1163-62-41 **Afonso S Bandeira**, **Ben Blum-Smith**, **Joe Kileel**, **Jonathan Niles-Weed*** (jnw@cims.nyu.edu), **Amelia Perry** and **Alexander S Wein**. *Statistical estimation under group actions.*

A common challenge in the sciences is the presence of heterogeneity in data. Motivated by problems in signal processing and computational biology, we consider a particular form of heterogeneity where observations are corrupted by random transformations from a group (such as the group of permutations or rotations) before they can be collected and analyzed. We establish the fundamental limits of statistical estimation in such settings and show that the optimal rates of recovery are precisely governed by the invariant theory of the group. As a corollary, we establish rigorously the number of samples necessary to reconstruct the structure of molecules in cryo-electron microscopy. We also give a computationally efficient algorithm for a special case of this problem, and discuss conjectured statistical-computational gaps for the general case. (Received July 26, 2020)