

12 January 2015  
CAAM 654  
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## Day 2 — Reading and Questions

Read: Defn 1.1, Thm 1.1, Defn 1.5, Lemma 1.4, Thm 1.7 in Chapter 1 of Eldar and Kutyniok.

1. What is the gist of the argument that control over the spark of a matrix allows a sparse recovery guarantee?
2. If you are handed a matrix, how could you compute its spark? What kinds of matrices have large sparks? Small sparks? The reading says that  $\text{spark}(A) \in [2, m + 1]$ . Why is that?
3. Formulate a stand-alone precise claim about  $m \geq 2k$  being necessary for  $k$ -sparse signal recovery. Pay attention to what assumptions you are making on the signal and the measurements. Write the gist of the proof.
4. What sort of measurements have high coherence? Low coherence?
5. Is there an intuitive reason why  $\mu(A) \geq 1/\sqrt{m}$  when  $n \gg m$ ?
6. Write a stand-alone precise claim about the minimal number of measurements sufficient for recovering a  $k$  sparse signal using a spark and coherence argument. Is this behavior optimal? What would be optimal?