Extrapolation and superresolution via sparsity

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This talk considers the basic question of frequency extrapolation of sparse signals observed over some frequency band, such as scattered bandlimited waves. How far, and how stably can we extend? I will review recent mathematical progress on this question, including a minimax theory of superresolution that settles the "k-sparse on a grid" case, without assumption of spike separation. I will also present the performance bound of a Prony-like grid-MUSIC algorithm that provably attains the minimax bound. Finally, I will show how these ideas can sometimes be extended to deal with situations where the bandlimiting model is far from accurately known, like in seismic imaging.

Joint work with: Nam Nguyen (IBM TJ Watson)