

Vishal Pramod Kasliwal

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Experience

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

HPC Computational Fluid Dynamics Application Development *March '17 – present*

HPC consulting project. Parallelized a computational fluid dynamics (CFD) simulation code written in C for a client in the oil & gas sector resulting in a $\sim 10X$ speedup. Refactoring client codebase to enable independent time-evolution in different regions of the simulation via domain-decomposition methods.

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

HPC research project. Investigated suitability of C++ compilers for HPC applications. Developed optimized scientific computational kernels. Investigated performance obtained by each compiler from each kernel. Analyzed compiled binary code to determine reason for differences in performance. Technical report at [Colfax Research](#).

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

Presented lecture on Intel Advisor for Stanford University HPC course ME344 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. Worked on the software stack to add functionality, documentation, & tests. Converted the LSST stack to use py.test. Developed & implemented algorithm to propagate covariance when stacking images. Worked on techniques for optimal image stacking & differential chromatic refraction. Implemented star-galaxy classifier using machine learning methods.

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

Postdoctoral Researcher *Sept '15 – Feb '17*

Developed and implemented parallelized Bayesian algorithm to estimate orbital parameters from stochastic light curves of binary supermassive black holes. 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*

Architected and implemented **k_{ALI}**, an open-source high performance library to model stochastic time-series data in a Bayesian framework. **k_{ALI}** 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, **k_{ALI}** 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. **k_{ALI}** 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*

Used Intel Xeon Phi accelerator cards to model AGN variability. Developed vectorized & parallelized C++ pipeline to forward-model and fit data to model using MLE of 2nd-order statistics.

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

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

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

Implemented 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*

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

Education

Drexel University

PhD. in Physics

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

PHILADELPHIA, PA

2008 – 2015

Virginia Commonwealth University

M.S in Physics & Applied Physics

CAFM Studies of Epitaxial Lateral Overgrowth GaN Films

RICHMOND, VA

2005 – 2007

University of Richmond

B.S. in Mathematics & Physics

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

RICHMOND, VA

2001 – 2005

Skills

Technical expertise: Scientific software design and implementation, with(in) a team. Skilled at applying statistical analysis and machine learning methodology to complex data. Familiar with applying Deep Learning methods using TensorFlow. Fond of Agile methodologies (Scrum) and continuous integration (Jenkins). Enjoys writing C, C++, & Python, and learning Julia/Go/IO/Prolog. Good knowledge of parallelization technologies: OpenMP, C++11 threads, POSIX threads, & MPI. Experience programming on novel computing platforms: Intel Xeon Phi (Knight's Corner & Knight's Landing). Good knowledge of programming tools: GNU toolchain, Intel toolchain, LLVM toolchain, PGI toolchain, AOCC toolchain, Valgrind, gdb, make, SCons etc.... Development experience on Linux (16 years) & Mac OSX (7 years). Experience with L^AT_EX (13 years). Good knowledge of UNIX programming environment and tools: Memory management, process spawning, etc...

Certifications: 1. [Neural Networks and Deep Learning](#) by deeplearning.ai on Coursera. Certificate earned on November 4, 2017

2. [Improving Deep Neural Networks: Hyperparameter tuning, Regularization and Optimization](#) by deeplearning.ai on Coursera. Certificate earned on November 26, 2017

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

Publications

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

Large Synoptic Survey Telescope Galaxies Science Roadmap arXiv, 2017

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

Science-driven Optimization of the LSST Observing Strategy GitHub Repository, 2016

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 overgrowth Appl.

Phys. Lett., 90, 011913, 2007

Presentations

Optical Variability Signatures from Massive Black Hole Binaries 229th 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.