Christian O. Bernal Zelaya

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Education

Expected Period	**September 2023 — 2028**	
Expected Degree	**Doctor of Philosophy (Ph.D.) in Statistics**	
Current GPA	**3.925**	
University	**University of California, Irvine**	California, USA

Expected Period	**September 2023 — June 2025**	
Expected Degree	**Masters of Science (M.S.) in Statistics**	
Current GPA	**3.925**	
University	**University of California, Irvine**	California, USA

Period	**August 2019 — May 2023**	
Degree	**Bachelor of Science (B.S.) in Mathematics**	
Concentration	**Applied Mathematics**	
Concentration	**Statistics**	
Minor	**Computer Science**	
GPA	**3.42**	
University	**California State University, Bakersfield**	California, USA

Research Projects

Period	**Aug 2023 — Present**	
Mentor	**Dr. Volodymyr M. Minin**	University of California, Irvine
Title	**Forecasting and nowcasting health care demand by integrating hospitalization and wastewater surveillance data**	

Creating an ODE based Bayesian semiparametric model that forecasts hospitalizations caused by COVID-19, with the ability to nowcast. The model is informed by hospitalization data and wastewater surveillance data. The model is created in JULIA, with a software package associated with it called UCIWWEIHR, https://cbernalz.github.io/UCIWWEIHR.jl/dev/. Various innovative strategies for selecting priors on specific parameters were employed. A manuscript is currently being prepared for submission, with this forming the first chapter of my dissertation.

Period	**June 2024 — January 2025**	
Mentor	**Dr. Dylan Morris & Dr. Kaitlyn Johnson**	CDC's Center for Forecast & Outbreak Analytics
Title	**Assessing the value of spatial components in a wastewater-informed epidemiological inference model**	

Expanding an existing wastewater-informed model that forecasts hospital admissions by adding spatial correlations. This was done to assess the value to including these spatial correlations that occurred at the wastewater treatment plant level. Model was made in R and STAN, with a software package associated with it, https://cdcgov.github.io/ww-inference-model/. PYTHON exposure occurred on a regular basis. A manuscript is currently being prepared for submission.

Period	**Aug 2023 — Sep 2023**	
Mentor	**Dr. Volodymyr M. Minin**	University of California, Irvine
Title	**COVID-19 Probabalistic Forecast Model Evaluations**	

Investigating COVID-19 probabalistic forecasting models by visualizing evaluation metrics in several ways. Project is the foundations for a potential dissertation portion where one of the goals is to impove the probabalistic forecasting by adding a spatial component.

Period	**March 2022 — Aug 2023**
Mentor	**Dr. Brian Ryals** California State University, Bakersfield
Title	**Disease Modeling Using Complex Graphs**

This project involves using MATLAB to create a simulation of SIR model for diseases. Several attributes are saved from each simulation made, which led to several hundred thousand rows of data that was analyzed adequately. One major aspect of this study was to investigate different vaccination strategies. A manuscript was put together, but never submitted due to graduating from institution.

Period	**Sep 2022 — Aug 2023**
Mentor	**Dr. Bilin Zeng** California State University, Bakersfield
Title	**Statistical Analysis of Neuroimaging**

Working with a statistics professor to look at MRI data, specifically patients with Alzheimer and ADHD. The project is done using R-Studio.

Period	**May 2022 — July 2022**
Mentor	**Dr. Sumona Mondal** Clarkson University
Title	**Using Comorbidities, Demographic, and Socioeconomic Data to Predict Onset of Rheumatoid Arthritis**

This position was with Clarkson University's REU program. Involved researching and reading papers about Rheumatoid Arthritis,RA. With this information we figured out variables that might have some affect toward RA. These variables were visualized using R-Studio and then tested for significance. A seemingly new strategy for sampling a dataset was created during this project.

Period	**March 2022 — May 2022**
Mentor	**Dr. Eduardo Montoya** California State University, Bakersfield
Title	**Educational Research for Intro to Statistical Concepts Course**

This was an educational research project that involved looking through several journals and case studies for papers that had data pertaining to certain areas. This data would then be used in the creation of problems for an Intro to Statistical Concepts course.

Period	**May 2020 — August 2021**
Mentor	**Dr. Prosper Torsu** California State University, Bakersfield
Title	**An Iterative Method For Solving Elliptic BVP In One-Dimension**

This project involves a decomposition method for solving elliptic boundary value problems in one-dimension. Which is an improvement to an existing technique for approximating elliptic systems. The project initiated prior to the quarantine, so progress was slow, but eventually a paper was submitted to be published.

Period	**June 2019 — July 2019**
Mentor	**Dr. Prosper Torsu** California State University, Bakersfield
Title	**Reservoir Simulation and Optimization of Well Placement**

This project involved creating a simulation with MATLAB. The simulation was then used to find the best placement of oil extractors. This was then presented in a poster presentation.

Publications/Manuscripts Under Preparation

Projected Submission	**August 2025**
Title	**Forecasting and nowcasting health care demand by integrating hospitalization and wastewater surveillance data**

Completed	**August 2021**
Archived	**October 2024** https://arxiv.org/abs/2410.06276
Title	**An Iterative Method For Solving Elliptic BVP In One-Dimension**

Presentations

Organization	**WNAR 2025**	Western North American Region of The International Biometric Society
Presentation Title	**Forecasting healthcare utilization using wastewater surveillance data.**	
Awards	**OUTSTANDING ORAL PRESENTATION AWARD**	
Organization	**CDPH CalCAT**	California Department of Public Health
Presentation Title	**Tutorial on UCIWWEIHR JULIA package.**	
Organization	**Department of Mathematics Seminar**	California State University, Bakersfield
Presentation Title	**Assessing the value of spatial components in a wastewater-informed epidemiological inference model & Forecasting and nowcasting health care demand by integrating hospitalization and wastewater surveillance data**	
Organization	**Internship Capstone Presentation**	CDC's Center for Forecasting & Outbreak Analytics
Presentation Title	**Assessing the value of spatial components in a wastewater-informed epidemiological inference model**	
Organization	**CDPH CalCAT Update**	California Department of Public Health
Presentation Title	**Forecasting and nowcasting health care demand by integrating hospitalization and wastewater surveillance data**	
Organization	**Competitive Edge**	University of California, Irvine
Presentation Title	**COVID-19 Probabalistic Forecast Models**	
Organization	**Student Poster Presentation**	California State University, Bakersfield
Presentation Title	**Disease Modeling Using Complex Graphs**	
Organization	**Student Research Competition 2023**	California State University, Bakersfield
Presentation Title	**Disease Modeling Using Complex Graphs**	
Organization	**Department of Mathematics Seminar**	California State University, Bakersfield
Presentation Title	**Disease Modeling Using Complex Graphs**	
Organization	**Department of Mathematics Seminar**	California State University, Bakersfield
Presentation Title	**Data-Centric Approach to Rheumatoid Arthritis: Exploring Fatty Acid Contribution to Infection**	
Organization	**REU Presentation**	Clarkson University
Presentation Title	**Data-Centric Approach to Rheumatoid Arthritis: Exploring Fatty Acid Contribution to Infection**	
Organization	**Senior Seminar**	California State University, Bakersfield
Presentation Title	**Presentation of Kellner C. Bernd's paper Power-Sum Denominators**	
Organization	**Senior Seminar**	California State University, Bakersfield
Presentation Title	**Critique of California State University, Bakersfield's General Education Curriculum**	
Organization	**Senior Seminar**	California State University, Bakersfield
Presentation Title	**Lecture on Stochastic Process**	
Organization	**Chevron Revs-Up Poster Presentation**	California State University, Bakersfield
Presentation Title	**Reservoir Simulation and Optimization of Well Placement**	

Teaching Experience

Period	**September 2023 — July 2025**
Employer	**University of California, Irvine**
Job Title	**Teaching Assistant**
Period	**January 2023 — August 2023**
Employer	**Panama Buena Vista Union School District**
Job Title	**Substitute Teacher**
Period	**December 2022 — August 2023**
Employer	**Paper Co.**
Job Title	**Science Tutor**
Period	**June 2023 — August 2023**
Employer	**California State University, Bakersfield**
Job Title	**Summer Session Mathematics Tutor**
Period	**June 2022 — May 2023**
Employer	**California State University, Bakersfield**
Job Title	**Facilitator/Course Instructor**
Period	**May 2022 — May 2023**
Employer	**California State University, Bakersfield**
Job Title	**Lead Mathematics Tutor**
Period	**August 2019 — August 2022**
Employer	**California State University, Bakersfield**
Job Title	**Mathematics Tutor**
Period	**August 2019 — December 2019, February 2022 — August 2022**
Employer	**Kern High School District**
Job Title	**AVID Tutor**

Prior Employment

Period	**June 2024 — September 2024**
Employer	**CDC's Center for Forecast and Outbreak Analytics**
Job Title	**Summer Data Scientist Internship**

Awards/Scholarships/Organizations Part Of/Grants

U.S. National Science Foundation Graduate Research Fellowship Program (NSF GRFP) Fellow [2025 - present]
Outstanding Oral Presentation Award at WNAR 2025
UC Irvine Department of Statistics Travel Award
UC Irvine Department of Statistics Technology Award
UC Irvine Diversity Recruitment Fellowship
Outstanding Graduating Senior in Mathematics at California State University, Bakersfield
Roadrunner Society at California State University, Bakersfield
Student Research Scholars at California State University, Bakersfield
Louis Stokes Alliances for Minority Participation (LSAMP)
Kern Community Foundation Scholarship
Pell Grant 1
Cal B Grant
Educational Opportunity Program (EOP)

Extracurricular Activities/Workshops

President of Mathematics Club at California State University, Bakersfield
Preliminary Arizona Winter School 2022: Heights and Model Theory

Programming Languages

R	**Python**	**C/C++**
STAN	**JULIA**	**JAGS**

Softwares Used

MATLAB	**R-Studio**	**Latex**	**Jupyter Notebook**
SAS	**SPSS**	**Microsoft Office**	**Minitab**