

J. Caleb Wherry

Curriculum Vitae

CONTACT INFORMATION

Luna Innovations Incorporated
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RESEARCH INTERESTS

Computational Mathematics, High-Performance Computing (HPC), Cloud Computing Solutions for HPC, Computational Complexity Theory, Algorithm Analysis & Design, Quantum Computation, & Foundations of Quantum Theory.

EDUCATION

Virginia Polytechnic Institute & State University, Blacksburg, VA Sept 2012 – Present

- Master of Science, Mathematical Physics

Austin Peay State University, Clarksville, TN Sept 2006 – May 2011

- Bachelor of Science, Computer Science
- Minors: Physics & Mathematics
- Advisor: Dr. Jim Vandergriff, Departments of Computer Science & Mathematics
- Senior Thesis: *A Complexity Analysis of Shor's Quantum Factoring Algorithm* [\[PDF\]](#)

Graduated: May 2011
Program GPA: 3.5/4.0

HONORS & AWARDS

International Mathematical Modeling Contest Honorable Mention Spring 2011
119th Tennessee Academy of Science: Best Undergraduate Mathematics Presentation Fall 2009
Alpha Lambda Delta: Honorary Freshman Society Inducted Spring 2007
Gamma Beta Phi: Top 10% of Class Society Inducted Spring 2007
APSU Academic Dean's List Fall 2006 – Spring 2008
APSU Don Waller Honors Computer Science Scholarship Fall 2006 – Spring 2008
APSU University Academic Honors Scholarship Fall 2006 – Spring 2008

CURRENT EMPLOYEEMENT

Research Engineer, Luna Innovations Incorporated Roanoke, VA
May 2011 – Present

- DARPA Trust & IRIS Projects.
- DoD TS Clearance.
- Applied mathematics research for graph theoretic problems.
- Quality Assurance Co-Lead:
 - Involved in all aspects of Software Development Life Cycle.
- Skills: C++11, Python, OOP/OOD, SH, SQL, Agile & Scrum, *nix, SQL, MATLAB, & Verilog

Scientific Software Engineer, Korovasoft Springfield, TN
Jan 2008 – Present

- Director of Engineering, Co-Founder
- Quality Assurance Lead:
 - Google Test & Mock, Continuous, Nightly, and Performance Tests (Valgrind)
- Researching computational & topological optimizations in genetic algorithms.
- Studying the effects of reproduction patterns in genetic algorithms.
- Providing efficient and robust software solutions to the scientific community.
- Developing novel methods for Cloud interaction on issues involving massive data sets & parallelizable algorithms.
- Skills: C/C++, Java, Perl, FORTRAN 95, OOP/OOD, *nix, & SQL

RESEARCH EXPERIENCE

Visiting Research Scholar, Institute for Quantum Computing, University of Waterloo Waterloo, ON, Canada
Summer 2010

- Supervisors: Dr. Michele Mosca, IQC, Deputy Director
Dr. Alioscia Hamma, Perimeter Institute for Theoretical Physics
- Collaboration with: Dr. Frank Wilhelm, IQC/University of Waterloo Professor

- Cross appointed at: Perimeter Institute for Theoretical Physics, Waterloo, ON, CA.
- Studied quantum speedups of inverse problems in general relativity & differential geometry.
- Studied genetic algorithm optimizations for pulse sequences in control theory for superconducting & NMR qubit implementations (Genetic evolver developed in C++).
- GRAPE & genetic algorithm hybrid methods researched.
- Skills: C++, SQL, Quantum Mechanics, & General Relativity

Undergraduate Researcher, Austin Peay State UniversityClarksville, TN
Fall 2009

- Supervisor: Dr. Ben Ntatin, Department of Mathematics
- Explored mathematics involved in the construction of Julia & Mandelbrot sets.
- Analyzed the above sets in the complex & quaternion algebras geometrically.
- Software designed in MATLAB and parallelized to produce high resolution images & high definition animations of higher dimensional sets.
- Skills: MATLAB & Complex/Quaternionic Analysis

Research Assistant, NASA Jet Propulsion Laboratory, California Institute of TechnologyPasadena, CA
Summer 2009
Spring 2009

- Tennessee Space Grant
- Undergraduate Student Research Program (USRP)
- Supervisor: Dr. Raghendra Sahai, NASA Principle Research Scientist, Origins of Stars & Planets Division
- Engineered complete astrophysical software suit developed in IDL (PROMOS: PROper MOtion Software).
- Image analysis algorithms developed for Hubble Space Telescope images to calculate nebular proper motions.
- Streamlined astrophysical research processes with agile & modular software engineering methodologies.
- Skills: IDL, GUI Design, C++, Astrophysics, & Numerical Analysis

Research Assistant, NASA Langley Research CenterHampton, VA
Fall 2008

- Undergraduate Student Research Program (USRP)
- Supervisor: Dr. Michael Pitts, NASA Senior Research Scientist, Earth Science Division
- Developed software for evolution of polar stratospheric clouds (PSCs) research.
- Implementation of trajectory & microphysical mathematical models written in FORTRAN to calculate the formation & flow of currently observed PSCs.
- Designed & engineered an IDL-based software system to streamline LaRC scientists' cloud research processes.
- Skills: IDL, GUI Design, FORTRAN 77/90, & Atmospheric Science

Research Assistant, Lawrence Livermore National Laboratory, Department of EnergyLivermore, CA
Summer 2008

- Computation Directorate Internship
- Supervisor: Matthew Myrick, Senior Cyber Security Engineer
- Statistically analyzed anomalous log behavior with Perl.
- Designed & implemented a web-based log intrusion detection system (LIDS) written in Perl that monitored all DNS, HTTP, UDP, TCP, ICMP, CONN & FTP logs.
- Skills: Perl, HTML, & Statistical & Network Analysis

PROFESSIONAL EXPERIENCE**Network Administrator**, Visitation HospitalPetite Rivière de Nippes, Haiti
Aug 2007 – Aug 2008

- Designed server system for Visitation Hospital, a free health care clinic in Haiti.
- Implemented & developed on OpenMRS, an open source electronic medical records system written in Java.
- Skills: Java, SQL, OpenMRS, OOP/OOD, & Windows Server 2003

Software Developer Intern, OEM Tube AssembliesClarksville, TN
Spring 2008

- Student Internship

- Supervisor: Mick VanMaanen
- Streamlined worker interaction with machinery through FactoryPMI. Used Jython to create hazard avoidance tools to keep employees safe in their work environment.
- Migrated MSSQL databases to MYSQL databases.
- Skills: Jython, SQL, OOP/OOD, MSSQL, MYSQL, Windows Server 2003, & Windows XP

TEACHING EXPERIENCE

Teaching Assistant, Austin Peay State University

Clarksville, TN

- MATH 1920: Calculus II Spring 2010, Spring 2011
- MATH 1910: Calculus I Fall 2009, Fall 2010
- MATH 1730: Precalculus Fall 2009, Spring 2010, Fall 2011, Spring 2011

Computer Science & Mathematics Tutor, Austin Peay State University

Clarksville, TN

- Tutor students in Computer Science & Mathematics disciplines. Jan 2008 – May 2011

Trombone Instructor

Clarksville, TN

- High school & college student trombone instructor. Jun 2005 – May 2011

INPROGRESS PAPERS

- [3] “**Optimal Control of Quantum Computing Systems: A Genetic Approach.**” Use of genetic algorithms to produce optimal control sequences for the quantum circuit model of Q.C.
- [2] “**On the Rates of Convergence of Genetic Algorithms.**” w/ Robert D. French. A discussion of trends in convergence based on input parameters & genome characteristics.
- [1] “**Quantum Computation: An Introduction for Undergraduates.**” An introduction to Q.C.

UNPUBLISHED PAPERS

- [6] “**Repeater Coordination.**” 2011 International Mathematical Modeling Contest paper (Honorable Mention). [\[PDF\]](#)
- [5] “**Introduction to Antennas and Radiating Systems.**” Electricity & Magnetism Spring 2011 final project. [\[PDF\]](#)
- [4] “**A Complexity Analysis of Shor’s Quantum Factoring Algorithm.**” Senior thesis. [\[PDF\]](#)
- [3] “**PROMOS: PROper MOTion Software.**” NASA Jet Propulsion Lab Final Paper for USRP Spring/Summer 2009. [\[PDF\]](#)
- [2] “**Analysis Tools for Polar Stratospheric Cloud Studies Using CALIPSO Data.**” NASA Langley Research Center Final Paper for USRP Fall 2008. [\[PDF\]](#)
- [1] “**Buffer Overflow: A Short Study.**” APSU Information Security Seminar Proceedings Nov 2007. [\[PDF\]](#)

PRESENTATIONS

- [16] “**A Complexity Analysis of Shor’s Quantum Factoring Algorithm.**” Austin Peay State University Senior Thesis Presentation (5th May 2011). Clarksville, TN. [\[PPTX\]](#)
- [15] “**Introduction to Antennas and Radiating Systems.**” Austin Peay State University Electricity & Magnetism Final Project (3rd May 2011). Clarksville, TN. [\[PPTX\]](#)
- [14] “**Big-Oh Notation.**” Austin Peay State University CS Senior Seminar Presentation (1st Mar 2011). Clarksville, TN. [\[PPTX\]](#)
- [13] “**Quantum Computation: The Mathematics of Information.**” Austin Peay State University Honors Mathematics Colloquium (12th Oct 2010). Clarksville, TN. [\[PPTX\]](#)
- [12] “**Quantum Computation: The Physics of Information.**” Austin Peay State University Honors Physics Colloquium (2nd Sept 2010). Clarksville, TN. [\[PPTX\]](#)
- [11] “**Genetic Programming: Applications In Quantum Computing.**” IQC USEQIP Undergraduate Research Symposium (3rd Jun 2010). Institute for Quantum Computing, Waterloo, ON, Canada.
- [10] “**PRO-MOTIONS: PROper MOTION Software.**” 5th Austin Peay State University Research Symposium (9th Apr 2010). Clarksville, TN. [\[PDF\]](#)
- [9] “**A Mathematical Introduction to Shor’s Quantum Factoring Algorithm.**” 89th Mathematical Association of America: Southeastern Sectional Conference (26th Mar 2010). Elon, NC. [\[PPTX\]](#)
- [8] “**Quantum Computation: Is RSA All Factored Out?**” Association for Computing Machinery: Mid-Southeast Conference (13th Nov 2009). Gatlinburg, TN. [\[PPTX\]](#)
- [7] “**Four Dimensional Julia Sets.**” 119th Tennessee Academy of Science Conference (30th Oct 2009). Knoxville, TN. [\[PPTX\]](#)

- [6] “**What Can You Do As An Undergraduate Researcher?**” Austin Peay State University Honors Physics Colloquium (17th Sept 2009). Clarksville, TN. [[PPTX](#)]
- [5] “**PRO-MOTIONS: PROper MOTION Software.**” 214th American Astronomical Society National Conference (8th Jun 2009). Pasadena, CA. [[PDF](#)]
- [4] “**PRO-MOTIONS: PROper MOTION Software.**” NASA Jet Propulsion Laboratory, California Institute of Technology Spring Research Symposium (6th May 2009). Pasadena, CA. [[PPTX](#)]
- [3] “**Analysis Tools for Polar Stratospheric Cloud Studies Using CALIPSO Data.**” NASA Langley Research Center Fall Research Symposium (10th Dec 2008). Hampton, VA. [[PDF](#)]
- [2] “**Intrusion Detection Systems: Anomalous Log Behavior.**” Lawrence Livermore National Laboratory Summer Research Symposium (15th Aug 2008). Livermore, CA.
- [1] “**Buffer Overflow: A Short Study.**” APSU Information Security Seminar (17th Nov 2007). Clarksville, TN. [[PPTX](#)]

SOFTWARE PROJECTS & LIBRARIES

- [10] “**Bamboo.**” Efficient and robust software for handling the Finite Element Method with mesh generation. C++ Implementation: [[CODE](#)] Java Implementation: [[CODE](#)] *Mathematica* Implementation : [[CODE](#)]
- [9] “**GARTH.**” Genetic Algorithm test bed software for unique problems in optimization theory. [[CODE](#)]
- [8] “**Data Structs R Us.**” Data structures library for trees, lists, graphs, etc. designed in C++. [[CODE](#)]
- [7] “**F90 Numerical Library.**” Numerical library for integration, differentiation, etc. designed in FORTRAN 90. [[CODE](#)]
- [6] “**String Evolver.**” Simple program for evolving towards a known string. Designed in Java. [[CODE](#)]
- [5] “**PROMOS.**” Full software suit for researching preplanetary nebulae morphology designed in IDL and C++. Spring/Summer 2009 project for NASA JPL. [[CODE](#)]
- [4] “**PSC Modeling.**” Modeling toolkit for tracking polar stratospheric clouds designed in IDL, FORTRAN, & C++. Fall 2008 project for NASA Langley Research Center. [[CODE](#)]
- [3] “**LIDS.**” Web-based log intrusion detection system designed in Perl. Summer 2008 project for DOE LLNL. [[CODE](#)]
- [2] “**SuperRent.**” Video rental system designed in C#. Spring 2008 project for undergraduate OOP class. [[CODE](#)]
- [1] “**Code.**” A random assortment of code I’ve written over the years in various languages. Some for classes and some just for fun. [[CODE](#)]

WORKSHOPS & ENRICHMENT PROGRAMS

- MCS: *Simulation of Extreme Events***, University of Oldenburg Oldenburg, Germany
Aug 2011
- Modern Computational Science (MCS)
 - 2-week summer school on modern computational science and its application to the simulation of extreme events.
 - Topics covered: Scientific software engineering, rare-event theory, stochastic differential equations, extreme weather & traffic simulations, & extreme polymer configurations.
- QCSYS**, Institute for Quantum Computing, University of Waterloo Waterloo, ON, Canada
Jul 2010
- Quantum Cryptography School for Young Students (QCSYS)
 - 1-week summer school for Canadian high school students on quantum cryptography.
 - Teaching assistant, mentor, & housing chaperone for students.
 - Topics covered: Intro to quantum physics, QKD, & QEC.
- USEQIP**, Institute for Quantum Computing, University of Waterloo Waterloo, ON, Canada
May 2010
- Undergraduate School on Experimental Quantum Information Processing (USEQIP)
 - Instructors: Dr. Raymond Laflamme, Dr. Michele Mosca, Dr. David Cory, Dr. Joseph Emerson, Dr. Jonathan Baugh, Dr. Hamed Majedi
 - 2-week summer enrichment program on current experimental work in quantum information processing.
 - Topics covered: Quantum information processing, NMR, quantum cryptography, QKD, QEC, quantum algorithms, & superconducting qubits.
- Mathematical Biology & Numerical Analysis Workshop**, University of Georgia Athens, GA
Aug 2009
- Workshop on current simulation & analysis techniques used in mathematical biology.
 - Topics covered: numerical simulations of ecosystems, functional connectivity & neuronal network dynamics, compositional heterogeneity & systems biology of complex traits.

QuISU, Massachusetts Institute of Technology

Cambridge, MA

- Quantum Information Science For Undergraduates (QuISU)

Jun 2009

- Instructors: Dr. Seth Lloyd, Dr. Jeffrey Shapiro, Dr. Scott Aaronson, Dr. Issac Chaung
- 1-week summer enrichment program on current work & progress in quantum computation.
- Topics covered: quantum mechanics (single/double qubit systems), quantum computational complexity, NMR, ion traps, harmonic oscillator, entanglement, teleportation, quantum key distribution & quantum illumination.

CONFERENCES

- [8] Random Matrix Techniques in Quantum Information Theory (Jul 4th - 6th 2010). Perimeter Institute for Theoretical Physics. Waterloo, ON, Canada.
- [7] Cosmological Frontiers in Fundamental Physics (Jun 15th - 18th 2010). Perimeter Institute for Theoretical Physics. Waterloo, ON, Canada.
- [6] Theory & Realization of Practical Quantum Key Distribution (Jun 14th - 17th 2010). Institute for Quantum Computing. Waterloo, ON, Canada.
- [5] 89th Mathematical Association of America: Southeastern Sectional Conference (Mar 26th - 27th 2010). Elon, NC.
- [4] Association for Computing Machinery: Mid-Southeast Conference (Nov 12th - 13th 2009). Gatlinburg, TN.
- [3] 119th Tennessee Academy of Science Conference (Oct 30th 2009). Knoxville, TN.
- [2] 214th American Astronomical Society National Conference (Jun 7th - 11th 2009). Pasadena, CA.
- [1] 87th Mathematical Association of America: Southeastern Sectional Conference (Mar 28th - 30th 2008). Charleston, SC.

ACTIVITIES

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| Austin Peay ACM Programming Team | Fall 2006, Fall 2007, Fall 2009, Fall 2010 |
| Austin Peay Math Jeopardy Team | Spring 2007, Spring 2008, Spring 2010, Spring 2011 |
| NASA Langley Research Center CoLab Member | Fall 2008 |
| Austin Peay Association for Computing Machinery Student Member | Fall 2006 – Spring 2011 |
| Austin Peay Association for Computing Machinery Secretary | Fall 2007 – Spring 2008 |
| Austin Peay Galois Math Club Student Member | Fall 2006 – Spring 2011 |
| Austin Peay Galois Math Club Vice President | Fall 2006 – Spring 2008 |
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| Cumberland Jazz Project: Lead Trombone | Fall 2009 – Spring 2011 |
| Austin Peay Jazz Collegians: Lead Trombone | Fall 2006 – Spring 2011 |
| Austin Peay Wind Ensemble: Principle Trombonist | Fall 2006 – Fall 2009 |
| CalTech Trombone Choir Member: Slide Rule | Spring 2009 |
| CalTech Jazz Band: Lead Trombonist | Spring 2009 |
| Chesapeake Bay Wind Ensemble: Bass Trombonist | Fall 2008 |

COMPUTER SKILLS

Databases: MySQL, MSSQL, MS Access

Languages: (Fluent) C++11, FORTRAN 90/95, Python, SQL, SH, & C

(Knowledge of) C#, Standard ML, Jython, Intel-Based Assembly, COBOL, Verilog, IDL, VB .NET 2005, Java, MATLAB, Make, CMake, & LaTeX

Platforms: Unix/Linux-Based, Windows NT-Based

Practices: [Agile](#), Scrum, Bug Tracking, Subversion/Perforce VC, Make, & OOPSoftware: IDL, MATLAB, *Mathematica*, Microsoft Office, Visual Studio .NET 2005, MS SQL Server, CDash, & Eclipse

Web: Perl, HTML, CSS, Javascript, & PHP

RELEVANT UNDERGRADUATE COURSESComputer Science

Intro to Programming I & II

Programming In COBOL*

Programming In Java

Programming In VB .NET 2005

Object-Oriented Programming in C#

File Processing*

Principles of Information Security

Mathematics

Calculus I,II, & III

Mathematical Reasoning

Discrete Mathematics

Differential Equations I

Linear Algebra

Numerical Analysis

Graph Theory

Physics

Calc-Based Physics I & II

Intermediate Mechanics

Electricity & Magnetism

Special/General Relativity

Quantum Mechanics

Data Structures & Algorithm Analysis Real Analysis
Computer Organization I & II
Operating Systems & Architecture
Programming Languages
Principles of Database Management

* Audit

REFERENCES UPON REQUEST