Report Writeup

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1 Discussions

1. To begin, our first inference was that when n ¡¡ p, OLS's analytical solution destabilizes the model and a solution for this is regularization i.e., adding a penalty term to the optimization problem. This served as a motivation for our project.

2. We used a simple function/design matrix to test our algorithm for Lasso, elastic net using Pathwise Coordinate Descent. We achieved fairly good results on the first criteria – subset selection. Both selected the weighted parameter with very few error parameters. Based on our second measurement criteria – MSE, elastic net gave us a better performance (lower MSE), although both gave us a relatively small error.

3. As an addition to our project, we performed Ridge with Pathwise Coordinate Descent in terms of A and B as mentioned in methods. This gave us the conclusion that Ridge does not require soft thresholding, regardless of the tuning parameter . This served as an explanation to the conceptual theory that ridge shrinks the parameter values instead of driving them to 0.

To build on this, we performed Ridge with Soft-Thresholding, Ridge where B = (Quadratic Soft-Thresholding) and Ridge where B = (Exponential Soft-Thresholding). Our results are explained in the results section of this report.

4. We were also able to prove our conceptual understanding that Batch Gradient Descent does not perform Subset selection, by experiment.

To conclude, our project allowed us to delve deeper into the mathematical base for Lasso using the L1 Norm, Ridge using the L2 norm, L0.5 and L4 norms and elastic net. This not only helped us understand but allowed us to tweak them to gain an understanding of other correlated concepts, understand the intuition behind certain conceptual hypothesis and implement them with ease.