

CITIZENSHIP: U.S. Citizen**EDUCATION:** **University of California, Santa Barbara** **2019 - Present**

- Ph.D. Mechanical Engineering
- Mechanical Engineering Excellence Fellowship
 - GPA: 4.0
 - Coursework:
 - ME 203: Operator Theory
 - ME 210 A/B: Numerical Analysis: Matrix Analysis, ODEs, PDEs
 - ME 215 A: Applied Dynamical Systems
 - ME 225EY: Biological Computing
 - ME 225 MM: Mathematical Methods
 - ME 236: Nonlinear Control Systems
 - ME 243 A/B: Linear Control Systems
 - ME 269: Network Systems
 - ECE 283: Machine Learning (Supervised, Unsupervised)
 - Teaching Assistantship and Tutoring:
 - ME 14: Statics
 - ME 155a: Control System Design
 - ME 163: Vibrations
 - ECE 179: Robot Dynamics and Control

University of California, San Diego **2015 - 2019**

- B.S. Math – Applied Science
- Chancellor's Associates Scholarship
 - Selected Coursework:
 - MAE 101 A: Intro to Fluid Mechanics
 - MAE 108: Probability and Statistics for Engineers
 - Math 103 A: Intro to Abstract Algebra
 - Math 120 A: Complex Analysis
 - Math 142 A/B: Real Analysis
 - Math 154: Intro to Graph Theory
 - Math 171 A: Linear Optimization

GRADUATE **Biological Control Laboratory** **Jan 2020 – Present**

- RESEARCH:** **University of California, Santa Barbara**
- Designed and built genetic toggle switches with time-varying parameters for the purpose of optimizing plastic degradation done by bacteria.
 - Mathematically modeled parameter varying genetic toggle switches.
 - Provided stability analysis of time varying toggle switch models through the framework of Koopman Operator theory.
 - Developed algorithms which fit time varying parameters to the pertinent toggle switch models.
 - Built a library of promoters which give distinct gene expression profiles during different bacterial growth phases.

UNDERGRAD **Delplanque Research Group** **June 2018 – Aug 2018**

- RESEARCH:** **University of California, Davis** (Funded by UC LEADs)
- Carried out numerical simulations of respiratory drug intake in the human trachea using OpenFOAM.
 - Found correlations between parameters of the simulated particle injections and the evenness of the particle distributions.

Coimbra Research Group**June 2017 – Aug 2017****University of California, San Diego** (Funded by UC LEADs)

- Conducted research on numerical methods to solve variable order differential equations (VODEs) using MATLAB.
- Devised an efficient numerical method that could solve VODEs 50% faster than conventional methods, so VODE model predictions could be made more quickly, improving the energy efficiency of the system.

Center for Advanced Surgical and Interventional Technology**June 2014 - Aug 2014****University of California, Los Angeles** (Volunteer)**June 2016 - Aug 2016**

- Assisted in the testing of an innovative way to treat prostate cancer known as focal laser therapy.
- Used CAD for the modeling of a human head to test remote trans-oral surgery.
- Developed molds using Solid Works to test the effects of a catheter-fed laser on phantom tissue.
- Compiled lists of potential treatment candidates within the UCLA health database using SQL.
- Tested haptic feedback on the da vinci remote surgical robot.

EMPLOYMENT: Supplemental Instructor**Sep 2016 - June 2019****University of California, San Diego**

- Facilitated math workshops for college students consisting of tutoring and support to ensure their academic success.
- Worked with professors to develop lesson plans for the facilitation of math workshops that supplemented material from courses.
- Classes Supported: Linear Algebra, Calculus (1,2,3), Pre-Calculus.

PUBLICATIONS: **Harrison, J.**; Yeung, E. Stability analysis of parameter varying genetic toggle switches using Koopman Operators. Mathematics 2021, 9, 3133. <https://doi.org/10.3390/math9233133>

PROJECTS: -**Quantitatively assessing wildfire risk** (SIAM Grad Student Math Modeling Camp)
-**Prediction of chronic kidney disease degeneration with machine learning** (SIAM Mathematical Problems in Industry | Vironix)

CONFERENCES: **Harrison, J.**, Yeung, E.: Analysis and validation of parameter varying genetic toggle switches using Koopman Operators

- SIAM CSE23 (2023)

Harrison, J., Ruvalcaba, C., Delplanque, J.-P.: Computational simulations for the improvement of respiratory drug intake in the human trachea

- SACNAS (2018) | UC LEADs Symposium (2019)
- SACNAS Presentation Award
- UC LEADs Symposium Honorable Mention.

Harrison, J., Orosco, J., Coimbra, C.F.M.: Efficient Numerical Methods for Solving Variable Order Differential Equations

- SACNAS (2017) | SCCUR (2017)

AWARDS & Mechanical Engineering Excellence Fellowship**2019**

DISTINCTIONS: -Funding given to a select subset of incoming Ph.D. students

Chancellor's Associates Scholarship (UCSD)**2015 - 2019**

- 4-year full-ride scholarship

**University of California's Leadership Excellence
through Advanced Degrees Fellowship (UC LEADs)**
- Funding for 2 Summers of research and travel for conferences

2017 - 2019

Fulfillment Fund Scholarship
- 4-year scholarship

2015 - 2019

**2018 SACNAS National Diversity in STEM Conference
Presentation Award**

2018

**TECHNICAL
SKILLSETS:**

Programming:

- Syntax:
 - Python
 - MATLAB
 - Java
 - SQL
 - HTML & CSS
 - Julia
- Environment:
 - Linux
 - Windows
 - macOS

Machine Learning:

- PyTorch
- TensorFlow
- Sci-Kit Learn
- SciPy Optimize
- Principal Component Analysis
- Neural networks for classification and prediction
- Logistic Regression
- k means Clustering

Biological Lab Skills:

- Bacterial Cell Cultures
- Mammalian Cell Cultures
- DNA Design
- Golden Gate Assembly
- Genetic Editing
- DNA Sequence Analysis
- Genetic Circuit Design
- Gen5 Plate Reader Experiments

Design and Simulation:

- Geneious Prime
- Solid Works
- Meshmixer
- OpenFOAM
- 3D printing
- Simulink

Mathematics:

- Modelling and control of biological and physical processes
- Verification and falsification of claims through logic and reasoning
- Probabilistic and statistical methods
- Numerical analysis
- Model parameter fitting

Circuits and Electronics:

- μ C: Arduino

Graphic Design:

- Adobe Photoshop
- Adobe Illustrator