Tomography under unknown angles

Team Members

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Papers Read

Graph Laplacian Tomography From Unknown Random Projections

Project

I plan to reconstruct the Shepp–Logan image from its noisy projections taken in unknown angles. The algorithm described in the paper shows us that if we apply a Laplace type operator on a dataset of projections, the eigen vectors of this operator reveal the projection orientations. Once we have estimated the projection angles, we could use any algorithm perhaps even in the domain of compressed sensing to reconstruct the image.

The algorithm can be shown as a generalization of the nearest neighbour approach for ordering the projections. On denoising the projections, we can show that the algorithm achieves reconstruction at even higher levels of noise.

Evaluation

Using this algorithm, I am going to reconstruct the 2-D Shepp–Logan phantom from its projections in unknown angles. We first take a number projection in angles uniformly distributed between $[0, 2\pi]$.

We then apply our algorithm of estimating the angles and then reconstruct our image. We may also add noise to our projections and estimate how well our algorithm performs under different levels of noise.