



**Interdisciplinary Workshop for Undergraduate Students
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Project: *Data Assimilation for Numerical Weather Prediction* [NWP]

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Abstract:

Modern fields of science and engineering rely on sophisticated computer models to describe, predict, and understand the behavioral patterns of complex physical phenomena such as the weather, ocean dynamics, oil reservoirs, earthquakes, and volcanoes. Predictions made by a computer model form an essential source of information about the unknown true state of the physical system of concern. These predictions encapsulate the knowledge about the underlying physical phenomena “prior” to incorporating additional sources of information. In addition to the prior information characterized by the model prediction, complex sensor networks are also employed to collect measurements of the physical phenomena, producing sparse snapshots of reality. Data assimilation (DA) is the inverse problem that fuses information from priors, computer model results, and measurements of reality, in order to provide a consistent description of the true state of the system of concern. In this project, we will learn the basics of numerical weather prediction, and will (learn how to) use a Python-based highly extensible data assimilation testing suite, named DATeS, to develop a practical algorithm for weather prediction. A simple quasi-geostrophic model (already implemented in DATeS to simulate sea surface height of the ocean) will be used as a test case for our project.