IVAN RAMIREZ ZUNIGA

Citizenship **United States** @ **ivanrazu@gmail.com**

SUMMARY

Applied mathematician with over 10 years of teaching experience in higher education. Strong research experience building and studying data-driven mathematical models in the overlap of immunology and infectious diseases. Experience with statistical and data analysis of human and animal data.

EDUCATION

University of Pittsburgh

Ph.D., Mathematics

2020

Thesis: “Mathematical Modeling of Energy Consumption in the Acute Inflammatory Response”
Advisors: Dr. Jonathan E. Rubin and Dr. David. Swigon

East Tennessee State University

MS., Mathematics

2014

Thesis: “Mathematical Modeling of Immune Responses to Hepatitis C Virus Infection” .
Advisor: Dr. Ariel Cintrón-Arias.

University of Costa Rica

B.S, Mathematics

2010

SKILLS AND TOOLS

Teaching | Communication | Scientific Research | Modeling | Data Analysis | Mathematical Analysis | Parameter Estimation | Matlab Programming | Python | R | Statistics | Machine Learning | Mac/Windows | LaTeX Typesetting | English/Spanish | Microsoft Office | XPP-Aut | Maple | Wolfram Mathematica

CERTIFICATIONS

- HIPAA, Privacy Rule (PA), UTHSC (2023).
- HIPAA, Violations and Penalties, UTHSC(2022).
- Diversity Certificate Program, UTHSC (2021).
- Erdos Data Science Boot Camp, The Erdos Institute (2021).

AWARDS

- Diversity Supplement (AI139088), 2020-2023, NIH/NIAID Program Project Award (R01), PI: Dr. Amber Smith.
- Andrew Mellon Predoctoral Fellowship, University of Pittsburgh, 2019-2020. These are competitive fellowships that are awarded to students of exceptional promise and ability who are enrolled in programs leading to the PhD in various fields of the humanities, natural sciences, and social sciences.
- Arts and Sciences Graduate Fellowship, University of Pittsburgh, 2014-2015. These fellowships are used to recruit doctoral students of exceptional promise and ability either when they first enroll in the PhD program or for later years.

RESEARCH INTERESTS

Mathematical biology, mathematical immunology and immunometabolism, mathematical modeling of infectious diseases and inflammatory response, epidemiology, population dynamics, parameter estimation, optimal control, uncertainty quantification, data science and machine learning.

EXPERIENCE

Consulting Services

2022-Present

- Research consulting services to the School of Public Health, Boston University. Performed data cleaning, interpretation, statistical analysis, and mathematical modeling. Methods: Numerical simulations, statistic models, t-tests, ANOVA, linear and multiple regression, linear mixed-effects regression, generalized additive models, and probabilistic modeling.

Postdoctoral Scholar

Department of Pediatrics, University of Tennessee Health Science Center

September 2020 – 2023

- Developed mathematical models of influenza virus as a primary infection as wells as bacterial co-infection. Methods: delayed differential equations, ordinary differential equations, mechanistic modeling, parameter estimation, bootstrap, numerical simulations.
- Performed data cleaning and data analysis of metabolomics data from viral infected and coinfected mice. Methods: numerical simulations, statistic models, t-tests, ANOVA, principal components, linear and multiple regression, hierarchical clustering, classification algorithms.

Instructor/Teaching Assistant

Department of Mathematics, University of Pittsburgh.

2014 – 2020

Prepared lectures, wrote and graded exams, homework, and quizzes. Held weekly office hours. Online teaching and course organization with canvas and blackboard. Group size: 25 students.
Courses Taught as Instructor:

- MATH 0120 Business Calculus, Summer 2019.
- MATH 0240 Calculus III, Summer 2018.
- MATH 0230 Calculus II, Summer 2017.
- MATH 0290 Differential Equations, Summer 2015.

Courses Taught as Teaching Assistant:

- MATH 0031 Algebra, Summer 2020.
- MATH 0450 Introduction to Analysis (Honors), Spring 2019.
- MATH 0220 Calculus I, Fall 2015, Spring 2017, Fall 2018.
- MATH 0230 Calculus II, Fall 2015, Fall 2016, Fall 2018 .
- MATH 0290 Differential Equations, Spring 2018.
- MATH 1360 Math Modeling, Fall 2016.
- MATH 0240 Calculus III, Summer 2016.
- MATH 0280 Introduction to matrices and Linear Algebra, Spring 2016.

Instructor/Teaching Assistant

Department of Mathematics, East Tennessee State University.

2013 – 2014

Prepared lectures, wrote and graded exams, homework, and quizzes. Held weekly office hours. Online teaching and course organization with blackboard. Group size: 25 students.
Courses Taught as Instructor:

- MATH 1920 Calculus II, Spring 2014, Summer 2014.
- MATH 1910 Calculus I, Fall 2013.

Courses Taught as Teaching Assistant:

- MATH 1920 Calculus II, Summer 2014.

Instructor

Department of Mathematics, Universidad de Costa Rica

2009 – 2012

Prepared lectures, graded exams, homework, and quizzes. Held weekly office hours. Course organization with moodle.
Group size: 35 students.
Courses Taught:

- MA 1005 Differential Equations, Spring 2011, Spring 2012, Fall 2012.

- MA 2210 Applied differential equations, Fall 2011, Fall 2012.
- MA 0230 Calculus for Economics, Fall 2011.
- MA 1001 Calculus I, Spring 2009, Spring 2010.
- MA 1002 Calculus II, Fall 2009, Fall 2010.
- MA 1004 Linear Algebra, Spring 2009, Spring 2010.

Instructor

Colegio Cientifico Costarricense (STEM high school)

2010 – 2012

Prepared lectures, graded exams, homework, and quizzes. Group size: 30 students.
Courses Taught:

- MA 0125 Precalculus.
- MA 1001 Calculus I.
- Math Reasoning.

PUBLICATIONS

- A.P. Smith, L.C. Lane, I. Ramirez-Zuniga, D.J. Moquin, P. Vogel, A.M. Smith (2022). Increased Virus Dissemination Leads to Enhanced Lung Injury But Not Inflammation During Influenza-Associated Secondary Bacterial Infection.FEMS Microbes, Volume 3, (2022).
- I. Ramirez Zuniga, Jonathan E. Rubin, David Swigon, Gilles Clermont, and Heinz Redl. A data-driven model of the role of energy in sepsis. Journal of Theoretical Biology. Volume 533, (2022).
- I. Ramirez Zuniga. Mathematical modeling of energy consumption in the acute inflammatory response during sepsis. Doctoral Dissertation, University of Pittsburgh, (2020).
- I. Ramirez Zuniga, Jonathan E. Rubin, David Swigon, and Gilles Clermont. Mathematical Modeling of Energy Consumption in the Acute Inflammatory Response. Journal of Theoretical Biology, 460. 101-114, (2019).
- R. Brady, C. Puelz, I. Ramirez Zuniga, K. Larripa, M.S. Olufsen (2017). “A coupled model exploring the cardiovascular response to an acute inflammatory event.” Proc 5th Int Conf Comp Math Biomed Eng (CMBE), Vol 1, 336-339.
- I. Ramirez Zuniga. (2014). “Mathematical Modeling of Immune Responses to Hepatitis C Virus Infection.” Electronic Theses and Dissertations. Paper 2425.

PRESENTATIONS

- Talk: “ Modeling the Dynamics of Alveolar Macrophages and Interferon Gamma During Influenza Infection ”. SIAM conference on applications of dynamical systems (DS23), Portland OR, May 2023.
- Poster presentation: ”Sequential interactions between RSV and pneumococcus in the nasopharynx of Zambian infants and mothers”. ReSViNET Conference, Lisbon Portugal, Feb 2023.
- Talk: ”Modeling the Energy Consumption During An Acute Inflammatory Response and Sepsis”. SIAM conference on the life sciences (LS22) (virtual), July 2022.
- Talk: “A Data-driven Mathematical Study of the Role of Energy in Sepsis”. Society for Mathematical Biology (SMB21) (virtual), June 2021.
- Talk: “A Data-driven Mathematical Study of the Role of Energy in Sepsis”. SIAM conference on the life sciences (DS21) (virtual), May 2021.
- Talk: “A Data-driven Mathematical Study of the Role of Energy in Sepsis” at the Joint Mathematics Meetings (JMM), Denver CO, January 2020.
- Poster presentation: “A Data-driven Mathematical Study of the Role of Energy in Sepsis” at the workshop :Summit on the Rules of Life at The Mathematical Biosciences Institute (MBI), Columbus OH, June 2019.
- Talk: “Mathematical Modeling of Energy Consumption in the Acute Inflammatory Response” at the Biology and Medicine Through Mathematics Conference (BAMM), Virginia Commonwealth University, Richmond VA, May 2019.
- Talk: “Mathematical Modeling of Energy Consumption in the Acute Inflammatory Response” at the AMS Microconference on Parameter Estimation at the Marriot City Center, Minneapolis MN, August 2018.
- Talk: “Mathematical Modeling of Energy Consumption in the Acute Inflammatory Response”. SIAM conference on the life sciences (LS18) at the Radisson Blu Minneapolis, Minneapolis MN, August 2018.
- Poster presentation: “Mathematical Modeling of Energy Consumption in the Acute Inflammatory Response”. at the workshop : Research training group in mathematical biology “Parameter Estimation for Mechanistic Biological Models”. NC State University, Raleigh NC, July 2018.
- Poster presentation: “Mathematical Modeling of Energy Consumption in the Acute Inflammatory Response” at the workshop :Host-pathogens dynamics at The Mathematical Biosciences Institute (MBI), Columbus OH, February 2018.

- Poster presentation: “Mathematical Modeling of Energy Consumption in the Acute Inflammatory Response” at the SIAM Conference on the Life Sciences 2016, Boston, MA July 2016.
- Talk: “Sensitivity Analysis and optimal Control Treatment of Hepatitis C Virus Dynamics” at the Appalachian Student Research Forum 2014. East Tennessee State University, April 2014, Johnson City, TN.
- Poster presentation: “Proyecto 6x4 UEALC”at the Week of Methods to Reduce Dimension in Data Analysis at Centro de Investigaciones Matematicas , CIMAT, Guanajuato, Mexico.

ATTENDED CONFERENCES AND WORKSHOPS

- **Conference**: (Virtual) 5th Workshop on Viral Dynamics, October, 2021.
- **Conference**: (Virtual) Society for Mathematical Biology, Annual Meeting and Conference, June 2021.
- **Conference**: Joint Mathematics Meeting 2020, Denver CO, January 2020.
- **Workshop**: Summit on the Rules of Life at The Mathematical Biosciences Institute (MBI), Columbus OH, June 2019.
- **Conference**: Biology and Medicine Through Mathematics Conference (BAMM), Virginia Commonwealth University, Richmond VA, May 2019.
- **Conference**: Joint Mathematics Meetings (JMM), Baltimore MD, January 2019.
- **Micro-conference**: AMS Microconference on Parameter Estimation at the Marriot City Center, Minneapolis MN, August 2018.
- **Conference**: SIAM, Life sciences (LS18) at the Radisson Blu Minneapolis, Minneapolis MN, August 2018.
- **Workshop**: Research training group in mathematical biology “Parameter Estimation for Mechanistic Biological Models”. NC State University, Raleigh NC, July 2018.
- **Workshop**: Host-pathogens dynamics at The Mathematical Biosciences Institute (MBI),Columbus OH, February 2018.
- **Conference**: Parameter Estimation and Uncertainty Quantification for Dynamical Systems, University of Pittsburgh, Pittsburgh PA, March 2017
- **Conference**: SIAM, Life Sciences 2016, Boston, MA July 2016.
- **Workshop**: Mathematics Research Communities - Mathematics in Physiology and Medicine, Snowbird Utah, June 2016.
- **Summer School**: “The Joint 2015 CAMBAM-MBI-NIMBioS” in Nonlinear Dynamics in Biological Systems at McGill University, Montreal, June 2015.
- **Workshop**: “Parameter Estimation for Dynamic Biological Models” at NIMBioS, May 2014.
- **Conference**: SEARCDE 2013, University of Tennessee, Knoxville, TN, September 2013.
- **Conference**: Society for Mathematical Biology Annual Meeting and Conference, Knoxville, TN 2012.
- **Summer School**: Math Schools for Latin America and the Caribbean, EMALCA, organized by University of Costa Rica, 2012.
- **Conference**: International Symposium of Applied Methods on Sciences, SIMAC, organized by University of Costa Rica, 2012.
- **Conference**: International Symposium of Applied Methods on Sciences, SIMAC, organized by University of Costa Rica, 2008.
- **Conference**: International Symposium of Applied Methods on Sciences, SIMAC, organized by University of Costa Rica, 2006.