



THE UNIVERSITY OF CHICAGO

COMPUTATIONAL AND APPLIED MATHEMATICS STUDENT SEMINAR

JUSTIN FINKEL

Committee on Computational and Applied Mathematics
University of Chicago

Data-driven Optimization of an Ocean Turbulence Model

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Cobb Hall, Room 104, 5811 S. Ellis Avenue

ABSTRACT

Turbulence, the chaotic dynamics of multiscale eddies, poses a major challenge for computational modeling of the atmosphere and oceans. Just as stirring a cup of tea drastically speeds up the steeping process, turbulent eddies in the ocean boundary layer are crucial for transporting heat, salt, and momentum within and between the ocean and atmosphere. Computer simulations are too coarse to resolve these important processes, forcing modelers to resort to heuristic approximations to capture the effects of small-scale turbulence on the resolved scales. Modern techniques in machine learning and optimization may offer invaluable contributions to bridge this gap between physics and reality. In this talk I will survey essential ideas of fluid dynamics and turbulence modeling, and present some results of a data-driven approach to this problem using Gaussian Processes. This is part of an ongoing collaboration with Los Alamos National Laboratory.