Paul Kreymborg

(858) 263-8811 · Princeton, NJ · frenebo@gmail.com

Education

University of California, Santa Barbara   **August 2019 - June 2023**

Bachelor of Science, Physics, Honors

GPA: 3.85

Senior Thesis: Developing a DMD Projector to Pattern Light on Microscope Sample Slides

Research Experience

Princeton University   **January 2023 - Present**

Research Assistant, Atkinson Lab

- Study electrochemically active bacteria, such as Shewanella Oneidensis.

- Develop interface technology to measure and control populations of S. Oneidensis.

University of California, Santa Barbara   **June 2021 - July 2023**

Student Researcher, Zvonimir Dogic Lab

- Performed soft active matter research in the Dogic Lab, utilizing microscopy, optical design, software, data analysis, and wet lab skills.

- Designed and constructed a custom fluorescence microscope and a Digital Micromirror Device (DMD) laser projector to perform real-time feedback control of light-activated nematics. Integrated microscope hardware, laser optics, and DMD electronics.

- Pinpointed a reliable recipe for a two-phase light-activated nematic, utilizing fluorescence microscopy and liquid sample preparation techniques. Achieved phase separation characteristics that allowed for study of cell-like active nematic droplets.

- Created Python software to control microscope and DMD projector hardware, calibrate projector alignment, and perform microscopy data acquisitions while projecting patterned light on sample slides.

- Built software used to quantify biopolymer networks in 3D microscopy images. Developed algorithm to process images larger than 1 gigabyte, a 10-fold improvement over the ability of previous tools.

Fellowships and Awards

- College of Creative Studies Create Fund Summer Fellowship, Summer 2021. *Awarded to offset living expenses for summer research.*

- Materials Research Laboratory Research Internships in Science Engineering (MRL RISE). Awarded in Fall 2021, Winter 2021 and Spring 2022. *Awarded to support student research in materials-related fields.*

Presentations

- "Directing Active Matter With Projected Light," Oral Presentation, UCSB MRL RISE Meeting, June 2022.

- "Active Nematic Bubbles," Oral Presentation, UCSB MRL RISE Meeting, March 2022.

- "Mapping Filaments in Active Nematics", Oral Presentation, UCSB MRL RISE Meeting, December 2021

- "Mapping Filaments in Active Gels," Poster Session and Oral Presentation, RACA-CON (Research and Creative Activities Conference), UCSB, November 2021.

Other Presented Work

- Co-author of "Data-driven model discovery using SINDy on particle based simulations of dry active nematics," Oral Presentation, APS March Meeting 2023.

Professional Experience

Ontraport, Santa Barbara, CA   **Oct-Dec 2019, Jul-Sep 2020**
Front-end Software Engineering Intern

- In 2019, learned website engineering under the instruction of software engineers, including bug tracking, project management, unit testing, version control, and Linux management tools.

- In 2020, investigated and fixed user-reported bugs in Ontraport, a sales and marketing web app. Wrote JavaScript, HTML, and CSS to correct problems in the website's user interface.

Software AG, San Diego, CA   **July 2018 - August 2019**
Data Analytics Intern

- Wrote software and developed machine learning models as a member of the Software AG data analytics team. Set up and trained ML models, designed proof-of-concept mobile and web apps, and developed a comand-line interface for data management.

- Trained and optimized an image object detection model to run on the limited hardware of an Nvidia Jetson Nano Developer Kit.

- Created a web app for editing data flow graphs of neural networks, using TypeScript, HTML, and C#. Built a server to allow separate users to collaboratively edit data flow graphs in real time.