

Vectorial Phase Retrieval

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Abstract:

Phase retrieval - namely the recovery of a signal from its absolute Fourier transform is a problem of fundamental importance in many fields.

In 1-D Phase retrieval is ill-posed, admitting multiple solutions.

In 2-D it often admits a unique solution, but finding it is challenging as it involves a non-convex optimization problem.

Current iterative algorithms are computationally intensive and most have no theoretical guarantees on the properties of their obtained solution.

In this talk I'll present a novel framework, denoted vectorial phase retrieval.

The key underlying idea is that in many physical scenarios one can measure not only one signal, but also another independent one, and their interference.

From a mathematical perspective, we show that vectorial phase retrieval leads to uniqueness already in the 1-D case. We next derive computationally efficient and robust to noise algorithms for recovery of the phases under several 1-D and 2-D settings of practical physical interest.

We illustrate our algorithms on both simulated signals and real experimental 2-d data.