Bhaven A. Mistry

CONTACT
INFORMATION

Doctoral Candidate
Department of Biomathematics
University of California, Los Angeles
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RESEARCH
INTERESTS

Stochastic and nonlinear dynamic models of biological systems: mathematical biology; HIV infection; molecular evolution; chromosome folding; polymer physics; molecular dynamics simulation; physics of biological assays; biological swarms; mechanistic home-range analysis; support vector machines; image processing; 3D computer graphics modeling.

EDUCATION

University of California at Los Angeles, Los Angeles, CA

Ph.D., Biomathematics, Expected August 2019
- Thesis Topic: *Stochastic Physics of Biological Assays and Improved Inference*
- Adviser: Professor Tom Chou
- Area of Study: Mathematical Biology, HIV Infection, Stochastic Processes, Physics of Biological Assays, Molecular Evolution, Polymer Physics, Molecular Dynamics Simulation

M.S., Biomathematics, February 2015

California State University at Northridge, Northridge, CA

M.S., Mathematics, August 2013
- Thesis Title: *Noise Induced State Transitions in 2D Interacting, Self-Propelled Particle Systems*
- Adviser: Professor Maria-Rita D'Orsogna
- Area of Study: Nonlinear Dynamic Systems, Numerical Analysis, Stochastic Processes

M.S., Electrical Engineering, December 2011
- Thesis Title: *Multicategory Support Vector Machines in the Primal*
- Adviser: Professor Xiyi Hang
- Area of Study: Machine Learning, Digital Signal Processing, Control Theory

University of California at San Diego, La Jolla, CA

B.A., Applied Mathematics, June 2005
- Emphasis on Computer Science and 3D Graphics Modelling

PAPERS IN
PREPARATION

[1] Mistry, B.A., D'Orsogna, M.R., Chou, T. Statistical Dynamics of Molecular Evolution and its Role in Systematic Evolution of Ligands by Exponential Enrichment (SELEX)

REFEREED
JOURNAL
PUBLICATIONS

[2] Mistry, B.A., Chou, T. Nonspecific Probe Binding and Automatic Gating in Flow Cytometry and Fluorescence Activated Cell Sorting (FACS) *Mathematical Biosciences and Engineering.* 16(5): 4477–4490 2018.
doi:10.3934/mbe.2019223

[3] Mistry, B.A., D'Orsogna, M.R., Chou, T. The Effects of Statistical Multiplicity of Infection on Virus Quantification and Infectivity Assays. *Biophysical Journal.* 114(12):2974–2985. 2018.
doi:10.1016/j.bpj.2018.05.005

[4] Mistry, B., D'Orsogna, M.R., Webb, N.E., Lee, B., and Chou, T. Quantifying Sensitivity of HIV-1 Viral Entry to Receptor and Coreceptor Expression through Kinetic Models. *Journal of Physical Chemistry B.* 120(26):6189–6199. 2016.
doi:10.1021/acs.jpcb.6b02102

CONFERENCE PRESENTATIONS

[1] *Southern California Applied Mathematics Symposium*, April 27, 2019. Oral Presentation.

[2] *American Physical Society March Meeting*, March 4–8, 2019. Oral presentation.

[3] *8th Annual Southern California Systems Biology Conference*, February 9, 2019. Poster presentation.

[4] *4rd Annual Quantitative and Computational Biosciences Retreat*, September 25, 2018. Poster presentation.

[5] *11th Annual International Conference on Systems Biology of Human Diseases*, June 4–6, 2018. Poster presentation.

[6] *American Physical Society March Meeting*, March 5–9, 2018. Poster presentation.

[7] *Biophysical Society 62nd Annual Meeting*, February 17–21, 2018. Poster presentation.

[8] *3rd Annual Quantitative and Computational Biosciences Retreat*, September 26, 2017. Poster presentation.

[9] *7th Annual Southern California Systems Biology Conference*, January 28, 2017. Oral presentation.

[10] *Gordon Research Conference: Stochastic Physics in Biology*, January 8–13, 2017. Poster presentation.

[11] *2nd Annual Quantitative and Computational Biosciences Retreat*, September 20, 2016. Oral presentation.

[12] *10th European Conference on Mathematical and Theoretical Biology and SMB Annual Meeting*, July 11–15, 2016. Poster presentation.

[13] *Southern California Applied Mathematics Symposium 2016*, June 4, 2016. Poster presentation.

[14] *Biology and Medicine through Mathematics Conference*, May 20–22, 2016. Poster presentation.

[15] *Multiscale Modeling and Validation in Medicine and Biology III*, February 25–26, 2016. Poster presentation.

TEACHING EXPERIENCE

University of California at Los Angeles, Los Angeles, CA

Teaching Fellow   **September 2017 to June 2019**

- CLUSTER 70A: Cosmos and Life
  - Fall 2017, Fall 2018
  - Responsible for two 2-hour discussion sections on topics including the Big Bang, the expansion of the universe, special and general relativity, the life cycle of a star, planetary science, and geology.
  - Sample student evaluations available upon request.
- CLUSTER 70B: Cosmos and Life
  - Winter 2018, Winter 2019
  - Responsible for two 2-hours discussion sections on topics including geological dating, evolutionary biology, paleontology, ecology, and phylogeny.
  - Sample student evaluations available upon request.
- CLUSTER 70CW: Cosmos and Life Seminar Series: Infinite Complexity and Chaos
  - Spring 2018, Spring 2019
  - Designed and instructed a 3 hour weekly seminar series on various high level mathematical concepts taught in layman's terms. The learning goals of the course were to expose non-STEM oriented students to ideas and pathologies in mathematics which would typically be missing from their college education, and to teach them pedagogical writing and presentation skills. Topics included introductions to the hierarchy of infinities, imaginary numbers, topology, analytic continuation, chaos theory, cryptography, and variational approaches to real world problem. One lecture is dedicated to the prevalence, but further need of women and diversity in STEM related fields.
  - Sample student evaluations available upon request.

California State University at Northridge, Northridge, CA

Guest Lecturer   September 2016
- MATH 493: Undergraduate Seminar in Mathematics
  – Presented my research on mathematical modeling of the dynamics of HIV infection of a single cell. Included a thorough explanation of the biology of retroviral infection, compartmental modeling, equilibrium dynamical systems, and nonlinear regression. The underlying theme of the talk was the the usefulness of mathematical modeling in systems biology.

Teaching Assistant   September 2012 to May 2013
- MATH 102L: College Algebra Lab
  – Spring 2013
  – Responsible for 1-hour supervision of laboratory where students work on and discuss functions, linear equations, quadratic equations, inequalities, probability, and determinants.
- MATH 103L: Mathematics Models for Business Lab
  – Fall 2012
  – Responsible for 1-hour supervision of laboratory where students work on and discuss algebra, geometry, and calculus applications in business.

Upward Bound STEM Instructor   February 2011 to July 2012
- Upward Bound Summer Session: Calculus
  – Summer 2011, Summer 2012
  – An introductory course in limits, derivatives, integrals, the Fundamental Theorem of Calculus, and their applications.
- Upward Bound Summer Session: Imagine Mars
  – Summer 2011
  – Students were to envision a colony on Mars by performing various science and art projects.
  – Projects included building a hydroponic garden, creating 3D models of the colony in Google Sketchup and Google Earth, and integrating social networking into the tasks.
- Upward Bound Saturday Academy
  – Spring 2011
  – A science elective course where the students performed miscellaneous science projects to motivate them in the STEM (Science, Technology, Engineering, Math) subjects.
  – Projects included building an electrical generator, an electric motor, and a battery.

PROFESSIONAL
EXPERIENCE

University of California at Los Angeles, Los Angeles, CA

IPAM RIPS Academic Mentor   June 2018 to August 2018
- Managed two teams of undergraduate mathematics students enrolled in a summer research internship program at Hong Kong University of Science and Technology. Each team worked with an industry sponsor to solve a real world problem, document their results, and present their findings to an audience of academics.
  – One team, working with Tencent in Shenzhen, China, expanded methods of automated music generation using a hybrid of recurrent and convolutional neural networks.
  – The second team, working with Using.ai in Shenzhen, China, formulated a method of semi-supervised learning using deep convolution generative adversarial networks for computer vision applications in autonomous vehicles.

California State University at Nortrhidge, Northridge, CA

Graduate Researcher   June 2011 to May 2013
- Developed an algorithm to simulate phase transition in large scale biological swarms induced by thermodynamic noise and spontaneous birth and death of individuals.
- Implemented an OpenGL 3D graphics visualization of the simulation.

Arete Associates, Northridge, CA

Intern Scientist   June 2010 to August 2010
- Developed two algorithms to map out areas of a digital elevation model that would be obscured from view of a tracker of a given airborne position for applications in tracking methodologies.

- One algorithm used concepts of ray tracing and geometry to test collisions of a ray connecting the target and tracker with the digital terrain. The resulting obscuration map was exported to Google Earth to overlay with the terrain map.
- The second algorithm used OpenGL 3D modeling to make use of the depth buffer to generate a shadow map.
- Presented and defended my final results of the project to the entire staff of scientists and engineers of the company.

Edwards Air Force Base, Edwards AFB, CA

Electrical Engineer   **June 2008 to May 2010**

- Collaborated with other intern engineers on various projects in the Avionics Lab.
  - Developed the hardware configuration and software for a guidance system for a small scale, inert smart bomb. This included coding a Kalman filter and interfacing with a micro controller and electric servos.
  - Built a prototype of a single-winged unmanned aerial vehicle to test a proof of design.
  - Collaborated with CSU Northridge's ECE faculty to develop a software-defined radio. In charge of developing a demodulation scheme for the raw input signal before being fed into a digital signal processor.
- Taught a course on object oriented programming with C++ and micro controller development to high school interns for two separate summers.

HARDWARE AND SOFTWARE SKILLS

Computer Programming:
- C, C++, OpenGL, Matlab, Mathematica, R, TEX (LATEX, BIBTEX), JavaScript, HTML, CSS, Assembly (SPARC, Motorola).

Analog and Digital Electronics:
- Digital signal processors and filters. Microcontrollers (Motorola HCS12, Arduino) and interfacing them with PWM compatible devices (servos, motors, etc.). IPC certified in soldering

EXPERTISE

Mathematics:
- Applied Mathematics, Linear Algebra, Numerical Analysis, Real and Complex Analysis, Measure Theory, Calculus of Variation, Topology, Stochastic Processes, Ordinary and Partial Differential Equations, Mathematical Physics, Group, Ring, and Field Theory, Nonlinear Regression, Combinatorics

Biology:
- Evolutionary Biology, Immunology, Virology, Physics of Biological Assays, Chromosome Folding, Developmental Biology, Neuroscience, Biochemistry, Ecology

Electrical Engineering:
- Linear and Nonlinear Systems Theory, Optimal Control, Digital Control, Fuzzy Control, Digital Signal Processing, Communications, Digital Logic

Computer Science:
- Object Oriented Programming, Pattern Recognition, Machine Learning, 3D Computer Graphics, Nonlinear Numerical Optimization, Assembly Programming

AWARDS

University of California at Los Angeles
- Carol Newton Travel Award, 2015–2016, 2016–2017, 2017–2018
- Systems and Integrative Biology Training Grant, 2014–2016
- Eugene V. Cota-Robles Fellowship, 2013–2017

The California State University
- CDIP Mini-Grant, 2015–2016
- Chancellor's Doctoral Incentive Program, 2013–2016
- Sally Casanova Pre-Doctoral Scholar, 2012–2013

California State University at Northridge
- Graduate Equity Fellowship, 2012–2013

SECURITY
CLEARANCE   U.S. Department of Defense Secret Clearance (expired: 2011)

CITIZENSHIP   USA, UK

REFERENCES   **Dr. Tom Chou** (e-mail: tomchou@ucla.edu; phone: (310)-206-2787)
AVAILABLE TO   • Professor, Biomathematics, University of California, Los Angeles
CONTACT   ⋄ Los Angeles, CA 90095
               ⋆ *Dr. Chou is my PhD adviser at UCLA.*

               Dr. Maria-Rita D'Orsogna (e-mail: dorsogna@csun.edu; phone: (818) 677-2703)
               • Professor, Mathematics, California State University at Northridge
               ⋄ 18111 Nordhoff St., Northridge, CA 91330
               ⋆ *Dr. D'Orsogna was my masters adviser at CSU Northridge and is on my PhD committee at UCLA. She is also a director of the IPAM RIPS program.*

               Dr. Van Savage (e-mail: vsavage23@gmail.com; phone: (310) 206-6692)
               • Professor, Biomathematics, University of California, Los Angeles
               ⋄ Los Angeles, CA 90095
               ⋆ *Dr. Savage serves on my doctoral committee and I have taken an extensive amount of courses with him during my PhD.*

               Dr. Tony Friscia (e-mail: tonyf@ucla.edu; phone: (310)-206-6011)
               • Professor, Department of Integrative Biology and Physiology, University of California, Los Angeles
               ⋄ Los Angeles, CA 90095
               ⋆ *Dr. Friscia is the interim director of the UCLA Cluster program and head of the CLUSTER 70 course. He can speak strongly towards my teaching abilities.*