Vishal Pramod Kasliwal

Last update on November 16, 2018

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Experience

Wave Computing - Senior Staff Research & Development Software Engineer — Campbell, CA

Wave Computing is developing the next-generation of solutions for speeding up Deep Learning applications using Dataflow Processing Units (DPUs), which contain thousands of interconnected dataflow Processing Elements (PEs). DPUs power Wave Computing's custom appliance for developing, testing, and deploying Deep Learning models. I develop the computational- and data movement- software kernels which are executed by Wave Computing's Dataflow Computers for Deep Learning acceleration.

Tools Development *Nov '18*

I have developed a tool for

- Visualizing the placement & routing performed by JitPR.

Deep Learning Kernel Development *Nov '18 – present*

I am developing compute-kernels for

- Average Pool (forward direction)

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Deep Learning Kernel Development *Dec '17 – Nov '18*

I have developed compute-kernels for

- 1x1 Convolution (forward direction)
- Matrix Multiplication (forward direction)
- ReLU (forward & reverse direction)
- Concatenation (forward direction)
- Fork (forward direction)

Deep Learning Library Development *Dec '17 – Nov '18*

I have worked extensively on the supporting library for the Deep Learning compute kernels.

- Owner of the libary of routines for performing IEEE 754 rounding.
- Owner of the library of routines for changing precision.
- Authored various block Matrix Multiplication operations.
- Authored various multi-byte addition operations.
- Authored various multi-byte shift operations.

Management Role *March '18 – Nov '18*

I assist my superior with the management of the kernel team consisting of seven engineers. My duties include

- maintaining the schedule of work being done by the members of the team.
- assisting in the planning of new work items.
- identifying & interviewing new compute-kernel team candidates.
- report on the progress of the compute-kernel team to the VP of product engineering.

Major accomplishments include

- I developed a workflow for creating new compute-kernels.
- I integrated the schedule of work into a JIRA managed project.

The outcome of my efforts is better project management leading to a significant reduction in the time taken to develop new compute-kernels.

Colfax International - High Performance Computing (HPC) Research Engineer — Sunnyvale, CA

HPC Computational Fluid Dynamics (CFD) Application Development *Mar '17 – Dec '17*

HPC consulting project. I parallelized a CFD simulation code written in C for a client in the oil & gas sector resulting in a $\sim$ 10X speedup. I have also refactored the client's codebase to enable independent time-evolution in different regions of the simulation via domain-decomposition methods.

C/C++ Compiler Analysis *Nov '17*

HPC research project. I investigated suitability of C++ compilers for HPC applications. I developed optimized scientific computational kernels and investigated the performance obtained by each compiler from each kernel. I analyzed compiled binary code to determine reason for differences in performance. A technical report of my findings can be obtained at Colfax Research.

Intel Advisor Lecture *May '17 – Jul '17*

I presented a lecture on Intel Advisor for the Stanford University course ME 344: Introduction to High Performance Computing on July 20th, 2017.

Large Synoptic Survey Telescope (LSST) Data Management (Princeton University) PRINCETON, NJ

Postdoctoral Research Associate *Sept '15 – Feb '17*

LSST Data Management is building a C++ & Python software stack to analyze raw imaging data from LSST. I worked on the software stack to add functionality, documentation, & tests. I developed & implemented algorithm to propagate covariance when stacking images and worked on techniques for optimal image stacking & differential chromatic refraction. I worked on a machine-learning based star-galaxy classifier and on converting the LSST stack to use py.test.

Department of Physics & Astronomy (University of Pennsylvania) PHILADELPHIA, PA

Postdoctoral Researcher *Sep '15 – Feb '17*

I developed and implemented a parallelized Bayesian algorithm to estimate orbital parameters from stochastic light curves of binary supermassive black holes. I also developed and implemented Python framework to automatically wrangle astronomical time-series data from a variety of sources including web-servers, SQL servers, data servers and local data files.

Principle Developer *Sept '15 – Feb '17*

I architected and implemented KĀLĪ, an open-source high performance library to model stochastic time-series data in a Bayesian framework. KĀLĪ is capable of modeling time-series data as variants of C-ARMA processes (a type of Gaussian random process). Written primarily in C++and exposed to Python using Cython, KĀLĪ uses scikit-learn for machine learning, Intel MKL for fast linear algebra, Intel Bull Mountain technology for hardware random number generation, & OpenMP 4.0 for vectorization & parallelization. KĀLĪ is being used to study astronomical time-series data by multiple research groups at Caltech, UPenn, & Drexel.

Department of Physics (Drexel University) PHILADELPHIA, PA

AGN Variability Analysis *June '09 – Aug '15*

I developed C++sofwtare for Intel Xeon Phi accelerator cards to model AGN variability. I developed vectorized & parallelized the C++ pipeline to forward-model and fit data to model using MLE of 2^{nd}-order statistics.

LSST Photo-z Analysis *Sept '08 – May '09*

I used MLE & machine learning (neural networks) to establish optimal y-band filter for LSST galaxy photo-z distance estimation.

Department of Physics (Virginia Commonwealth University) RICHMOND, VA

Adjunct Instructor *Jun '07 – Aug '08*

I taught *Introduction to Astronomy* course.

AFM Image Analysis *Aug '05 – May '07*

I implemented an IDL pipeline to analyze AFM images of silicon surfaces etched using oxygen.

Department of Physics (University of Richmond) RICHMOND, VA

Cosmic Microwave Background Analysis *May '03 – May '05*

I used IDL to perform statistical tests of the utility of the bispectrum for detection of non-Gaussianity in the CMB.

Education

Drexel University PHILADELPHIA, PA

PhD. in Physics *2008 – 2015*

Probing AGN Accretion Physics through AGN Variability: Insights from *Kepler*

Virginia Commonwealth University RICHMOND, VA

M.S in Physics & Applied Physics *2005 – 2007*

CAFM Studies of Epitaxial Lateral Overgrowth GaN Films

University of Richmond RICHMOND, VA

B.S. in Mathematics & Physics *2001 – 2005*

The Bispectrum as a Quantifier of non-Gaussianity in the Cosmic Microwave Background

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Certifications

deeplearning.ai — COURSERA.ORG

Deep Learning Specialization
Certificate earned on June 24, 2018.

Neural Networks and Deep Learning
Certificate earned on November 4, 2017.

Improving Deep Neural Networks: Hyperparameter tuning, Regularization and Optimization
Certificate earned on November 26, 2017.

Structuring Machine Learning Projects
Certificate earned on December 17, 2017.

Convolutional Neural Networks
Certificate earned on January 22, 2018.

Sequence Models
Certificate earned on June 24, 2018.

Skills

Technical expertise: My expertise lies in the design & implementation of high-performance scientific/numerical software. I am skilled at applying statistical analysis and machine learning methodology to complex data and am familiar with developing Deep Learning applications using TensorFlow & Keras. Used to working with(in) teams, I am fond of using Agile methodologies (Scrum) and continuous integration (Jenkins) to manage & deliver on-time & bug-free software. I enjoy writing Flow Graph, C, C++, & Python, and am learning Julia/Go/Io/Prolog. I have excellent knowledge of parallelization technologies: OpenMP, C++11 threads, POSIX threads, & MPI as well as experience programming on novel computing platforms such Wave Computing's Dataflow Processing Units (DPU) & Intel's Xeon Phi (Knight's Corner & Knight's Landing). I have extensive knowledge & experience with various programming toolchains including the GNU toolchain, Intel toolchain, LLVM toolchain, PGI toolchain, AOCC toolchain, Valgrind, gdb, make, SCons etc.... My preferred platform is Linux (16 years of development experience) although I have also developed on Mac OSX (7 years). I am very comfortable with writing in LaTeX (13 years of experience) and have a good understanding of the UNIX programming environment and tools (Memory management, process spawning, etc...)

Public speaking: With years of experience delivering highly technical talks to both expert & general audiences, I am comfortable with public speaking & outreach.

Natural languages: English *(native language)* and Hindi *(native language)*.

Service

The National Science Foundation Served on a grant review panel for the Division of Astronomical Sciences.

The Astrophysical Journal Peer reviewed multiple publications for this journal.

Monthly Notices of the Royal Astronomical Society Peer reviewed publications for this journal.

Publications

A Performance-Based Comparison of C/C++ Compilers Colfax Research, 2017

Science-driven Optimization of the LSST Observing Strategy arXiV, 2017

Large Synoptic Survey Telescope Galaxies Science Roadmap arXiV, 2017

Extracting Information from AGN Variability MNRAS, 470, 3, 3027-3048, 2017

The LSST Data Management System Proceedings of ADASS XXV, 2015

Do the Kepler AGN light curves need reprocessing? MNRAS, 453, 2075, 2015

Are the variability properties of the Kepler AGN light curves consistent with a damped random walk? MNRAS, 451, 4328, 2015

Thirty Meter Telescope Detailed Science Case: 2015 http://arxiv.org/abs/1505.01195, 2015

AFM and CAFM studies of ELO GaN films Proc. SPIE 6473, 647308, 2007

Local electronic and optical behaviors of a-plane GaN grown via epitaxial lateral overgrowrth Appl. Phys. Lett., 90, 011913, 2007

Grants

Kepler Guest Observer Program Co-Investigator on Kepler Guest Observer Program accepted proposals K2 GO16088, K2 GO14088, K2 GO12013, K2 GO8052, & K2 GO10052

NASA Grant NNX14AL56G Helped write proposal for awarded NASA Grant NNX14AL56G. Grant was used to fund my Ph.D. research.

Presentations

Applications of High Performance Computing in Artificial Intelligence Rajasthan Student Startup Exposure Program 2018 (RSSEP2018), September 8th, 2018, San Jose, CA

Intel Advisor Stanford University ME344: Introduction to High Performance Computing, July 20th, 2017, Stanford, CA

Optical Variability Signatures from Massive Black Hole Binaries 229^{th} Meeting of the American Astronomical Society, 2017, Grapevine, TX

Extracting Information From AGN Variability: an LSST AGN Collaboration Proposal 2017 LSST AGN Science Collaboration Roadmap Development Meeting, 2017, Grapevine, TX

Extracting Information from AGN Variability 2016 KARL LSST Workshop, November 2016, Louisville, KY.

Surveying the Dynamic Sky with the LSST 2016 KARL LSST Workshop, November 2016, Louisville, KY.

AGN Variability: Insights from Kepler 2016 Hotwiring the Transient Universe V Meeting, October 2016, Villanova, PA.

Probing Accretion Processes through Variability 2016 TMT Science Forum 'International Partnership for Global Astronomy', May 2016, Kyoto, Japan.

AGN Variability: Insights from Kepler Princeton HSC Science Discussion Series, March 2016, Princeton, NJ.

AGN Variability on Short Timescales: What does Kepler tell us about AGN Variability? 2015 TMT Science Forum 'Maximizing Transformative Science with TMT', June 2015, Washington, DC.

What can Kepler tell us about AGN variability? 225th Meeting of the American Astronomical Society, January 2015, Seattle, WA.

Do Kepler AGN Light Curves Exhibit a Damped Random Walk? 24th Meeting of the American Astronomical Society, June 2014, Boston, MA.

The Bispectrum of Galactic Dust: Implications for Microwave Background non-Gaussianity 204th Meeting of the American Astronomical Society, May 2004, Denver, CO.