

COMPUTATIONAL MATH SEMINAR

A Journey to the World of Computational Inverse Problems

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Abstract: In this talk, we take a journey to the world of computational inverse problems, where we highlight important connections to mathematics, statistics, machine learning, and applications. The main goal of an inverse problem is to extract some underlying parameters or information from available and noisy observations. However, there are enormous computational challenges when solving state-of-the-art inverse problems of interest. We present new tools for tackling these challenges. We describe generalized hybrid projection methods, which are iterative methods for solving large-scale inverse problems, and we show how approximations provided by the iterative method can be used for subsequent uncertainty quantification. Then, for problems where training or calibration data are readily available, we describe recent advances in exploiting machine learning techniques for estimating regularization parameters. Examples from atmospheric inverse modeling and image processing are discussed.

Monday, January 10, 2022, 10:00 am
Mathematics and Science Center: MSC W201

MATHEMATICS
EMORY UNIVERSITY