

T. Preston Hinkle

e-mail: tphinkle@gmail.com

website: tphinkle.github.io

github: github.com/tphinkle

EDUCATION

- **University of California, Irvine**

Irvine, California

Ph.D., Physics

2012 – 2017 (*forthcoming*)

- **The Ohio State University**

Columbus, Ohio

B.S., Physics and B.S., Astronomy

2006-2011

RESEARCH DESCRIPTION

- **Ph.D. Research**

Advisor: Professor Z. Siwy

Transport in micro- and nanofluidic systems

- **Experiment:** Designed and conducted experiments to study ion and particle transport in microfluidic channels and synthetic nanopores.
- **Hardware:** Responsible for design and fabrication of devices in a clean room environment.
- **Software:** Created software for every part of the experimental workflow, from instrument control to data analysis.

- **B.S. Research**

Advisor: Dr. Y.L. Loh

Condensed matter theory research

- Wrote Markov Chain Monte Carlo simulations in C++ and Mathematica to study cold atoms.

PROGRAMMING SKILLS

- | | | |
|---------------|-------|-----------------------------------|
| • Python | • C++ | • Qt framework |
| • Mathematica | • Git | • L ^A T _E X |

SOFTWARE PORTFOLIO

A selection of software written for research projects. Source code is available at <https://github.com/tphinkle>.

- Data processing and analysis
 - Software pipeline for analyzing resistive pulse data from experiments written in Python and PyQt. Implements a custom thresholding algorithm for event detection. Includes a GUI to allow manual event validation. Implements a model trained via machine learning to automatically validate detected events. Includes a backend library for analyzing extracted events.
 - Python scripts for analyzing microscope images taken by a high-speed camera. Includes particle tracking, size measurement, and edge detection. Uses a combination of custom algorithms and the OpenCV-Python image processing library.
 - Python program to automatically compile and plot experimental data. Automated a previously manual process and reduced data analysis time from ~1 hour to ~1 minute per experiment.
- Instrument control
 - C++ GUI program for controlling measurement devices in a microfluidics experiment. Uses multithreading to allow simultaneous control of a high-speed camera, data acquisition card, and syringe pump. Each measurement instrument uses its own communication protocol. Displays live camera images and current time-series data. Enables an automatic process for trapping cancer cells in a microfluidic channel.
 - GUI program written in C++ that remotely controls a measurement instrument for producing IV curves and current time series. Streamlined IV measurements and enabled real-time feedback on device noise and capacitance characteristics.

RELEVANT EXPERIENCE

- **Data science fellowship:** Awarded the UCI Data Science Initiative Summer Fellowship for proposal to write open-source software for analyzing data from experiments.
- **Data science workshops:** Instructor and teaching assistant for graduate level Python and machine learning workshops.
- **Astrophysics machine learning course:** Helped organize and lead discussions in a study group for applying machine learning methods towards astrophysics research.
- **Programming and data science education:** Completed various workshops and online courses in data science, machine learning, and computer science.

SELECTED PUBLICATIONS

Preston Hinkle *et al.* A hybrid resistive pulse-optical detection platform for microfluidic experiments. **2017**. (Under review).

Crystal Yang, Preston Hinkle, Justin Menestrina, Ivan V. Vlassiouk, and Zuzanna S. Siwy. Polarization of Gold in Nanopores Leads to Ion Current Rectification. *J. Phys. Chem. Lett.* **2016**, 7 (20), 4152-4158.

Yinghua Qiu, Preston Hinkle, [and 9 others.] Pores with longitudinal irregularities distinguish particles by shape. *ACS Nano* **2015**, 9, 4390-4397.

TALKS

Building a full resistive pulse sensing data analysis pipeline

UC Irvine Data Science Initiative invited talk for prospective graduate students

Detecting and isolating cancer stem cells using resistive pulse sensing

UC Irvine Data Science Initiative Summer Fellows talk

Ion and particle transport in solid-state nanopores

Advancement to Ph.D. candidacy talk

A new method for measuring nanoparticle length using the resistive pulse technique

2015 Annual Meeting of the Far West Section of the APS

POSTERS

Developing a resistive pulse sensing analysis pipeline for cell characterization

UCI Data Science Initiative Summer Fellows research presentation

A new procedure for measuring particle length using the resistive pulse technique with irregular single micropores

Biophysical Society 2016 Meeting

Charge induced rectification in single nanopores

Biophysical Society 2016 Meeting

Pores with longitudinal irregularities distinguish particles by shape

Biophysical Society 2015 Meeting

Estimation of mean square flux noise in SQUIDs from Monte Carlo simulations of the classical 2D XY model

American Physical Society 2014 March Meeting

TEACHING

Instructor/TA for graduate-level data science workshops 2016–
Data Science Initiative, University of California, Irvine

Graduate teaching assistant 2012–2014
Department of Physics and Astronomy, University of California, Irvine

Temporary lecturer 2011–2012
Department of Physics, The Ohio State University

Private tutor 2011–
Physics tutor for high school and college students.