

Daniel Gruss

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Summary Research, software development, and modeling of electron transport in nanoscale devices

Research Experience

Materials and Device Simulation

Center for Nanoscale Science and Technology, NIST Summer 2015 – Present
Faculty Assistant, UMD/CNST Cooperative Research Program

Oregon State University Winter 2011 – Present

- Developed and implemented scalable algorithms for electronic transport simulation in nanoscale devices
- Designed and built analysis, processing, and visualization tools for data management
- Set the foundation for simulation of sequencing and single molecule detection with electronic currents
- Established a novel, STM-inspired approach for probing many-body systems in cold-atom optical lattices

PhD Advisor: Michael Zwolak

Education

Oregon State University Fall 2010 – Present
College of Science, Doctor of Philosophy Physics

Overall 4.00/4.00 Graduate GPA, Expected graduation June 2016

Oregon State University Winter 2007 – Spring 2010
College of Science, H.B.S. Computational Physics, Physics (Applied Option), Engineering Physics

Overall 3.98/4.00 GPA over 275 credit hours, Summa Cum Laude, Computer Science Minor

Technical Skills

Simulation of nanoscale devices: system modeling, linear algebra, non-linear differential equations, numerical integration, algorithm design, complexity and error management, performance and efficiency profiling

- python: 5+ years experience for research-grade computing, including Numpy, SciPy, Matplotlib, IPython
- C/C++: 8 years experience, 4+ years in numerical simulation context
- Daily work with linux, bash shell, git/github version control
- T_EX/L^AT_EX expertise for scientific and mathematical typesetting
- Mathematica: 6 years experience in a research context
- Experience with Blender and Adobe Illustrator/Inkscape for scientific visualization, diagrams
- 4 years academic coursework experience with Java, HTML/CSS/Javascript, C/C++
- Experience with numerical research with MATLAB, Julia, R, Intel Math Kernel Library
- User-level work with high performance computing cluster/queueing systems (PBS, SLURM), AWS spot instances for numerical simulation, MPI parallelization of C/C++ programs, ScaLAPACK
- Research and teaching experience with density functional theory packages VASP and Wien2k

Journal Publications

1. “Energy-Resolved Atomic Scanning Probe,” **Daniel Gruss**, Chih-Chun Chien, Massimiliano Di Ventra, and Michael Zwolak, in preparation (2016)
2. “Landauer’s formula with finite-time relaxation: Kramers’ crossover in electronic transport,” **Daniel Gruss**, Kirill Velizhanin, and Michael Zwolak, accepted by Scientific Reports (2016)
3. “Interaction-induced conducting-nonconducting transition of ultra-cold atoms in 1D optical lattices,” Chih-Chun Chien, **Daniel Gruss**, Massimiliano Di Ventra, and Michael Zwolak, New J. Phys. 15 063026 (2013)

Presentations

1. Landauer’s formula with finite-time relaxation: Kramers’ crossover in electronic transport, Daniel Gruss, Kirill Velizhanin, and Michael Zwolak, APS March Meeting, Baltimore, MD (2016)
2. Characterizing a conducting-to-nonconducting transition in an inhomogeneous Hubbard model out of equilibrium via tDMRG simulations, Daniel Gruss, Chih-Chun Chien, Massimiliano Di Ventra, and Michael Zwolak, APS March Meeting, Denver, CO (2014)
3. Interaction-induced transport of ultra-cold atoms in 1D optical lattices, Daniel Gruss, Chih-Chun Chien, Massimiliano Di Ventra, and Michael Zwolak, APS March Meeting, Baltimore, MD (2013)
4. Interaction-induced transport of ultra-cold atoms in 1D optical lattices - Sigma Xi Columbia-Willamette Chapter - Student Research Symposium, Portland (2013)

Awards, Memberships, Scientific Visits

OSU College of Science Student Travel Fund awardee	(2013, 2014)
Sponsored research visits to Los Alamos National Laboratory	(2012, 2013)
Sigma Xi Grant-in-Aid of Research “Entanglement and correlations in transport: From nanoscale electronics to cold atoms”	(2013)
Peter Fontana Outstanding Teaching Assistant Award for Excellence in Teaching Physics	(2013)

Additional Experience

Teaching Assistant, Oregon State University

Fall 2010 – Spring 2015

- Teaching assistant for a broad range of physics courses: general physics with and without calculus, Upper division programs, online-based astronomy sequence, and graduate level solid state physics
- Duties included supervising laboratory session, leading recitation sections, exam/assignment grading, and teaching computational methods

Optical Tweezer Holography, Oregon State University

Summer 2008 – Fall 2010

- Supported research in laser-based micro-particle trapping using spatial light modulating holography
- Created software for trap control, precision position and force measurement, and automated data analysis

Thesis: Applied Computing Techniques for Holographic Optical Tweezers (2010), Advisor: David McIntyre