

Mia Rodgers: https://github.com/miamrogers/4310-ML/blob/main/ME6_regression/regression.ipynb

Alex Larsen: https://github.com/alarsen123/ML-HW/blob/main/ME6_regression/ME6_regression/regression.ipynb
ME6

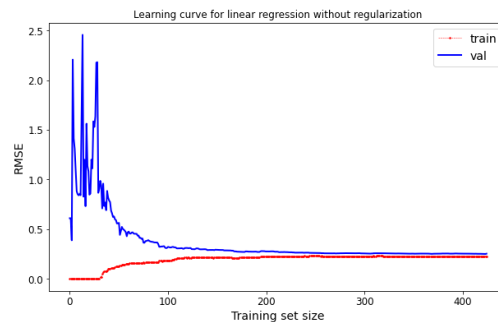
In this exercise, we practiced linear regression with gradient descent on the sklearn breast cancer dataset. We first used the Normal equation to obtain the best theta vector which was:

```
[ 3.02181174e+00  2.17772056e-01 -4.54546867e-03 -2.37398610e-02 -3.17834750e-04 -8.46891370e-02  4.22203525e+00 -1.39799728e+00 -2.14183303e+00 -  
1.02709200e-01 -3.32616097e-02 -4.34955932e-01  6.75847233e-03  2.25202577e-02  9.23217886e-04 -1.58543207e+01 -6.49034090e-02  3.56546799e+00 -  
1.05679513e+01 -1.69734069e+00  7.14644016e+00 -1.95183121e-01 -7.15937520e-03  2.43505057e-03  1.01122332e-03 -5.42856861e-01 -6.71582941e-02 -  
3.81191215e-01 -4.64309895e-01 -5.56787546e-01 -4.30348309e+00]
```

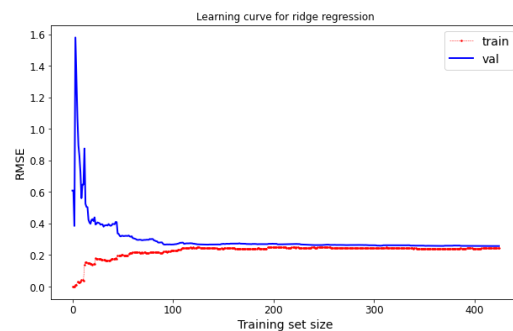
Then we did the same using gradient descent where the best theta was a 31 by 569 array so it is too big to put in this summary. Next, we tested six different modeling techniques which included: (1) linear regression without regularization, (2) ridge regression, (3) ridge regression with feature normalization, (4) Ridge regression with regularization parameter: alpha, (5) Lasso regression, and (6) Lasso regression with regularization parameter: alpha.

Model performance:

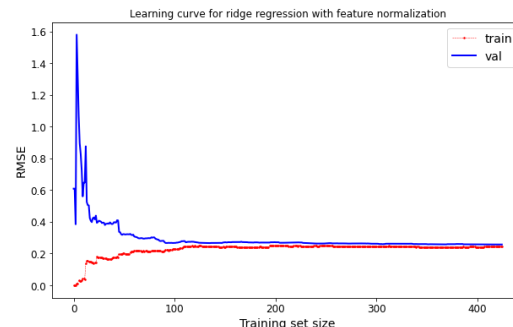
1. R-squared score (training): 0.782
R-squared score (test): 0.729
RMSE: 0.251



2. R-squared score (training): 0.744
R-squared score (test): 0.717
RMSE: 0.257

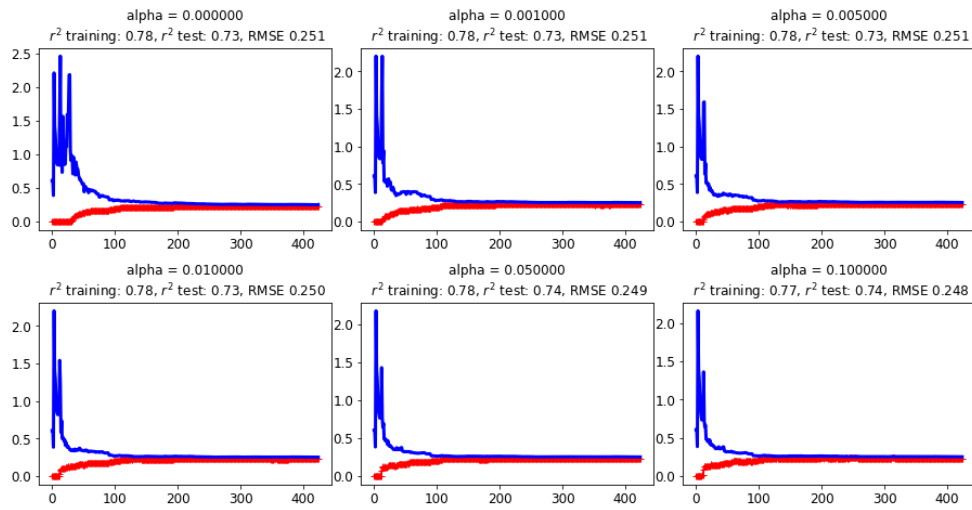


3. R-squared score (training): 0.741
R-squared score (test): 0.721
RMSE: 0.255

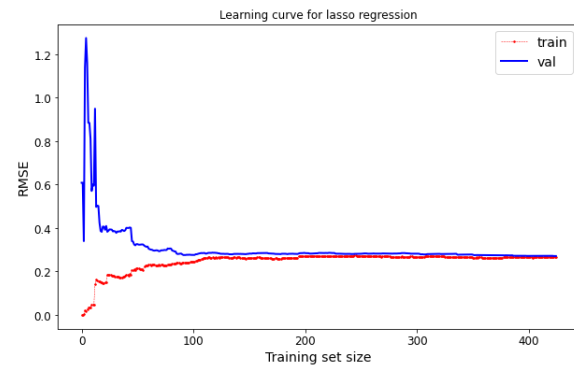


4.

Learning curves for ridge regression with regularization parameter: alpha

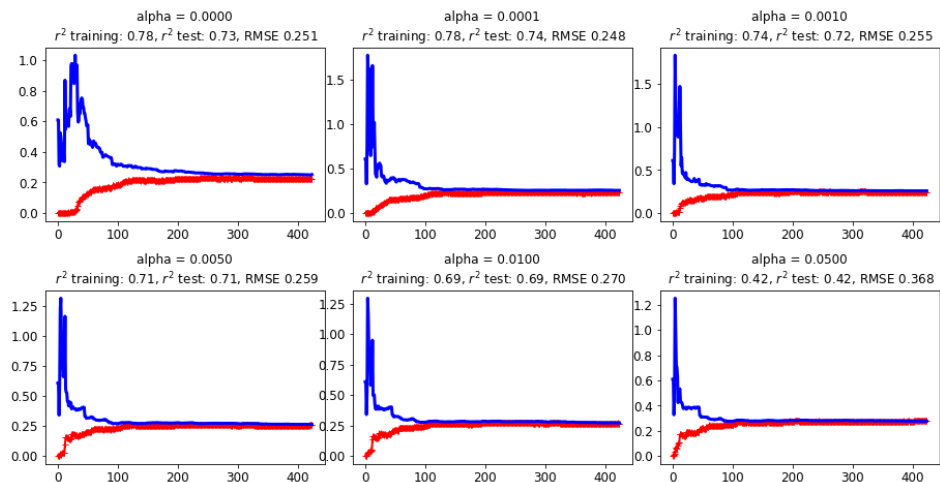


5. R-squared score (training): 0.690
R-squared score (test): 0.688
RMSE: 0.270



6.

Learning curves for lasso regression with regularization parameter: alpha



Out of all of these models, it seems like ridge regression and lasso regression seem to have the best performance.