



THE UNIVERSITY OF  
CHICAGO

DEPARTMENT OF STATISTICS

## PHD DISSERTATION PROPOSAL PRESENTATION

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Deep Neural Networks for Orbit Recovery from Method of Moments

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Jones 304, 5747 S. Ellis Avenue

### ABSTRACT

Orbit recovery problems are a class of inverse problems that often arise in practice and in various forms. In these problems, we aim to estimate an unknown function after being distorted by a group action and observed via a known operator. Typically, the observations are contaminated with a non-trivial level of noise. Two particular orbit recovery problems of interest are multireference alignment and single-particle cryo-EM modeling.

Method of moments approach has been used for both these problems in literature, in order to suppress the noise. This thesis proposal introduces deep neural network priors for the same, i.e. neural networks that output the signals and the distribution of group elements, with moments being the input. In the multireference alignment case, the advantage of using the NN to accelerate the convergence for the reconstruction of signals from the moments is demonstrated. In the cryo-EM case, simulated and biological volumes are reconstructed using the proposed method. I will also briefly discuss future plans and ideas for cryo-EM reconstruction in more general settings, for example, presence of translations, as well as conformational heterogeneity.