

## EDUCATION

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**University of California, Berkeley**  
*B.S. Engineering Physics | GPA: 3.506*

Berkeley, CA  
*Aug. 2015 – May 2019*

## EXPERIENCE

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**University of California, Berkeley**  
*Undergraduate Researcher | Crommie Group | Physics*

Berkeley, CA  
*April 2016 - May 2019*

- **Microfabrication:** Fabricated 2D devices using graphene and hexagonal boron nitride for STM studies
- **2D Material Transfer:** Adapted a dual polymer transfer method to achieve atomically clean graphene surfaces
- **Imaging Device:** Fabricated graphene device for non-invasive, real-time imaging of electric fields from live cells
- **Non-contact AFM:** Revamped the assembly process of nc-AFM sensors for a 10-fold increase in quality factor
- **CVD:** Pioneered the effort to produce the first large (500  $\mu\text{m}^2$ ) single crystal monolayer CVD graphene in this lab
- **Programming:** Designed software to measure performance of cantilevers using lock-in detection

## PROJECTS

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**Machine Learning Framework for Guiding Directed Evolution Experiments** *May 2019 - Present*

- Developing an accessible tool based on learning-to-rank models for guiding directed evolution experiments
- Designed the strategy to be adaptable to ongoing experiments without modifications to the experimental plan
- Utilized auto-encoders to learn compact representations of proteins specific to the target experiment

**A Monte Carlo method for Decomposition of Tryptophan Fluorescence Spectra** *Sep. - Nov. 2018*

- Proposed a Metropolis-Hastings Monte Carlo algorithm to decompose fluorescence spectrums
- Investigated the effect of noise and the number of components on the stability of the algorithm

**Single Cell Trapping for Measuring Antibody Production in Hybridoma Cells** *Jan. - May 2018*

- Designed a micro-patterned agarose gel device that can trap and isolate single cells
- Streamlined a research plan to execute multiple approaches in parallel with limited lab time
- Worked closely with a small group to identify and overcome challenges in a resource limited teaching lab

**Pacman Capture the Flag with AI** *Jan. - May 2018*

- Designed an algorithm to approximate the shortest path for pacman agents to collect all food pellets
- Cast the problem as a traveling salesman problem and approximated solutions with minimum spanning trees
- Implemented a k-means based partitioning algorithm to divide the work between multiple pacman agents

**Learning to Rank Protein Mutants for Guided Directed Evolution of Renilla Luciferase** *Aug. - Dec. 2017*

- Proposed a machine learning model to identify high performing mutation combinations
- Adapted the RankNet algorithm used for search engines to rank proteins
- Explored the use of weakly trained models to label unknown variants to augment the experimental dataset
- Succeeded in identifying the top protein mutants in a data set with just a fraction of the dataset

**Constructing a 5 cent smart phone microscope using PDMS Polymer Lenses** *Aug. - Dec. 2017*

- Fabricated lenses in a kitchen oven by curing PDMS upside down to generate curvature using gravity
- Achieved a magnification of 172x and a numerical aperture of 0.212 through Zemax optimization
- Explored a lift-off technique using a sacrificial PVA layer to detach PDMS cured in a 3D printed mold

## SKILLS

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**Programming:** Python, Pytorch, Keras, Numpy, Java, C#, SQL, Matlab, Labview

**Research:** Chemical vapor deposition, Dry/Wet transfer of 2D materials, Photolithography, Raman spectroscopy, AFM, STM, E-beam/Thermal evaporation, Sputtering, Cell culturing

## MEMORABLE COURSEWORK

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Machine Learning, Nonlinear Optics, Data structures, Artificial Intelligence, Probability and Random Processes, Optical Systems, Biophotonics, Thermal Physics, Quantum Mechanics, Linear Algebra