Econometrics **May 4, 2023**

Topic 14: Regularization Methods in Thresholded Parameter Space

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Key points: The connections and differences of all regularization methods and some interesting phase transition phenomena.

Disclaimer: *The note is built on Prof. Jinchi Lv's lectures of the course at USC, DSO 607, High-Dimensional Statistics and Big Data Problems.*

14.1 Model Setup

Now, consider a generalized linear model (GLM) linking a p-dimensional predictor $\mathbf{x}$ to a scalar response Y. With canonical link, the conditional distribution of Y given $\mathbf{x}$ has density

$$f(y;\theta,\phi) = \exp\left[y\theta - b(\theta) + c(y,\phi)\right]$$

where $\theta = \mathbf{x}'\boldsymbol{\beta}$ with $\boldsymbol{\beta}$ a $p-$dimensional regression coefficient vector, $\dot{b()}$ and $c(\cdot,\cdot)$ are know functions and ϕ is dispersion parameter. Again, $\boldsymbol{\beta} = \left(\beta_{0,1},\cdots,\beta_{0,p}\right)'$ is sparse with many zero components, and $\log p = O(n^a)$ for some $0 < a < 1$.