Parameter Estimation for Exponential Sums: A Gentle Introduction

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Exponential sums appear in applications quite regularly. They are functions of the form

$$f(\mathbf{x}) = \sum_{j=1}^{M} c_j e^{i\mathbf{x}\cdot\mathbf{y}_j}, \quad \mathbf{y}_j \in \mathbb{R}^d, \ c_j \in \mathbb{C} \setminus \{0\}.$$

Often, one wants to estimate their frequencies $\mathbf{y}_j$ from a finite number of samples. While the case $d = 1$ is well-understood, the higher dimensional case is an active area of research.

In this talk, we aim to give an introduction to this problem. We sketch the basic methods to solve it and give a few applications. We also take a small detour to compressed sensing, which we will introduce briefly. In particular, we illustrate how ideas from compressed sensing may be used to gain insights for the parameter estimation problem.