

**Education** **University of New Mexico (UNM)**, Albuquerque, NM 2010 – 2016  
Doctor of Philosophy in Physics May 2016  
Master of Science in Physics May 2014  
Dissertation: Smoluchowski Equation in Population Dynamics and the Spread of Infection  
Supervisor: Professor V. M. Kenkre

**New Mexico Institute of Mining and Technology (NM Tech)**, Socorro, NM 2007 – 2010  
Master of Science May 2007  
Thesis: Testing the SOC Hypothesis of Tropical Precipitation Using a Cloud Resolving Model  
Supervisor: Professor Sharon Sessions

**Lewis & Clark College (LC)**, Portland, OR 2002 – 2004  
Bachelor of Arts in Physics May 2006

**Research Topics** **Adaptive Motion Planning and Machine Learning**

*Postdoc, UNM June 2018 – present*

*PI: Prof. Lydia Tapia, Dept. of Computer Science*

- Deep Neural Networks in swept volume prediction.
- Deep Reinforcement Learning and Stochastic Reachability in moving obstacle avoidance.

**Koopman Operator, Dynamic Mode Decomposition, and Kernel Methods:  
Application to smart technology (in renewable energy)**

*Informal Postdoc, UNM Fall 2016 – Spring 2018*

*PI: Prof. Manel Martínez-Ramón, Dept. of Electrical and Computer Engineering and  
Prof. Yoshihiko Susuki, Dept. of Electrical and Information Systems, Osaka Prefecture University,  
Osaka, Japan*

- Interdisciplinary project between Machine Learning and Nonlinear Dynamics.
  - Applying Machine learning techniques to Koopman operator method
  - Application to micro-grids and power systems, prediction of power-load
  - Invited visit for a research collaboration at Osaka Prefecture University, Osaka, Japan December 2016
- Supervisors: Professor Manel Martínez-Ramón, Department of Electrical and Computer Engineering, UNM.

**Smoluchowski Equation in Population Dynamics and the Spread of Infection**

*Ph.D. Dissertation Research, UNM August 2013 – May 2016*

- Interdisciplinary project between non-equilibrium Statistical Mechanics, Biophysics, and Ecology
- Reaction-diffusion phenomena in non-translationally invariant system
- Hantavirus epidemic spread in rodents
- Related articles [?]

**Testing the SOC (Self-Organized Criticality) Hypothesis of Tropical Precipitation Using a  
Cloud Resolving Model**

*M.S. Thesis Research, NM Tech August 2007 – May 2010*

- Atmospheric Physics and Critical phenomena
- A model study of the dynamical aspect of tropical convection
- Investigated the SOC hypothesis in tropical convection
- Result presented at the poster session, 29th Conference on Hurricanes and Tropical Meteorology, American Meteorological Society, Tucson, AZ, May 2010.

**SOC in atmospheric dynamics**

*A research topic while in graduate program, UNM Summer 2011 – Spring 2012*

- Investigation of cloud-size size distribution over the tropics, in order to investigate SOC in atmospheric dynamics.

- Result presented at the poster session, 4-corners section regional meeting, American Physical Society, 2012 Socorro, NM, October 2012.

Supervisor: Professor J. Galewsky, Department of Earth and Planetary Science

### **Topics in percolation and jamming**

*A research topic while in graduate program, UNM Fall 2017*

Supervisor: Professor C. Moore, Department of Computer Science, UNM

### **fMRI study of developmental effects of prenatal cocaine exposure**

*Research Assistant, Center for Study of Brain, Mind and Behavior, Princeton University, Princeton, NJ 2006 – 2007*

- Data acquisition using an MRI, participants age group: 8-13 year-olds.
- Analysis of fMRI data, using software AFNI.

Supervisor: Dr. A. Dettwiler-Danspecgruber

### **Optical photometry of the binary star system, 44i Boötes**

*John S. Rogers Summer Science Research, cohort, LC Summers 2004, 2005*

- Operation of telescope and data acquisition
- Obtaining and analysis of the light-curve

Results presented at:

- 207th Meeting, American Astronomical Society, Washington DC January 2006
- John S. Rogers Summer Science Research Poster Presentation, Portland, OR, November 2004, 05
- Northwest Section Meeting, American Physical Society, Moscow, ID, May 2004

Supervisor: Dr. Thomas Olsen

## Work Experience

**Postdoctoral Fellow** June 2018 – present

The Tapia Lab, Department of Computer Science, UNM

*PI: Prof. Lydia Tapia*

- Motion planning in robotics and biology
- Deep Learning, Deep Reinforcement Learning

**Faculty (part-time)** January 2017 – April 2018

School of Math, Science & Engineering, Central New Mexico Community College, Albuquerque, NM

Courses Taught:

- Introduction to Stellar and Galactic Astronomy (ASTR 1110)
- Algebra-Based Physics I (PHYS 1510)
- Algebra-Based Physics II (PHYS 1610)

**Summer course instructor** Summer 2013

SEBIC ( Saudi Basic Industry Corporation Students) program at CELAC (Center for English Language and American Culture), UNM

- Introductory College Physics I

**Graduate Student Researcher:** See Research Topics

### **Graduate Student Physics Laboratory Instructor**

General Physics II (PHYC 102L), UNM Springs 2013, 2011

General Physics I (PHYS 101L), NM Tech Fall 2007- Spring 2009

### **Graduate Student Teaching Assistant**

Computational Physics (PHYC 290), UNM Spring 2013

Classical Mechanics (PHYC 503), UNM Fall 2014

Statistical Mechanics (PHYC 505), UNM Spring 2015

- Publications** M. Martínez-Ramón, Y. Susuki, A. Masuda, S. Sugaya, A. Mammoli, and A. Ishigame, Gaussian process for Koopman spectral analysis with application to smart grids, SIAM Conference on Applications of Dynamical Systems (SIAM DS), Snowbird, Utah, United States, May 19-23, 2019 (invited; accepted).
- H.T.L. Chiang, A. Faust, S. Sugaya and L. Tapia, Fast Swept Volume Estimation with Deep Learning. Proc. Int. Workshop on Algorithmic Foundations of Robotics (WAFR), 2018.
- S. Sugaya and V. M. Kenkre, Analysis of Transmission of Infection in Epidemics: Confined Random Walkers in Dimensions Higher Than One. *Bull. Math. Biol.*, 80, (2018) 3106–3126
- S. Sugaya, Y. Susuki, A. Ishigame, A. Mammoli M. Martínez-Ramón, Modeling Nonlinear Dynamic System in RKHS through the Koopman Operator, International Symposium on Nonlinear Theory and its Applications (NOLTA), 7 – 10 (2017).
- V. M. Kenkre and S. Sugaya, Theory of Transmission of Infection in the Spread of Epidemics: Interacting Random Walkers with and Without Confinement. *Bull. Math. Biol.*, 76, 3016 (2014). **Featured in an issue of the World Biomedical Frontiers due to its innovation and potential for significant impact.**
- K. Spendier, S. Sugaya, and V. M. Kenkre, Reaction-diffusion theory in the presence of an attractive harmonic potential. *Phys. Rev. E*, 88 062142 (2013).
- S. L. Sessions, S. Sugaya, D. J. Raymond, and A. H. Sobel, Multiple equilibria in a cloud-resolving model using the weak temperature gradient approximation, *J. Geophys. Res.*, 115, D12110 (2010).
- Honors and Awards** PiBBs (Program for interdisciplinary Biology and Biomedical Sciences) fellow, UNM Fall 2013- Spring 2015  
Leslie Fallon award (Excellence in Teaching), Dept. of Physics, NM Tech May 2010  
Sigma Pi Sigma, Dept. of Physics, NM Tech Spring 2009
- Activities and Services** Co-organizer, Becoming a Robot Guru Workshop at the 13th International Workshop on the Algorithmic Foundations of Robotics, 2018, Yucataán, Mexico  
Volunteer Data Analyst, United Way of Central New Mexico, Albuquerque, NM, September 2016 – April 2017  
Webmaster, Graduate Student Association (GSA), Dept. of Physics, UNM, Spring 2015  
Student member, American Meteorological Society, 2010–2011  
Graduate student benefit officer, GSA, NM Tech, Fall 2009 – Spring 2010  
Representative from Physics, GSA, NM Tech Fall 2008 – Spring 2010  
Event coordinator, Physics club, Lewis & Clark College, Fall 2005-Spring 2006  
Treasurer, Physics club, Lewis & Clark College, Fall 2004-Spring 2005  
Student member, Society of Physics Student, 2005-2006  
Student member, American Physical Society, 2005-2006  
Volunteer translator\* at the Atomic Bomb Memorial Day, Princeton Unitarian Church, Princeton, NJ, August 2006  
Volunteer translator\*, INTEL International Science and Engineering Fair, Portland, OR, May 2003  
\* . . . . . translation between English and Japanese