

# Pate Motter

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## Education

Candidate for Doctor of Philosophy in Computer Science  
University of Colorado, Boulder

Defending August 25, 2017

Master of Science in Computer Science  
University of Colorado, Boulder

May 2013

Bachelor of Science in Computer Science, minor in Mathematics  
University of Arkansas, Fayetteville

May 2011

## Research Experience

*Doctoral Research / Research Assistant, [Lighthouse Project](#), University of Colorado* August 2014 – Present

- Lighthouse is a user-facing tool that recommends the best numerical methods to solve a user's given problem
- Incorporating hardware-based information to predict high-performing iterative linear solvers for sparse systems using classification machine learning algorithms
- Generating runtime performance data on multiple computational clusters to use as training data for classification algorithms
- Prediction accuracy improvement using hardware data as opposed to previous works without
- Research code uses C++, Trilinos, Python, and Scikit-Learn running on multiple computational clusters

*Summer Computation Intern, Lawrence Livermore National Laboratory* Summer 2014, 2015

- Worked on the [BLAST hydrodynamics code](#), a high-order shock CFD code targeting future architectures
- Examined performance gain possibilities for computationally intensive kernels w/ HPCToolkit and other tools
- Developed benchmarking suite for comparing high performance linear algebra libraries
- Ported BLAST to various linear algebra libraries such as Eigen, BLAZE, and Armadillo to compare performance
- Used C, C++, Fortran, MFEM, Armadillo, Eigen, HPCToolkit, and OpenSpeedShop

*Software Developer / Researcher, TerraSpark Geosciences* Aug 2011 – Jan 2014

- Implemented the first GPU-based solutions for our flagship seismic interpretation software
- Reduced cost of applying computational seismic filters from hours to seconds
- Designed seismic noise reduction techniques using wavelets and curvelets
- Developed using OpenCL and C++ in an Agile commercial environment

*Passionate on Parallel-REU Research Student, University of Illinois, Urbana-Champaign* Summer 2010

- Worked with economists, Drs. Stefan Krassa, Anne Villamil, and Jamsheed Shorish, to parallelize pre-existing backward induction code simulating policy responses to financial crises.
- Adapted existing Python code to have dynamic load balancing and interconnectivity through the use of message passing.

*REU Research Student, University of California, Santa Cruz* Summer 2009

- Worked with Dr. Jacob Rosen in the bionics lab at UCSC creating a low-level data recording system for an upper-limb exoskeleton wearable robot.
- The data was recorded from MATLAB's Simulink to a PC where it can then be played back by the robot to mimic the recording

*REU Research Student, University of Arkansas* Summer 2008

- Worked with Dr. Douglas Spearot on molecular dynamic simulations of nano-laminates to examine their plastic deformation
- Developed in C++ and LAMMPS; simulations were performed on an on-campus computational cluster.

## Teaching Experience

*Teaching Assistant, University of Colorado – Computer Systems course* August 2014 – Dec 2014

- Taught and graded three lab sections of undergraduate systems course
- Lectured and taught C, x86 assembly, and low-level performance analysis

*Teaching Assistant, University of Colorado – Data Structures course* Jan 2014 – May 2014

- Taught and graded three lab sections of undergraduate data structures course
- Lectured and taught C++, Java, data structures, algorithmic analysis

*Freshman Engineering Peer Mentor, University of Arkansas* Aug 2008 – May 2011

- Mentored 14 freshmen engineering students
- Met individually each week to determine and personal problems and how to solve them

## Other Experience

*University of Arkansas Programming Team*, University of Arkansas

Aug 2008 – May 2011

- Worked as a three-member team to competitively solve a variety of computational problems
- Competed in various collegiate competitions

## University Projects

*N-Body Problem Solver*, University of Colorado - Graphics Course Final Project

Dec 2012

- Developed OpenGL N-Body solver that compares performance of serial C++, OpenMP, and OpenCL
- Incorporated the interoperability of OpenCL and OpenGL

*GPGPU Linear Program Solver*, University of Colorado - Linear Programming Course Final Project

Dec 2011

- Developed program to perform the simplex method in OpenCL and C++

*Chua's Circuit*, University of Colorado - Chaotic Dynamics Final Project

May 2011

- Constructed Chua's circuit in addition to a simulated version and its ODE counterpart
- Performed statistical analysis on the three versions using Python and oscilloscope readings

## Awards

- XSEDE allocation for furthering my thesis work - #CCR160019 (2016)
  - 200k+ SUs
- Selected to attend [Argonne's Training Program on Extreme-Scale Computing](#) (2016)
- Nvidia Research Grant for GPU-based machine learning and numerical linear algebra (2015)
  - Nvidia Titan X
- Best poster award at LLNL Summer Student Symposium (2014)
- Nvidia Research Grant for low-power high-performance computing (2013)
  - Kayla and Carma ARM-based development kits
  - Nvidia Tesla K20

## Peer-reviewed Publications

- E. Jessup, P. Motter, B. Norris, and K. Sood, "[Performance-Based Numerical Solver Selection in the Lighthouse Framework](#)," SIAM Journal on Scientific Computing vol. 38, no. 5, pp. S750–S771, Jan. 2016.
- K. H. Koh, Y. Endo, A. Repenning, H. Nickerson, and P. Motter, "[Will it stick? exploring the sustainability of computational thinking education through game design](#)," in SIGCSE 2013 - Proceedings of the 44th ACM Technical Symposium on Computer Science Education, 2013.

## Peer-reviewed Presentations

- J. Marbach, P. Motter, [GPU Acceleration for Seismic Interpretation Algorithms](#), GPU Technology Conference. May 2012, San Jose, California, USA.
- J. Marbach, R. Welch, P. Motter, S. Dominguez. [Porting Makes You Stronger: Implementing Challenging Seismic Attributes on the GPU](#), GPU Technology Conference. March 2013, San Jose, California, USA.

## Peer-reviewed Posters

- P. Motter, I. Karlin, and C. Earl, "[BLAST Motivated Small Dense Linear Algebra Library Comparison](#)." SC '15, Austin, TX, 2015.
- K. Sood, P. Motter, E. Jessup, and B. Norris, "[Automating Sparse Linear Solver Selection with Lighthouse](#)." SC '15, Austin, TX, 2015.

## Other Posters

- P. Motter, I. Karlin, R. Rieben, and S. Langer, "[Analysis and Improvement of Corner Force Computation in BLAST](#)." LLNL Student Poster Symposium, 2014. Awarded best poster.

## Skills

Languages: C++, C, Python

Libraries: MPI, OpenMP, Trilinos, Pandas, Scikit-Learn, CUDA, OpenCL

Tools: Intel Vtune, HPCToolkit, gdb, Visual Studio, Matlab