Andrew Franck

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Education

Occidental College *Los Angeles, CA*

B.A. in Mathematics, Computer Science and Physics *Aug. 2023 - Jun. 2027*

GPA: 3.9 out of 4.0

California Institute of Technology *Pasadena, CA*

Exchange Student - Co-Enrollment Program

GPA: 4.0 out of 4.0

Research

Neural Operators for Excitable Media Dynamics in Fitzhugh-Nagumo Systems *Occidental College, CA*

Mentor: Justin Li (Occidental College, Computer Science) *Jun. 2025 - Dec. 2025*

- Developed Fourier Neural Operator model to accelerate Fitzhugh-Nagumo reaction-diffusion simulations by several orders of magnitude while maintaining <8% relative L2 error and 0.98 Rsquared score.

Transformer Based Learning for COPUS Lecture Classification *Occidental College, CA*

Mentor: Chris Cianci (Occidental College, Computer Science) *Aug. 2025 - Dec. 2025*

- Led research of computer vision pipeline achieving 95% accuracy in automating classroom observation, replacing manual coding with ML-based behavioral analysis of STEM lectures using transformer models.
- Recognizes and classifies over 20 distict actions according to COPUS evaluation actions.

Gaussian Process-Based Reinforcement Learning for Autonomous Vehicle Sampling *Portland State University, CA*

Mentor: John Lipor (Portland State University, Electrical & Computer Engineering) *May. 2025 - Aug. 2025*

- Assisted in development of reinforcement learning-based policy for adaptive level-set estimation in autonomous underwater vehicles, aiming for efficient seabed classification from ambient acoustic data.
- Modeled spatial similarity using Gaussian processes (GPs), and implemented scalable GP inference using GPyTorch prediction and uncertainty estimation.
- Improved the expert policy using exhausive lookahead methods and AUC-based terminal cost approximation.

Computational Study of Neural Action Potentials Using the Hodgkin-Huxley Model *Occidental College, CA*

Mentor: Janet Scheel (Occidental College, Physics) *Aug. 2024 - Dec. 2024*

- Studied neuron excitement and action potential dynamics through Hodgkin-Huxley ion channel kinetics. Determined threshold values for spike generation and frequency-current relationships for repetitive firing.

Deep Learning for Ocular Biometry from Ultrasound Images *Portland State University, CA*

Mentor: John Lipor (Portland State University, Electrical & Computer Engineering) *May. 2023 - Oct. 2023*

- Developed a deep learning to analyze ocular ultrasound images, with shared and independent layers based on GoogLeNet model.
- Our approach demonstrates accurate measurement of axial length, offering a automated alternative to manual biometry measurements in clinical settings.

Evaluating Machine Learning Strategies for Geothermal Energy Assesments *Portland State University, CA*

Mentor: John Lipor (Portland State University, Electrical & Computer Engineering) *Jan. 2023 - May. 2023*

- Developed ML model in Pytorch to predict geothermal heat flow residuals based on 28 feature dataset.
- Updated research to analyze topographical maps with vision-based deep learning model.
- Recognized differences in topograpical terrain which indicate favorable locations for geothermal power plants.

Publications

2025 A. Franck. **Neural Operators for Excitable Media Dynamics in FutzHugh-Nagumo Systems**. *Under Review*

2025 J Lipor, H. Khazaei, **A. Franck**, D. Khazaei, J. Ng, F. Etesami. **Deep Learning for Ocular Biometry from Ultrasound Images**. *Book: Fundamentals of Orbital Inflammatory Disorders, 145-158*

2023 J Lipor, H. Khazaei, **A. Franck**, D. Khazaei, J. Ng, F. Etesami. **Deep Learning for Ocular Biometry from Ultrasound Images**. *Journal of Clinical & Medical Imaging*

Presentations

Neural Operators for Excitable Media Dynamics in Fitzhugh-Nagumo Systems *Nov 2025*
Occidental College Computer Science Department Advanced Research Talks *Los Angeles, CA*

Applications of Neural Operator Theory to Reaction-Diffusion PDEs in Neuroscience *Nov 2025*
Occidental College Mathematics Department Advanced Research Talks *Los Angeles, CA*

Transformer Based Learning for COPUS Lecture Classification *Nov 2025*
Computer Science Practicum Symposium, Occidental College *Los Angeles, CA*

Computational Study of Neural Action Potentials Using the Hodgkin-Huxley Model *Nov 2024*
Occidental College Physics Research Talks *Los Angeles, CA*

Projects

Machine Learned Detection of Baseball Pitcher's Tell
Python, PyTorch, Seaborn, Scikit-learn *Jun 2024 - PRESENT*

- Implemented learning systems for baseball pitch video analysis with up to 87% validation binary classification accuracy.
- High-dimensional calculus and linear algebra used to display model methods for prediction.
- Model returns specific video locations/sections that led to specific pitch classifications.
- Used communication skills and networking to obtain optimum video training data from SCIAC college baseball team. Worked with pitchers, coaches and administrators to obtain a 300+ element video training set.

Custom Deep Learning Library in Pure NumPy
Python, NumPy *Jan 2023 - Jun 2023*

- Used Python/NumPy to develop custom deep learning library, which operates and calls functions analogously to PyTorch. Developed custom MyTorch loss functions, optimizers using stochastic gradient descent, and forward/backward passes. Created functioning convolutional, recurrent, and regular neural networks.

Activities

NCAA Varsity Athlete *Los Angeles, CA*
Occidental College Baseball *Aug. 2023 - PRESENT*

- Balanced **25-30 hour/week practice/game schedule** with full academic courseload and research as varsity baseball athlete. Demonstrated leadership, teamwork, and exceptional time management skills.

Occidental College Peer Tutoring Group *Los Angeles, CA*
Mathematics Tutor *Aug. 2025 - PRESENT*

- Assisted students, hosted homework help and test review sessions for introductory and advanced mathematics courses twice a week.

Occidental Computer Science Club *Los Angeles, CA*
Computer Science Mentor *Aug. 2025 - PRESENT*

- Served as a student mentor for prospective and current computer science students. Advised on courses, planning, pathways.

Honors & Awards

2023 - PRESENT **Margaret Bundy Scott Scholarship**, Occidental College's Highest Merit Scholarship for $140,000
2023 - PRESENT **Deans List x5**, Occidental College

Skills

Languages Python, MATLAB, C++, SQL
Developer Tools Linux/Unix, Bash, Git, GitKraken, Mathematica, Trello, LaTeX
Technologies/Frameworks NumPy, Pandas, Keras, PyTorch, Matplotlib, SciKit-Learn, Torchvision, Seaborn, Vercel