

## Topic 15: Sparse Orthogonal Factor Regression

by Sai Zhang

**Key points:** Sparsity and dimensionality reduction for Multivariate Linear Regression models.

**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.

Consider a Multivariate Linear Regression (MLR) model

$$\underset{n \times q}{\mathbf{Y}} = \underset{n \times p}{\mathbf{X}} \cdot \underset{p \times q}{\mathbf{C}} + \underset{n \times q}{\mathbf{E}}$$

How to apply regularization methods to this model? There are several approaches to consider

- **Shrinkage**: ridge regression to overcome multicollinearity
- **sparsity**: variable selection in multivariate setting
- **Reduced-rank**
  - **Dimension reduction** via reducing rank of  $\mathbf{C}$
  - $\min \|\mathbf{Y} - \mathbf{XC}\|_F^2$  s.t.  $\text{rank}(\mathbf{C}) \leq r$