Julián Antolín Camarena
Curriculum Vitae
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Currently: Postdoctoral Fellow with Oak Ridge Associated Universities working on AI, ML, deep learning, and mathematical approaches to inverse reinforcement and imitation learning to better understand human decision making in human-autonomy teams.

Education

- **Physics PhD, December 2019 from The University of New Mexico (UNM)**
  Adviser: Prof. Sudhakar Prasad.
  Dissertation: *Electromagnetic analysis of bidirectional reflectance from roughened surfaces and applications to surface shape recovery*
- **Physics MS, August 2008 from Auburn University**
  Adviser: Prof. Eugene Oks.
  Thesis: *Application of Generalized Hamiltonian Dynamics to Modified Coulomb Potential.*
- **Physics BS, August 2006 from The University of Texas at El Paso (UTEP)**

Work Experience

- **May 2020 - present**
  Oak Ridge Associated Universities Postdoctoral Fellow. Artificial intelligence, machine learning and deep learning computational and theoretical approaches to understanding human-computer interactions and human-autonomy systems.
- **Spring 2020 - present**
  Research assistant. Artificial intelligence and machine learning video game player modeling for *Busy Beeway* game being developed by the Tapia Lab at UNM
- **Spring 2019**
  Research assistant. Molecular dynamics and stochastic modeling of biomolecular dynamics with application to the *DockIt!* video game being developed in the Tapia Lab at UNM.
- **Fall 2011 - Fall 2012**
  Lecturer at the Universidad Autónoma de Ciudad Juárez, Mexico. Course taught: electricity and magnetism for engineering students, differential equations and an undergraduate-level introductory course in quantum optics, and introductory classical and quantum information theory.
- **Fall 2012 - Fall 2014**
  Research assistant. Regularization of statistical inverse problems, and bayesian bioimaging superresolution. UNM.
- **August 2008 - May 2010**

Teaching assistant. Laboratory instruction, grading. UNM.

- **Fall 2008 - Spring 2011**
  Teaching assistant for courses including quantum computation, statistical mechanics, mathematical methods in physics, and electrodynamics I and II, UNM.
- **August 2006 - August 2008**
Teaching assistant. Laboratory instruction. Auburn

Expertise

Theoretical and computational physics with emphasis on electromagnetics and optics, Bayesian analysis, machine and deep learning, artificial intelligence, statistical modeling, dynamical systems, scientific simulation, optimization, teaching.

Computational

Python, MATLAB, TensorFlow, Keras, Pytorch, Scikit-Learn, Pandas, Numpy, Scipy

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Research and Teaching Experience

- **May 2020 - present**
  Artificial intelligence, machine learning and deep learning computational and theoretical approaches to understanding human-computer interactions and human-autonomy systems.
- **January 2020 - May 2020**
  Research assistant. Artificial intelligence and machine learning video game player modeling for *Busy Beeway* mobile game being developed by the Tapia Lab at UNM. The objective is to use player data to model a human player in order to understand their motivations during game play as a means to further the psychological understanding of human decision making. UNM
- **Spring 2019**
  Research assistant. Molecular dynamics and stochastic modeling of biomolecular dynamics with application to the *DockIt!* video game being developed in the Tapia Lab in the Computer Science department at UNM. I spearheaded the initiative to use stochastic differential equations (Itô diffusions) and dynamic Markov bridges for long-time simulations.
- **Spring 2015-October 2019**
Research assistant. Development of a novel global, nonlinear, alternating optimization algorithm for parameter estimation in shape recovery from noisy images. Full electromagnetic scattering analysis of intensity imaging of randomly rough perfectly conducting surfaces. UNM.
- **Fall 2014**
  Research assistant. Bayesian modeling and machine learning applied to quantitative bioimaging superresolution. UNM.
- **August 2012 - present**
Research assistant. Analysis of regularization of statistical inverse problems in signal and image

analysis, maximum entropy and other physics-based methods of random field texture modeling. UNM.

- **August 2010 - May 2011**

Research assistant. Numerical analysis of regularization in image analysis. UNM.

- **May - July 2009**

Research assistant. Analytical modeling of one-dimensional combustion through piecewise linearization of nonlinear reaction-diffusion equations. UNM.

- **January - May 2009**

Independent studies course. Numerical studies of stochastic differential equations in the modeling of the continuous quantum measurement process of a qubit. UNM.

- **May - July 2005**

Summer research program at The Georgia Institute of Technology. Numerical analysis of nonlinear dynamics and chaotic trajectories of the Roessler system.

Publications

- **Boris Mederos, Ramón A. Mollineda, Julián Antolín Camarena**, *Reconstruction of noisy signals by minimization of non-convex functionals*, **Nonlinear Analysis Real World Applications, Elsevier, Dec 2016**
- **Torin Adamson, Julián Antolín Camarena, Lydia Tapia, and Bruna Jacobson**, *Optimizing Low Energy Pathways in Receptor-Ligand Binding with Motion Planning*, accepted in 2019 IEEE International Conference on Bioinformatics and Biomedicine (IEEE BIBM 2019)
- **Julián Antolín Camarena,** *Generalized Hamiltonian Dynamics: Application to a Perturbed Coulomb Potential*, Lambert Academic Press, Saarbrücken, Germany, May 2010. This is a re-typing and expansion of my MS thesis.
- **Julián Antolín Camarena,** *Application of the Generalized Hamiltonian Dynamics to a Modified Coulomb Potential***,** submitted to International Review of Atomic and Molecular Physics (IRAMP), 2010.
- **Julián Antolín Camarena, Zhixian Yu, Sudhakar Prasad,** *Recovery of 3D Surface Shapes from their 2D Reflectance Distribution under Directional Illumination* (in review by authors)
- **Sudhakar Prasad, Julián Antolín Camarena,** *Electromagnetic Scattering from Curved and Rough Infinite Perfectly Conducting Strips of Finite Width* (in preparation).

Talks/Posters

- Society for the Advancement of Chicanos and Native Americans in the Sciences (SACNAS) Fall 2003 Meeting, October 2003 Albuquerque, NM
  Poster: *What is a Geowall?*
- APS Texas Section Spring Meeting, April 2004, Tarleton State University, Tarleton, TX
  Poster: *What is a Geowall?*
- Research Experience for Undergraduates Research Expo. The Georgia Institute of

Technology, July 2005.
Talk: *Chaos in the Rössler system*

- APS Texas Section Fall Meeting, October 2005, University of Houston, Houston, TX
  Talk: *Chaos in the Rössler system*
- APS Texas Section Fall Meeting, October 2008, The University of Texas at El Paso, El Paso, TX
  Talk: *Application of Generalized Hamiltonian Dynamics to Modified Coulomb Potential*
- Mini lecture series on quantum optics, Universidad Autónoma de Ciudad Juárez, Ciudad Juárez, México, April 2011.
- *Entanglement and Quantum Paradoxes*, Universidad Autónoma de Ciudad Juárez, Ciudad Juárez, México, September 28, 2011.
- *Complex Systems*, Universidad Autónoma de Ciudad Juárez, Ciudad Juárez, México, March 20, 2012.
- *Introduction to Neural Networks*, Universidad Autónoma de Ciudad Juárez, Ciudad Juárez, México, April 25, 2012
- *Tutorial on FRAME: Filter, Random Fields, and Maximum Entropy, invited talk* at CQuIC, UNM, November 20, 2013.
- *Faster STORM with compressed sensing*, UNM, September 25, 2014.
- *Stochastic Simulation and Molecular Dynamics*, invited talk, Universidad Autónoma de Ciudad Juárez, Ciudad Juárez, México, September 12, 2019.