

METIS

Regularization

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What Is the Impact?

1. Model will not generalize well (not accurate on unseen data)
2. Low Bias, High Variance

How do you avoid overfitting?

1. MORE DATA (always a good answer, not always possible)
2. Feature Engineering
3. Regularization!

Regularization

Lasso (l1) (Least Absolute Shrinkage and Selection Operator)

$$\sum_{i=1}^n \left(y_i - \beta_0 - \sum_{j=1}^p \beta_j x_{ij} \right)^2 + \lambda \sum_{j=1}^p |\beta_j| = \text{RSS} + \lambda \sum_{j=1}^p |\beta_j|$$

Ridge (l2) (Long story about the [name](#))

$$\sum_{i=1}^n \left(y_i - \beta_0 - \sum_{j=1}^p \beta_j x_{ij} \right)^2 + \lambda \sum_{j=1}^p \beta_j^2 = \text{RSS} + \lambda \sum_{j=1}^p \beta_j^2$$

Regularization Intuition

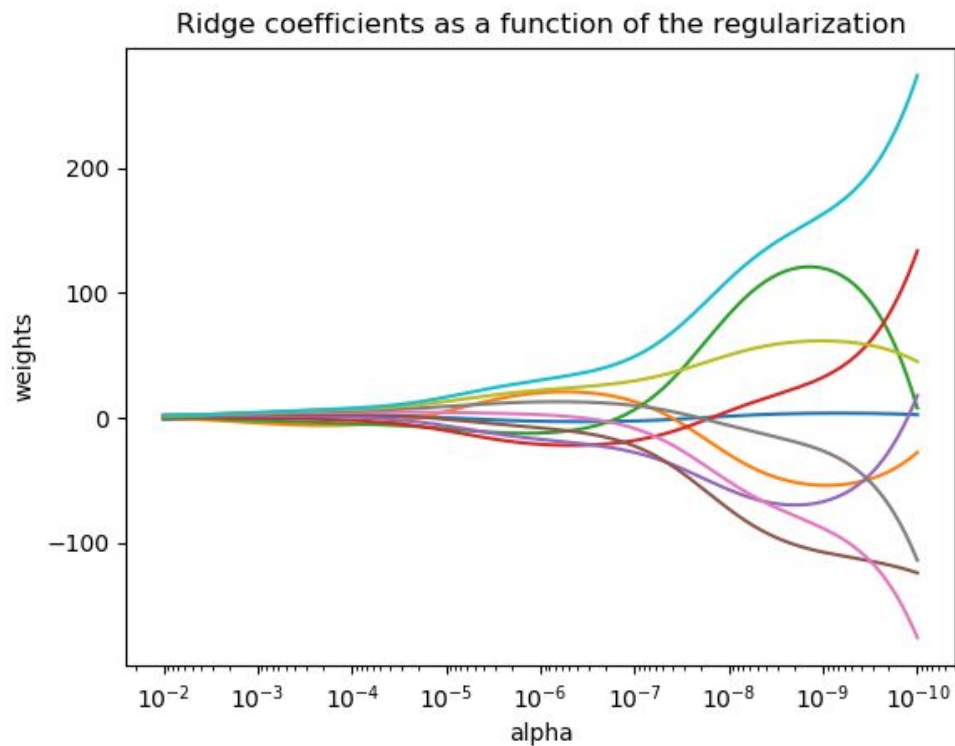
Ridge:

- If $\lambda=0$, normal RSS
- As $\lambda \rightarrow \infty$ coefficients will approach zero
- Shrinks all coefficients, still need to feature engineer

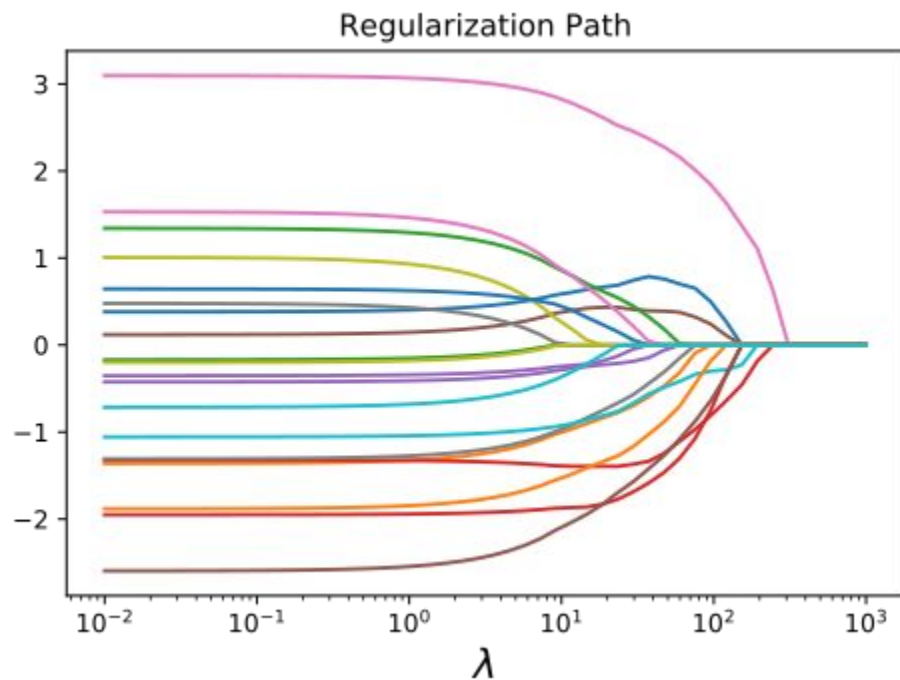
Lasso

- The absolute value will force to zero
- More interpretable

Ridge Visual Example



Lasso Visual Example



TO THE NOTEBOOK!!!!

