

Sparsity Pattern Detection with Orthogonal Matching Pursuit in Noise

Alyson Fletcher
Univ. of California, Berkeley

Sundeeep Rangan
Qualcomm Technologies

Consider OMP recovery of sparse vector \mathbf{x} from linear measurements:

$$\mathbf{y} = \Phi \mathbf{x} + \mathbf{w}$$

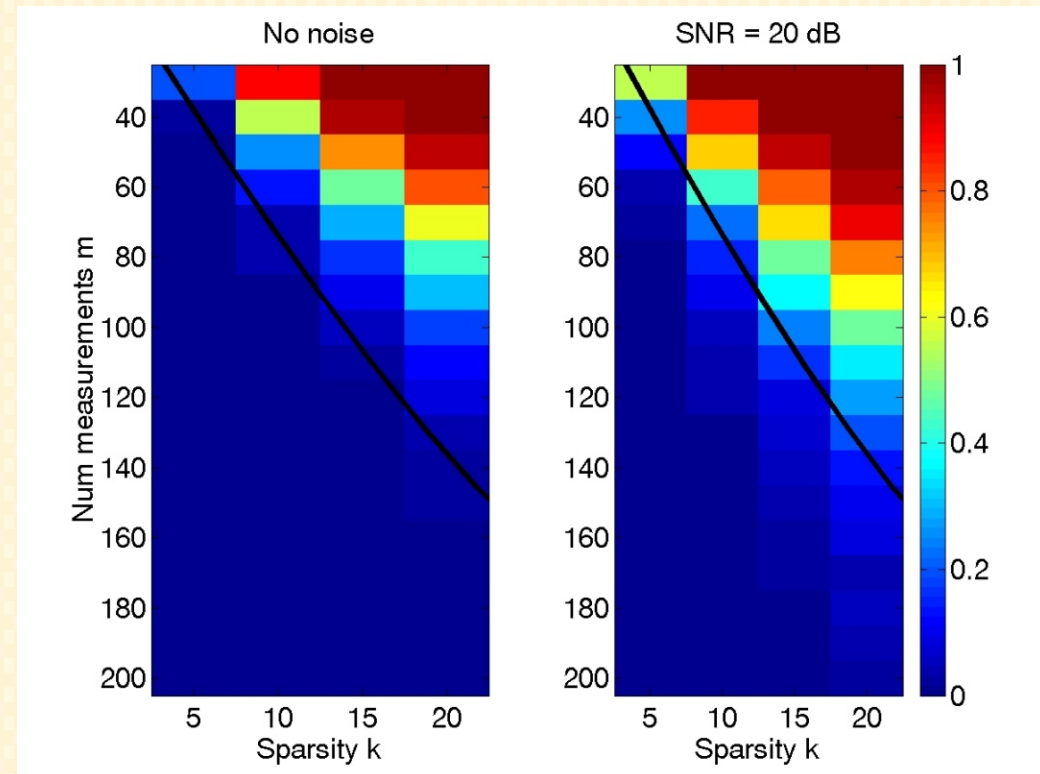
Sufficient condition for detection of k -sparse \mathbf{x} , $k_{\min} \leq k \leq k_{\max}$, with large random $\Phi \in \mathbb{R}^{m \times n}$:

$$m > 2k_{\max} \log(n - k_{\min})$$

- Improves on previous scaling

$$m > 4k \log(n)$$

- Allows noise and uncertainty in k
- Same scaling law as lasso method [Wainwright 06]



Simulated $P(\text{misdetection})$ for OMP at $n = 100$. Line: theoretical sufficient condition for no errors at infinite n

OMP can have similar performance as more complex lasso