A nuclear norm regularized estimator

- Estimate $\mathbf{M}$ using the shrunken sensing matrices + nuclear norm regularizer

$$\widehat{\mathbf{M}} = \arg\min_{\mathbf{M} \succeq \mathbf{0}} \quad \frac{1}{n} \sum_{i=1}^{n} \left(y - \langle \widetilde{\mathbf{A}}_i, \mathbf{M} \rangle \right)^2 + \lambda_n \|\mathbf{M}\|_*$$

Apply averaging and truncation to sensing matrices!

- In all, collect $N = mn$ total measurements, but utilize the n effective measurements

Theoretical guarantees

Our results (inverted measurements)

Number of measurements needed

$$n \gtrsim rD \iff N \gtrsim mrD$$

Estimation bound (whp)

$$\text{Set } m \approx \left(\frac{N}{D}\right)^{1/3}, \tau \approx \sqrt{\frac{N}{mD}}$$

$$\|\widehat{M} - M\|_F \lesssim r^{3/2}\left(\frac{D}{N}\right)^{1/3}$$

[12] Negahban and Wainwright. (2012) [13] Tsybakov and Rohde. (2012)