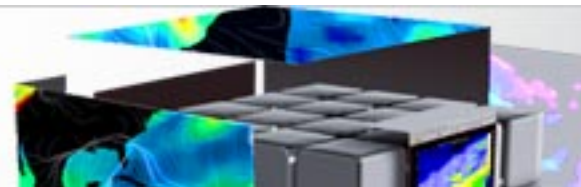# Rapid Model Fitting Tool Suite

Mike Galloy and Cory Ahrens

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Outline

- Motivation
- Project goals
- Preliminary results
- User feedback

Motivation

- Many problems in science and engineering involve ``fitting'' data to a model

- Usually fit by minimizing sum of squares of residuals (between model and data)

- Computationally intensive process

- Many evaluations of model, Jacobian and solving linear systems of equations

Motivation

- Standard algorithm for minimizing least-squares: Levenberg-Marquardt (LM)

- Requires many model and Jacobian evaluations along with solving linear systems

- Graphical processing units (GPUs) offer extreme parallel computing capability

Project Goals

- Develop IDL interface to GPU accelerated LM routine

- Develop expression parser for "on the fly" CUDA kernel construction of (simple) models.

- Develop IDL interface to GPU accelerated quasi-Newton method (e.g. BFGS) with bound constraints

Preliminary Results

- Prototype C version of LM – profiling shows "most" time spent in model and Jacobian evaluation

- Currently switching LAPACK/BLAS calls with MAGMA/CUBLAS.

- MAGMA: optimized port of LAPACK to multi-core architectures (UT-Knoxville)

- Developing expression parser

User Feedback

- What capabilities would you like to see?