

# Mario Banuelos

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## EDUCATION

### **Ph.D., Applied Mathematics, 2018**

University of California, Merced  
Research Advisor: Prof. Suzanne Sindi

### **Preliminary Mathematics Teaching Credential, 2013**

California State University, Bakersfield, 2013

### **B.A., Mathematics, *magna cum laude*, 2012**

California State University, Fresno, 2012  
Obtained minor in History

## CURRENT AND FORMER POSITIONS

- **Assistant Professor**, Mathematics, College of Science and Mathematics, California State University, Fresno, 2018 - *Present*
- **Post-Doctoral Researcher**, Mathematical Sciences Research Institute - Undergraduate Program (MSRI-UP) in Mathematical Data Science, Summer 2018
- **Genomics Graduate Intern**, Joint Genome Institute and University of California, Merced, Summer 2017

## RESEARCH INTERESTS

Biostatistics, Genome Evolution in Populations, Optimization Methods in Computational Biology, Data Science, including

- Implementing and developing statistical and optimization methods to model and detect structural variations in genomic data of related individuals.
- Developing and applying machine learning methods for arbitrary architectures with applications in signal reconstruction of data corrupted by noise.

## TEACHING INTERESTS

Applied Statistical Methods, Linear Algebra, Bioinformatics, Mathematical Biology, Machine Learning and Data Science

## TEACHING EXPERIENCE

### **Assistant Professor, California State University, Fresno**

Fall 2018 Elementary Statistics, Exploring Statistics

### **Teaching Assistant, University of California, Merced**

Spring 2015-16/Fall 2016 Complex Analysis

Fall 2014, 2015 Linear Analysis

Fall 2013/Spring 2014 Calculus II for Physical Sciences and Engineering

Summer 2013 Calculus I

### **Mathematics Teacher, Robert F. Kennedy High School,**

Fall 2012/Spring 2013 Algebra I, California High School Exit Exam Math

## PROFESSIONAL DEVELOPMENT AND OUTREACH

Fall 2017-Present *BiotaQ Program Leadership*

Serving in a leadership position for this program, which focuses on developing Next Generation Science Standards (NGSS) STEM modules for secondary education. Both graduate and undergraduate students then deliver these after-school modules to Merced high school students.

June 2016-2018 *DESCARTES Scholars Program Mentor*

Serving as a mentor for Applied Math Majors in this NSF-sponsored program to prepare students with the necessary tools to succeed in computational and data-enabled science careers.

June 2015-2016 *DESCARTES Teacher Scholars Program*

Assisted in workshops for high school math teachers gaining experience with computational tools in Matlab and discussing opportunities for students in data science.

Spring 2015/18 *Latinx in Mathematical Sciences Conference (hosted by IPAM)*

Organized a group of first-generation undergraduate students to attend and gain exposure to opportunities in graduate school, academia, industry, and government.

## HONORS AND AWARDS

- 2017-2018 UC Merced Fletcher Jones Fellowship Recipient
- Honorable Mention - Ford Foundation Dissertation Fellowship 2017
- Certificates in General Pedagogy:
  - *Developing Teaching Strategies and Improving Teaching by Assessing Learning*, May 2015

- *Mastering the Classroom with 1st Generation College Students*, February 2015
- Certificate in Undergraduate Learning Outcomes Assessment: Pedagogy and Program Planning, May 2014
- SACNAS 2015 Best Graduate Oral Presentation in Applied Mathematics, Oct. 2015
- *Gates Millennium Scholar*, August 2008 – August 2018
- *CSUB Edvention Fellow*, September 2012 – September 2013

## PUBLICATIONS

- M. Banuelos, S. Sindi, *Modeling Transposable Element Dynamics with Fragmentation Equations*, Mathematical Biosciences, 2018.
- M. Banuelos, S.Sindi, and R. F. Marcia, *Structural variant prediction in extended pedigrees through sparse negative binomial genome signal recovery*, Proceedings of 2018 International Conference of the IEEE Engineering in Medicine and Biology Society.
- M. Banuelos, S.Sindi, and R. F. Marcia, *Negative binomial optimization for biomedical structural variant signal reconstruction*, Proc. of 2018 IEEE International Conference on Acoustics, Speech and Signal Processing.
- M. Banuelos, L. Adhikari, R. Almanza, A. Fujikawa, J. Sahagún, K. Sanderson, M. Spence, S. Sindi, and R. Marcia, *Sparse diploid spatial biosignal recovery for genomic variation detection*, Proc. of the 2017 IEEE International Symposium on Medical Measurements and Applications (MeMeA).\*
- M. Banuelos, L. Adhikari, R. Almanza, A. Fujikawa, J. Sahagún, K. Sanderson, M. Spence, S. Sindi, and R. Marcia, *Nonconvex regularization for sparse genomic variant signal detection*, Proc. of the 2017 IEEE International Symposium on MeMeA.\*
- M. Banuelos, R. Almanza, L. Adhikari, S. Sindi, and R. Marcia, *Biomedical signal recovery: genomic variant detection in family lineages*, Proc. of the IEEE 5th Portuguese Meeting on Bioengineering.
- M. Banuelos, R. Almanza, L. Adhikari, S. Sindi, and R. Marcia, *Constrained Variant Detection with SPaRC: Sparsity, Parental Relatedness, and Coverage*, Proc. of the 2016 International Conference of the IEEE Engineering in Medicine and Biology Society.
- M. Banuelos, R. Almanza, L. Adhikari, S. Sindi, and R. Marcia, *Sparse genomic structural variant detection: exploiting parent-child relatedness for signal recovery*, Proc. of the 2016 IEEE Workshop on Statistical Signal Processing.
- M. Banuelos, R. Almanza, L. Adhikari, S.Sindi, and R. Marcia, *Sparse signal recovery methods for variant detection in next-generation sequencing data*, Proc. of the 2016 IEEE International Conference on Acoustics, Speech and Signal Processing.

\* Indicates work done with Research Experiences for Undergraduates (REU) students at University of California, Merced supported by NSF Grant DMS 1359484.

## PRESENTATIONS

### *Contributed Talks*

- July 2016 M. Banuelos, R. Almanza, L. Adhikari, S.Sindi, and R. Marcia, *Leveraging Sparsity To Detect Structural Variants in Genomic Data*, 2016 SIAM Conference on the Life Sciences, Boston, MA
- Oct. 2015 M. Banuelos, S. Sindi, *Modeling Size Distribution of Transposable Elements with Fragmentation Equations*, 2015 SACNAS National Conference, Washington, DC
- July 2015 M. Banuelos, S. Sindi, *Modeling Size Distribution of Transposable Elements with Fragmentation Equations*, 2015 Annual Meeting for the Society of Mathematical Biology, Atlanta, GA
- Oct. 2014 M. Banuelos, *Student Self-Assessment as a Learning Tool in Calculus*, UCSC Assessment Symposium, Santa Cruz, CA

### *Poster Presentations*

- Aug. 2018 M. Banuelos, S. Sindi, and R. Marcia, *Constrained Optimization Methods for Detecting Related and Rare Genomic Rearrangements*, 2018 International Congress of Mathematicians (ICM), Rio de Janeiro, Brazil
- Nov. 2017 M. Banuelos, R. Almanza, L. Adhikari, S. Sindi, and R. Marcia, *Genetic Variants Over Generations: Sparsity-Constrained Optimization Tools for Structural Variant Detection*, 2017 Genome Informatics, Cold Spring Harbor, NY
- Apr. 2016 M. Banuelos, R. Almanza, L. Adhikari, S.Sindi, and R. Marcia, *Predicting Structural Variants In Genomic Data Using Sparsity and Relatedness Constraints*, Research in Computational Molecular Biology (RECOMB).
- Mar. 2015 M. Banuelos, S.Sindi, *Modeling the Size Distribution of Transposable Elements with Discrete and Continuous Fragmentation Equations*, 2015 UC Merced Research Week.

## AFFILIATIONS

- Society for Industrial and Applied Mathematics (**SIAM**), Institute of Electrical and Electronics Engineers (**IEEE**), Society for Advancement of Chicanos/Hispanics and Native Americans in Sciences (**SACNAS**), Society of Mathematical Biology (**SMB**)