Nolan R. Bonnie

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Education

University of Colorado Boulder **August 2022 - Present**
Ph.D. student in Computer Science GPA: 4.00
Advised by Dr. Orit Peleg
Interdisciplinary Quantitative Biology Certificate Program

University of California, Irvine **September 2017 - June 2021**
B.S. in Mathematics
Specialization in Data science

Awards

NSF GRFP Honorable Mention	2023
R&D 100 International Award Winner (Project ATHENA)	**2022**
NSF NRT Fellow	2022 - 2023
Distinguished Anteater Award	2020 - 2021
UCI UROP Fellow	2019 - 2020
Facebook-Udacity PyTorch Scholarship Recipient	2018 - 2019
UCI Campuswide Honors Collegium	2017 - 2021

Publications and Presentations

Bonnie, N. R., Hernández-Paniagua, I. Y., Dabdub, D. (2023). A Longitudinal Quantification of the Ozone Weekend Effect in the South Coast Air Basin of California [Available upon request]. Computational Environmental Sciences Laboratory, University of California, Irvine.

Bonnie, N. R. (2020). Adversary Emulation with Planning AI. Poster presentation at the Sandia National Laboratories 2020 Student Intern Cyber/CS Symposium. July 2020, Online.

∗ **Bonnie, N. R.**, Ebding, K., Harrell, C., Kothapalli, A., Sabetan, S., Watson, G. (2018). Virtualized Integrated Network Monitoring System. Poster presentation at the Sandia National Laboratories 2018 Student Intern Cyber/CS Symposium. July 2018, Livermore CA, USA.

∗ Order is Alphabetical

Graduate Research

Infrared Computer Vision **Winter 2022 - Present**

- Currently developing computer vision framework to track individual fireflies with lab-developed infrared (IR) imagine techniques
- Obtained 800GB of infrared firefly data through summer 2023 field experiments

- Current implementations involve convolutional neural networks (CNNs), OpenCV image processing, clustering, and Gaussian mixture models

Stereo Calibration Free Spatial Reconstruction **Fall 2023 - Present**

- Writing software to calibrate stereo videos of firefly swarms by utilizing individual fireflies to approximate the optimal fundamental matrix

Network Analysis of Emergent Criticality in Synchronous Fireflies **Summer 2023 - Present**

- Designing large-scale criticality experiment on *Photuris frontalis* swarms to understand emergent physical properties of their synchronization.
- Analyzing pilot experiment data from summer 2023
- Methods include network analysis, Markov chains, causal inference

Principal Component Analysis (PCA) of *Photuris Forresti* Flash Modes **Fall 2023 - Present**

- *P. forresti* is an endangered firefly species with a unique flash-chain pattern consisting of dots and dashes
- Currently processing spatial-temporal reconstructions of these flash-chains to understand the modes of flashing through PCA

Quantification of Spontaneous Neuron Synchronization **Fall 2023 - Present**

- Working with Professor Chris Link to analyze spontaneous synchronization of WTC11 ipscs
- Replicated mouse model result showing that individual neuron periodicity averages to group synchronous period in our human neuron cultures
- Implementing new algorithm to differentiate individual neuron electrical wavelength signature from a single electrode

Relevant Work Experience

Sandia National Laboratories – R&D S&E, Cybersecurity **July 2020 - August 2022**

- Full-time Member of the Technical Staff with D.O.E. Q Clearance.
- Developed a novel generalized planning AI with applications to cyber-emulytics (used for ATHENA).
- Multiple patents filed from AI planning work.
- Engineered new big-data (6 PB) analysis methods for detailed network traffic data.
- Developed scalable anomaly detection tools.

Learning and Academic Resource Center – Programming Tutor **September 2018 - June 2020**

- Taught three supplementary course sections, with classes of 16 students every quarter.
- Supported a Matlab programming course for engineers.
- Developed lesson plans and practice tests.
- 96.3% student satisfaction from over 150 evaluations.

Sandia National Laboratories – Cybersecurity R&D Intern **June 2018 - September 2018**

- Managed a 7 person team working on a high-priority research project.
- Project was an innovative proof of concept, and changed the way government servers are protected.
- Created synthetic data for a cybersecurity project that used AI to detect cyber attacks.

Leadership and Teaching

TA for CSCI 1300 *Starting Computing* taught in C++	**Fall 2023**
Undergraduate mentoring at Fort Lewis College in Durango Colorado	**Winter 2023**
Instructor at Sandia Labs for *Introduction to R and Machine Learning*	**Summer 2021**
Discussion Leader for *Introduction to Machine Learning*	**Winter 2019**
UCI Engineering Student Council	**Fall 2017 - Spring 2018**

Relevant Coursework

Graduate Coursework: Deep Reinforcement Learning for Robotics, Data Center Scale Computing, Dynamic Models in Biology, Bio-inspired Multi-Agent Systems, Responsible Conduct of Research, Bioinformatics & Genomics

Undergraduate Coursework: Artificial Intelligence, Machine Learning, Scientific Computing and Visualization, Graph Theory, Atmospheric Chemistry, Differential Equations, Probability and Stochastics, Bayesian Statistics, Computational Optimization, Algorithms, Linear Algebra, Abstract Algebra, Real Analysis, Number Theory, Numerical Methods

Undergraduate Research

Undergraduate Research Study in Data Science and Computing **Winter 2018 - June 2021**

- Selected by Professor Donald Dabdub to participate in 4 quarters of individual research study.
- Studied various topics related to data science and computation, such as: Scientific computing, scientific visualization, programming in R, data analysis, big data, machine learning, and neural networks.
- Applied graduate level statistical learning techniques to real world prediction problems, and used the basis of what I learned to conduct research in atmospheric chemistry

Undergraduate Research Study in Mathematics **Winter 2018 - Fall 2020**

- Participated in research groups led by professors Chris Davis, Shuhao Cao, and Knut Solna
- Studied research topics related to: computational algorithms, optimization, graph theory, discrete mathematics, deep neural networks, and machine learning.

Skills and Other Interests

Formal languages: Python, R, Matlab, Spark, C++, UNIX, HTML, CSS, Java, JavaScript, and Fortran 77.
Classical music: 16 years of piano, 9 years of guitar.
Volunteering: Colorado League certified high school mountain biking coach, 5 years.