POLYTECHNIQUE MONTRÉAL

Polytechnique Montréal

INF8245AE – Machine Learning

# Assignment 1 – Linear Regression

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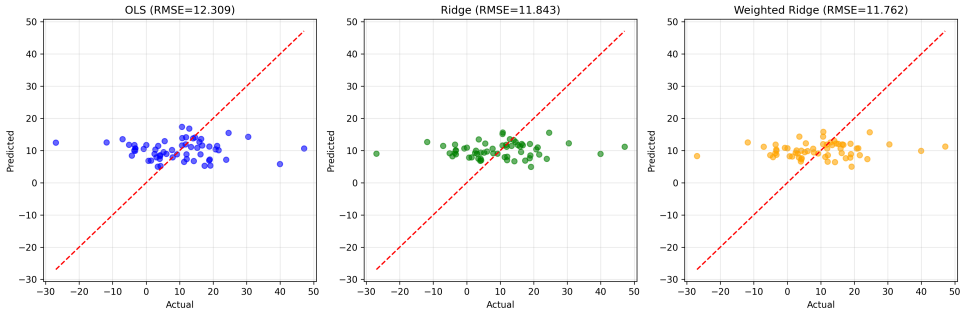


FIGURE 1 – Comparison of predictions from linear, ridge and weighted ridge regression on the test set.

## 0.1 Question 1 : Linear and Weighted Ridge Regression

## 0.2 Question 2 : Cross-Validation

| **Metric** | **Best $\lambda$** | **$\lambda$=0.01** | **$\lambda$=0.1** | **$\lambda$=1** | **$\lambda$=10** | **$\lambda$=100** |
|---|---|---|---|---|---|---|
| MAE | 10 | 7.381 | 7.316 | 7.140 | 7.110 | 7.817 |
| MaxError | 100 | 27.758 | 27.681 | 27.559 | 27.476 | 27.095 |
| RMSE | 10 | 9.855 | 9.772 | 9.577 | 9.532 | 10.101 |

TABLE 1 – Mean MAE, MaxError, and RMSE scores obtained via 5-fold cross-validation for different values of $\lambda$ in ridge regression.

## 0.3 Question 3 : Gradient Descent for Ridge Regression

| **Learning Rate Schedule** | **RMSE** |
|---|---|
| Constant | 13.890951849807372 |
| Exponential Decay | 13.928319736225347 |
| Cosine Annealing | 14.347341446546864 |

TABLE 2 – RMSE results for different learning rate schedules in gradient descent for ridge regression.

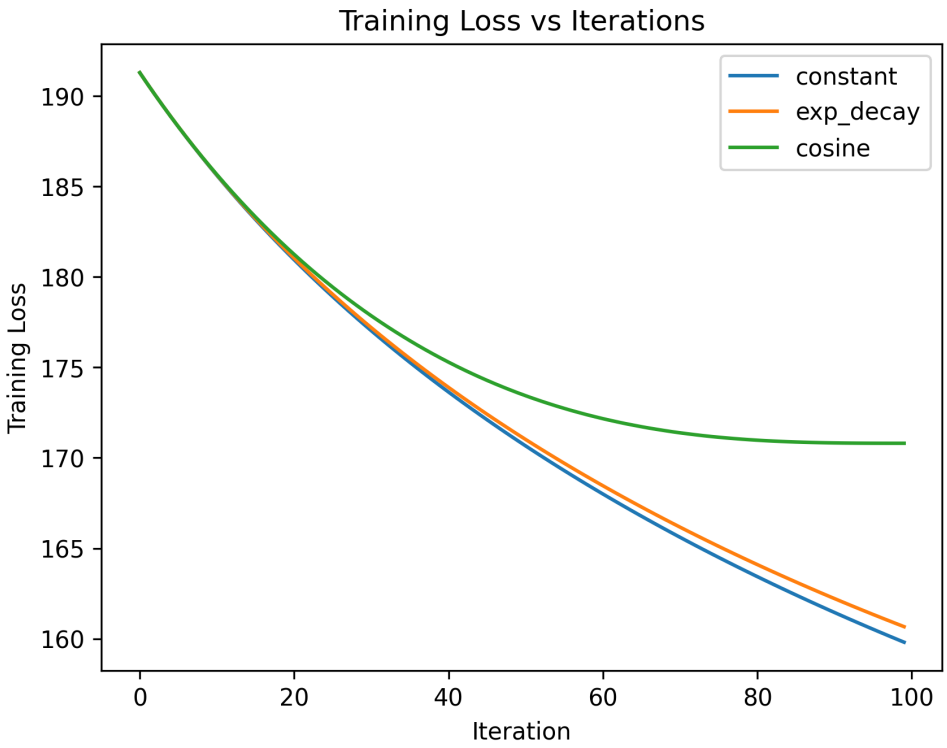


FIGURE 2 – Training loss vs iterations for different learning rate schedules in gradient descent for ridge regression.