



# SINA BONAKDAR

Graduate Student Research Assistant  
Department of Biomedical Engineering  
University of Michigan

## PROFILE

Enthusiastic first-year Ph.D. student in the Biomedical Engineering program at the University of Michigan, dedicated to advancing the understanding of biological systems through data-driven and mechanistic modeling. Specializing in the systems biology of the vaginal microbiome, a critical determinant of women's reproductive health. Previously served as a Biomedical Engineer site lead for the Biomedical Department at Paradise Valley Hospital in San Diego, CA. Passionate about leveraging computational and data analytics skills to develop innovative treatment methods aimed at improving health outcomes and saving lives.

## SKILLS

- Machine Learning (Unsupervised: PCA, t-SNE, UMAP, k-means, k-means++, Supervised: Decision Trees, k-nearest neighbors, PLS-DA, Random Forest, Gradient Boosted Decision Trees, Neural Network, Support Vector Machines, Naïve Bayes, Linear Regression, Logistic Regression, Lasso, Cross validation, AUC, Model Evaluation and Optimization)
- Statistical Analysis: t-test, ANOVA, Accuracy, Confusion Matrix, Sensitivity Analysis
- Python (Jupyter, NumPy, Pandas, Matplotlib, seaborn, scikit-learn, SciPy, NetworkX)
- R Programming Language
- MATLAB
- Ordinary Differential Equation Models (ODEs)
- Microsoft Office (Excel, Word, PowerPoint)
- Medical Device Quality Control, service, and Inspection
- Materials Characterization (SEM, XRD, OM)
- Mechanical Testing (Shear Punch, Creep, Hardness)

## CONTACT

[bonakdar@umich.edu](mailto:bonakdar@umich.edu)

+1(650) 350-8335

<https://sites.google.com/umich.edu/sinabonakdar/>

<https://www.linkedin.com/in/sina-bonakdar/>

<https://github.com/Sina2285>

## EDUCATION

**Doctorate in Philosophy in Biomedical Engineering** August 2023 - December 2028  
University of Michigan, Ann Arbor, MI  
Concentration: Biotechnology and Systems Biology (GPA: 4.0/4.0)  
Research Focus: Systems Biology of the Vaginal Microbiome using Computational Modeling Approaches  
Research Advisor: Dr. Kelly Arnold

**Graduate Data Science Certificate Program** January 2024 - December 2028  
University of Michigan, Ann Arbor, MI

**Biomedical Informatics and Data Science Fellowship** August 2024 - May 2026  
National Institute for General Medical Sciences (NIGMS)  
Grant Number: [T32GM141746](#)

**Master of Science in Biomedical Engineering** August 2018 - April 2020  
University of Michigan, Ann Arbor, MI  
Concentration: Biomaterials and Regenerative Medicines (GPA: 3.8/4.0)

**Bachelor of science in Metallurgy and Materials Engineering**  
University of Tehran (GPA: 3.3/4.0) September 2013 - February 2018

## PUBLICATIONS

- An in silico framework for the rational design of vaginal probiotic therapy, Christina Y. Lee, Sina Bonakdar, Kelly B. Arnold (*Submitted*)

## CERTIFICATIONS

- Applied Data Science with Python (Credential ID: [QFTRTGSFDX78](#)) May 2024
- A) Applied Social Network Analysis in Python (Credential ID: [SURM6PKBJEC9](#)) May 2024
- B) Applied Text Mining in Python (Credential ID: [ZFXFS8F5AJKW](#)) May 2024
- C) Applied Machine Learning in Python (Credential ID: [2CHU5SWFLDHW](#)) April 2024
- D) Applied Plotting, Charting, and Data Representation in Python (Credential ID: [4VUC3PZERDHY](#)) March 2024
- E) Introduction to Data Science in Python (Credential ID: [RZ3QC9LU3PFM](#)) March 2024
- Introduction to Programming Using Python (Credential ID: [P22GD64EY5YU](#)) October 2022
- Python Data Structures (Credential ID: [TCFJT7LG8C56](#)) October 2022
- Using Python to Access Web Data (Credential ID: [STN3G4KWBK5D](#)) October 2022

## WORK EXPERIENCE

---

### Ph.D. Student, Graduate Student Research Assistant

May 2023 - December 2028

Department of Biomedical Engineering, University of Michigan, Ann Arbor, MI

- Research assistant in Dr. Kelly Arnold's lab, with a focus on systems biology of vaginal microbiome which is critical for women's health.
- Develop sensitivity analysis, data-driven and mechanistic models for rational design of antibiotic and probiotic therapy of vaginal microbiome.

### Research Assistant (PBMC Sampling)

January 2024 - January 2028

Ann Arbor VA Medical Center, Ann Arbor, MI

- Developed a peripheral blood mononuclear cells (PBMC) isolation protocol and refined cytometry techniques for cell counting, ensuring high-quality sample preparation and preservation.
- Worked with various wet lab equipment for cell culture experiments, contributing to critical research in immunology.

### Biomed Engineer I

August 2021 - March 2023

Prime Healthcare Services (Paradise Valley Hospital (PVH), Alvarado Hospital, Bay View Hospital), San Diego, CA

- Provided technical solutions and support for proper utilization, evaluated the safety, efficiency, effectiveness and developed quality standards for testing, troubleshooting, and servicing of medical equipment used in ER, surgery, ICU, CAT lab, radiology, MRI.
- Created validation protocols, data collection, and documentations as well as reporting to management team, and maintained a database regarding CAPA, services and preventative maintenances of biomedical equipment.
- Worked at the primary point of contact for solving of any issues related to medical devices in PVH from April 2022.
- Made a professional relationship with hospital directors and staff, and collaborated with engineering and IT departments in handling of the cross functional projects and ensured of quality standards are compliant to all governing standards.
- Trained new hired Biomed Engineers and technicians in preventative maintenance, repairing, and inspection of medical devices.
- Worked as an on call Biomed engineer for the three hospitals located in San Diego area from April 2022.

### Cancer Research Assistant

May 2019 - July 2019

North Campus Research Center, University of Michigan, Ann Arbor, MI

- Developed the abilities to work in a wet lab environment and constructed a scaffold for growing ovarian cancers.
- Oversaw research activities including design, data analysis, reporting, and participated in weekly lab meetings to present results.

### Bachelor's Thesis research

September 2016 - February 2018

Metal Forming Laboratory, University of Tehran, Iran

- Project Aim: Employed Scanning Electron Microscopy (SEM), X-ray Diffraction (XRD), and optical microscopy to analyze microstructure, coupled with Shear Punch Test (SPT), hardness, and creep tests for mechanical property assessment.
- Investigated methods to enhance the mechanical properties and microstructure of Mg-6Zn alloy through the addition of 2 percent Cerium.

### Teacher Assistant

September 2013 - June 2015

Soroush High School, Tehran, Iran

- Tutored mathematics, physics, and chemistry to 70 students in 10<sup>th</sup> grade and held office hours for students.

## PROJECT EXPERIENCE

---

### Machine Learning and Data Analysis on COVID-19 Dataset (*HS 650 Course Project*)

December 2023

- Investigated the heightened immunity of children in comparison to elderly cohort through an in-depth analysis of a COVID-19 dataset. Aiming to comprehend the dynamics of COVID-19 and provide crucial insights for public health strategies.
- Utilized a range of machine learning tools, including unsupervised and supervised models, for classification and prediction of final cohorts based on antibody and Fc-Receptor features in the R programming language.
- Utilized PCA to distinguish healthy age groups and differentiate individuals in the patient cohort, integrating clustering methods (k-means, k-means++, GMM) for segmentation based on inherent similarities, coupled with decision tree and random forest models to predict sample cohorts and identify critical features separating healthy individuals from patients.

### Machine Learning Analysis of RNA Seq Data in Breast and Ovarian Cancers (*BIOINF 527 Course Project*)

December 2023

- Conducted a meta-data analysis on a RNA seq data utilizing Machine Learning techniques, encompassing unsupervised models like PCA, t-SNE, UMAP, k-means, and k-means++, alongside supervised models including decision trees and random forest models, to classify and predict sample cohorts effectively.
- Identified pivotal genes crucial for distinguishing samples afflicted with breast cancer from those with ovarian cancer.
- Collaborated with three lab mates to produce an official report summarizing findings, subsequently presented in a seminar setting.

### Medical Equipment and Instrumentation Laboratory (*BIOMEDE 458 Course Project*)

December 2019

- Designed signal conditioning circuits and LabVIEW files for developing of medical products such as spirometry, ECG, and pulse oximeter.
- Measured and collected data and performed statistical analysis on human data subjects using Python and MATLAB.
- Collaborated in a group with three members to hold different projects and provided official reports.

### Mechanistic Modeling of HIV/Aids (*MATH 463 Course Project*)

December 2019

- Researched previous models and developed a new differential equations model for a treatment method against HIV.
- Validate the model by performing statistical analysis using MATLAB and presented in a seminar.

### Mechanistic Modeling of Lipid Oxidation/ Synthesis Pathway (*BIOMEDE 418 Course Project*)

December 2019

- Developed a new model for nutrient-sensing signaling pathway in the nucleus of hepatocytes.
  - Identified the most sensitive parameters on synthesis and oxidation of lipids using data-driven models and performed sensitivity analysis in MATLAB.
- Investigated the effect of adding fenofibric acid as a drug for treating obesity.