



# THE UNIVERSITY OF CHICAGO

## COMPUTATIONAL AND APPLIED MATHEMATICS COLLOQUIUM

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### Learning the Koopman Operator for Dynamic Data

THURSDAY, December 5, 2019, at 4:00 PM  
Jones 226, 5747 South Ellis Avenue

#### ABSTRACT

Recent work in the study of dynamic systems has focussed on data driven decomposition techniques that approximate the action of the Koopman operator on observable functions of the underlying phenomena. In particular, the data driven method of dynamic mode decomposition (DMD) has been explored, with multiple variants of the algorithm in existence, including extended DMD, DMD in reproducing kernel Hilbert spaces, a Bayesian framework, a variant for stochastic dynamical systems, and a variant that uses deep neural networks. In this talk, I shall briefly summarize the large existing work on data driven learning of Koopman operator models, and then describe new sampling based sketching approaches (SketchyCoreSVD, SketchyCoreTucker) together with matrix-valued Kernels, to achieve a deep learning architecture for accelerated Koopman operator approximations of dynamic observable data. Examples are drawn from remote sensing, bio-medical cardiac magnetic resonance video, and time series reactive flow simulations of a single ejector combustion process.

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