Quang Thinh Ha

Personal Information

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Research

JAN 2017 - Present

Boston University, USA
Advisor: Prof. Emily M. Ryan

- Developing extension of LAMMPS - Large-scale Atomic/Molecular Massively Parallel Simulator - package for multiphase flow using Smooth Particle Hydrodynamics (SPH).
- Simulating the multiscale reactive-transport system in hierarchical porous media with SPH, with applications toward activated carbons and microbial fuel cell.
- Employing Design of Experiment framework to guide the appropriate tuning of experimental parameters using numerical simulation.
- Applying Data Assimilation schemes to combine sequentially observed experimental data with numerical model.

JUN 2018 - AUG 2018

Los Alamos National Lab, USA
Advisor: Dr. Rao V. Garimella

- Learning about the conservative remapping in multi-physics codes and Arbitrary Lagrangian-Eulerian method.
- Measuring the performance of the Portage code on large meshes and enhancing the polyhedron clipping code to take advantage of flexible and efficient data structures.
- Porting the polyhedron-polyhedron intersection code used in Portage to Graphics Processing Units (GPU) and producing performance benchamrks.

AUG 2016 - MAR 2017

Boston University, USA
Advisor: Prof. Paul E. Barbone

- Utilised and benchmarked Finite Element Method library on Intel Knight Landing architecture. Toward solving systems with billions degree of freedoms on supercomputer clusters.
- Estimated internal tension and contact pressure from ultrasound images of breast tumour.
- Developed user-friendly package for solving inverse problems in elastography, specifically aimed toward medical practice.

JUN 2014 - SEP 2014

University of Cambridge, UK
Advisor: Dr. Garth N. Wells

- Reconstructed 3D model of human's heart using 4D data from CT scans.
- Contributed code to FEniCS project - an automated PDE solver package for C++ and Python. Integrating Google Unit Test into the framework.

Conference

MAR 2017

Uncertainty Quantification and Data-driven Modeling
United States Association for Computational Mechanics
Poster: Krylov subspace method for Hessian approximation - Conjugate Gradient in infinite dimensional Hilbert space.
Abstract: We considered the problem of estimating the uncertainty in large-scale statistical inverse problems within the framework of Bayesian inference. When the probability density function of both the noise and prior follow Gaussian distributions and the forward problem is linear, then the posterior probability distribution of the inverse problem solution is also Gaussian, meaning it can be characterized by its mean and covariance. Even in situations where the posterior is not Gaussian, the solution uncertainty may be partially characterized through the covariance operator. It can be shown that the covariance is a sum of two terms: the data-matching Hessian and the prior. The ill-posed nature of inverse problems implies that the spectrum of the data-matching Hessian collapses rapidly to zero. This means that its action can be well approximated using a small set of basis vectors thus allowing scalability for large problems.

Education

SEP 2016 - Present

Doctor of Philosophy and **Master of Science** in Mechanical Engineering
Boston University, USA
Advisor: Prof. Emily M. Ryan
Completed Courses: Parallel Programming for High Performance and Big Data Computing; Multiscale Methods for Stochastic Processes and Differential Equations; Advanced Optimisation Theory; Advanced Stochastic Modeling; Estimation Theory; Nonparametric and Semiparametric Data Modeling; Computational Fluid Dynamics; Continuum Mechanics in Fluid and Solids.
Current GPA: 3.66/4.0
Workshop: Neural Networks for Machine Learning; Introduction to MPI; Parallel Programming.

JUL 2016

Master of Engineering in Mechanical Engineering and Bioengineering
University of Cambridge, UK
Thesis: "Uncertainty Quantification on Large-scale Bayesian Inverse problems using Conjugate Gradient method."
Advisor: Dr. Garth N. Wells
Abstract: The aim of inverse problems in physical sciences and engineering is to extract model parameters that cannot be measured directly from experimental observations and the associated forward model of the system. In this report, we have used the Krylov space created by the conjugate gradient method to reconstruct the posterior covariance matrix. From our formulation, the number of floating-point operations is halved compared to the direct matrix inversion for the same purpose. Additionally, the storage required for the Krylov space is restricted by the low-rank of discretised physical theory, making it independent from the problem size.
Distinction in Written Exams; Honoured in Thesis.

JUL 2015

Bachelor of Arts in Mechanical Engineering and Bioengineering
University of Cambridge, UK
Courses: Finite Element Methods; Pracical Optimisation; Partial Differential Equations; Fracture Mechanics; Plate and Shell Structures; Molecular Modeling; Cellular and Molecular Biomechanics.
Overall grade: 2.i (68%)

Awards

2016	Boston University, Distinguished Ph.D. Fellowship	Full-year stipend for distinguished upcoming Ph.D. student.
2015	Cambridge University ARM Hackathon, First Place	Hackathon open to undegraduates at University of Cambridge.
2014	University of Cambridge, Foundation Scholars	Achieved First Class in academic performance.

Teaching

Present	Boston University, Graduate Teaching Fellow	Introduction to Material Science.
Fall 2017	Boston University, Graduate Teaching Fellow	Engineering Mechanics I.

Computer Skills

Fluent:	Python, MATLAB, Julia, LaTeX, Git, Bash.
Intermediate:	C++, CMake, MPI, OpenCV, OpenGL.
Basic:	Maya, Blender.

Interests and Activities

Technology, Open-Source, Programming, Computer Graphics, Photography,
Paradoxes in Decision Making, Braintwisters,
Karate, Boxing, Road Cycling, Mountaineering, Coffee.

Referee

Prof Emily M. Ryan
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Prof Paul E. Barbone
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