

# T. Preston Hinkle

**e-mail:** tphinkle@gmail.com

**website:** tphinkle.github.io

**github:** github.com/tphinkle

## EDUCATION

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- **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

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- **Ph.D. Research**

Advisor: Prof. Z. S. 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

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- |          |                                   |                |
|----------|-----------------------------------|----------------|
| • Python | • C++                             | • Qt framework |
| • Git    | • L <sup>A</sup> T <sub>E</sub> X | • Mathematica  |

## SOFTWARE PORTFOLIO

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*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

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- **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:** Developed and instructed 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

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Preston Hinkle *et al.* A hybrid resistive pulse-optical detection platform for microfluidic experiments. **2017**. (Accepted for publication in *Scientific Reports*).

Crystal Yang, Preston Hinkle, Justin Menestrina, Ivan V. Vlassiounk, 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

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*Resistive pulse sensing for microfluidic applications*

Research talk given at Singapore University of Technology and Design

*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

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*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

## TEACHING

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*Instructor for graduate-level data science and machine learning courses*

2016–

UCI 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.