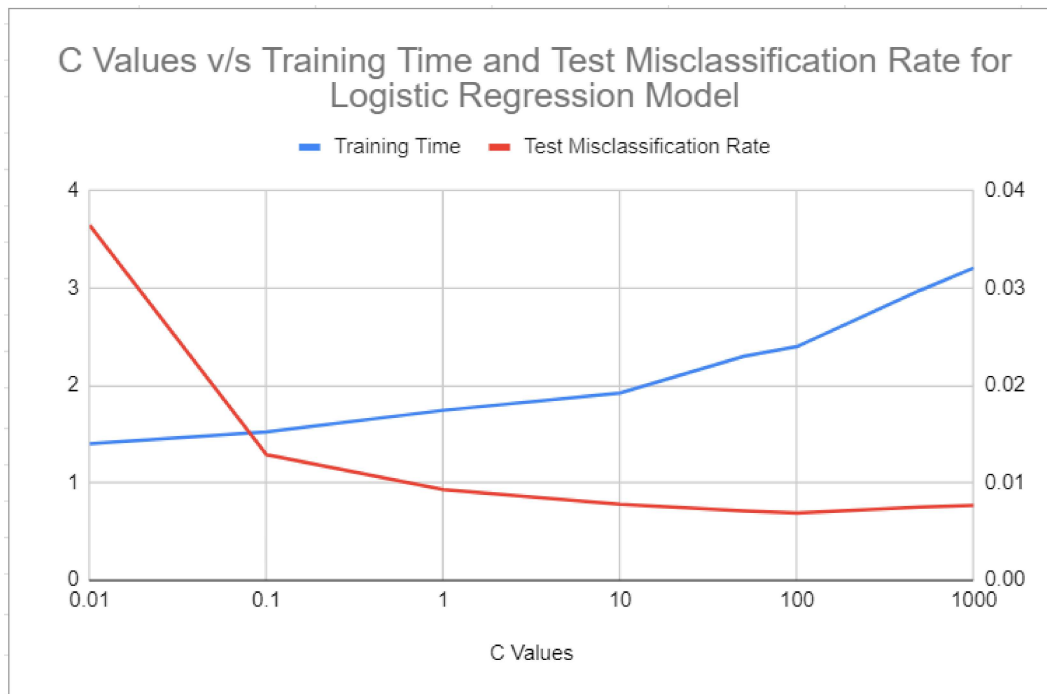


Figure 2: LinearSVC

Observation: The C parameter controls the penalty for misclassification, with smaller values of C leading to stronger regularization and potentially simpler models, while larger values of C allow the model to fit the training data more closely, potentially leading to longer training times. The training time exhibit an increasing trend as C values increase due to the increased complexity and potential overfitting of the model.

Table 3: Effect of C Values on Logistic Regression Model

C Values	Training Time	Test Misclassification Rate
0.01	1.40262406	0.0365
0.1	1.52405432	0.0129
1	1.745059878	0.0093
10	1.922780091	0.0078
50	2.300209421	0.0071
100	2.400838354	0.0069
500	2.981411726	0.0075
1000	3.209210138	0.0077

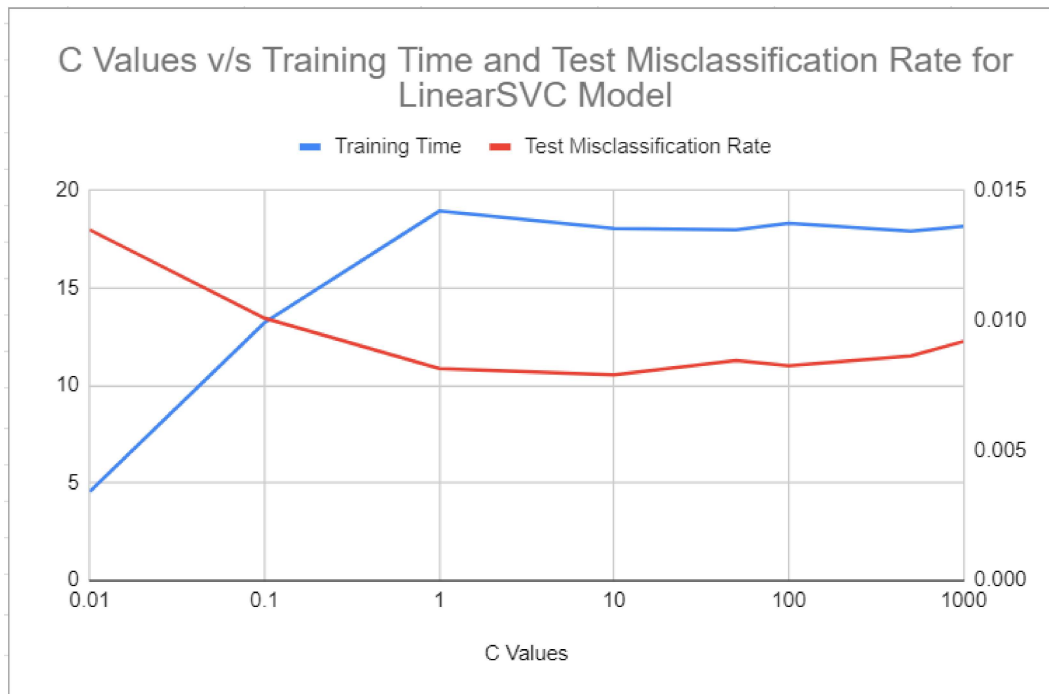


Figure 3: Logistic Regression

Observation: Overall, training time may exhibit a somewhat similar trend to LinearSVC models, where training time increases with higher values of C due to the increased complexity and potential overfitting of the model.