Upper and lower bounds for strong basins of attractions of non-convex sparse spike estimation

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Finding its utility in various domains of signal processing and data science, off-the-grid sparse spike estimation aims at recovering positions and amplitudes of Dirac measures observed through an underdetermined linear operator. Under a restricted isometry assumption on the observation operator, we study the size of strong basins of attractions for the non-convex off-the-grid sparse spike estimation problem. We first extend previous results [1] to obtain a lower bound on the size of sets where gradient descent converges with a linear rate to the minimum of the non-convex objective functional. We then give an upper bound that shows that the dependency of the lower bound with respect to the number of measurements reflects well the true size of basins of attraction for random Gaussian Fourier measurements. These theoretical results are confirmed by experiments.

This poster is based on the the preprint: On strong basins of attractions for non-convex sparse spike estimation: upper and lower bounds, Y. Traonmilin, J.-F. Aujol, A. Leclaire and P.-J. Bénard available at https://hal.science/hal-04047677

[1] Y. Traonmilin, J.-F. Aujol, and A. Leclaire. The basins of attraction of the global minimizers of non-convex inverse problems with low-dimensional models in infinite dimension. Information and Inference: A Journal of the IMA, 04 2022. iaac011.

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