

STAT 151A Lecture 31

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Remark 0.1 (LASSO)

Instead of $\lambda \sum \beta_j^2$ penalty, we impose a $\lambda \sum |\beta_j|$ penalty

$$\min_{\beta} \|y - \mathbf{Z}\beta\|_2^2 + \lambda \|\beta\|_1$$

Downside: No closed form solution

However: LASSO is a convex problem, easy, fast algorithm to find best solution

Upside: LASSO, as $\lambda \uparrow$, will start to set many β_j to zero

Possible workflow for using LASSO to select variables and then do Inference

- (1) Split data into train and test
- (2) In training portion of data, fit LASSO
- (3) In testing portion, fit OLS using only the variables selected by LASSO (ie receiving non zero coefficients) \rightarrow this is a regular linear model

What if $p > n$

$\mathbf{X}^\top \mathbf{X}$ is not invertible

LASSO and Ridge work great here as long as $\lambda > 0 \rightarrow$ unique solution