



THE UNIVERSITY OF CHICAGO

Department of Statistics

DISSERTATION PRESENTATION AND DEFENSE

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Identification of Dynamical Systems: Identifiability to Stochastic Optimization

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ABSTRACT

The central theme of this thesis is to understand two related questions. When can a differential system model be identifiable from observations? If the model is identifiable, how can we identify it practically? While these questions are by no means new, we study them in a modern context where systems and models are more complex, observations are more frequent, and the stochastic nature of the underlying phenomenon must be considered. Chapter 1 discusses the nuances of these two questions in this modern context. Chapters 2 and 3 delve into the first question by refining notions of identifiability and by contributing necessary conditions for identifiability of certain differential equation models. Chapters 4 to 7 delve into the second question from the perspective of designing computable estimators to handle the higher frequency of observations. Chapter 8 also addresses the second question by designing a novel optimization framework to address the phenomenon with a stochastic nature.