Raul Garcia

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Education

2020–2025 **Rice University**.
PhD Computational and Applied Mathematics
Advisor: Dr. Illya V. Hicks

2014–2018 **University of California, Davis**.
BS Applied Mathematics
Cum laude

Interests

Mixed-integer programming formulations, stochastic optimization, mathematical software, operations research, deep learning

Experience

Summer 2022 **Research Intern**, *MIT Lincoln Laboratory*, Lexington MA.
Group 42 - Surveillance Systems
Airborne collision avoidance algorithm development and simulation analysis

2019–2020 **Quality Product Auditor**, *Pacific Southwest Container*, Modesto CA.
Performed daily testing and data collection of products. Assisted in development of experiments for analysis of product quality. Conducted internal process audits. Generated Process Capability Analysis reports.

2017–2018 **Reader**, *Dept. of Mathematics*, UC Davis, Davis CA.
Undergraduate grader for courses in Real Analysis and Ordinary Differential Equations

2017–2017 **Orientation Leader**, *Student Housing*, UC Davis, Davis CA.
Advised and mentored incoming students with course scheduling, degree requirements, campus resource navigation, and student life.

Publications

A combinatorial disjunctive constraint approach to optimal path planning.
Raul Garcia, Illya V. Hicks, Joey Huchette, Miles Olson
In preparation.

Deep object detection for waterbird monitoring using aerial imagery.
Krish Kabra, Alexander Xiong, Wenbin Li, Minxuan Luo, William Lu, Raul Garcia, Dhananjay Singh Vijay, Jiahui Yu, Maojie Tang, Tianjiao Yu, Hank Arnold, Anna Vallery, Richard Gibbons, Arko Barman
Submitted to IEEE International Conference on Machine Learning and Applications 2022.

Software

2022–Present **Audubon_F21**, Python package for identifying and censusing various colonial water-bird species from aerial UAV imagery.
- Sponsored by Houston Audubon for their waterbird population monitoring studies
- Employs Faster R-CNN object detection model (Detectron2) with data augmentation and Bayesian optimization for hyperparameter tuning
- Led experimentation of custom implementation utilizing DenseNet as backbone
- Co-developer with various students from the Rice Data to Knowledge Lab

2021–Present **ClutteredEnvPathOpt.jl**, Julia package employing various MIP approaches to optimal path planning of robots and drones in cluttered environments.
- Formulation techniques for disjunctive constraints: 1) Combinatorial disjunctive contraints constructed via an independent branching scheme; 2) Big-M
- Co-developer with Joey Huchette and Miles Olson

Teaching

Rice University

Department of Computational and Applied Mathematics

Spring 2022 **Grader**, CAAM 378: Introduction to Operations Research and Optimization.

Fall 2021, **Grader**, CAAM 335: Matrix Analysis.
Fall 2020

Spring 2021 **Grader**, CAAM 334: Matrix Analysis for Data Science.

University of California, Davis

Department of Mathematics

Spring 2017 **Teaching Assistant**, MAT 17C: Calculus III for Bioscience Students.

Fall 2016 **Teaching Assistant**, MAT 17A: Calculus I for Bioscience Students.

Spring 2016 **Teaching Assistant**, MAT 17B: Calculus II for Bioscience Students.

Presentations

"A Combinatorial Disjunctive Constraint Approach to Optimal Path Planning".
- MIP Workshop (poster), May 2022
- Kavraki Lab, Apr 2022
- Rice CAAM Dept. Graduate Seminar, Sep 2021

"Deep Learning for Precision Waterbird Monitoring".
- Rice D2K Showcase (poster), Apr 2021

"On the Value of Binary Expansions for General Mixed-Integer Programs", Paper Presentation.
- Rice SIAM Journal Club, Feb 2021

Awards and Fellowships

2022–2025 **GEM Fellowship**, MIT Lincoln Laboratory.

2020–2024 **Computational Science and Engineering Recruiting Fellowship**, *Ken Kennedy Institute*, Rice University.

Service and Outreach

2020–Present	**Society for Industrial and Applied Mathematics (SIAM) Student Chapter**, Rice University.
	○ Graduate Seminar Chair, 2021-2022
	○ Grill Master, 2020-2021
2021–Present	**Julia Users of Rice Group**, Co-founder, Rice University.
Summer 2021	**Instructor**, *Tapia STEM Camp*, Rice University.
	Guided high school students from underrepresented backgrounds on projects focusing on computational thinking and equity
2020–Present	**Rice Graduate Education for Minorities**, *Tapia Center for Excellence and Equity in Education*, Rice University.
2020–2021	**Mentor**, *Association of Women in Mathematics (AWM)*, Rice University.
	Served as mentor to a group of first-year Rice students interested in mathematics
2015–2018	**Chicano and Latino Engineers and Scientists Society**, UC Davis.
	Memberships.
	○ Institute for Operations Research and the Management Sciences (INFORMS)
	○ Society for Industrial and Applied Mathematics (SIAM)

Conferences

MIP Workshop.
○ 2022 - Poster presenter
○ 2021 - Attendee (online)

Blackwell-Tapia Conference.
○ 2021 - Attendee with support

INFORMS Annual Meeting.
○ 2021 - Attendee

Relevant Coursework

Linear and Integer Programming; Applied Machine Learning Projects; Stochastic Optimization; Intro to Machine Learning; Iterative Methods for Systems of Equations and Unconstrained Optimization; Advanced Numerical Analysis; Computational Science; Object-Oriented Programming

Programming Languages and Software

Programming & Software	Julia, Python, C++, C, Gurobi, MATLAB, Bash, Rust
Libraries	JuMP, Detectron2, PyTorch, scikit-learn

Languages

English, Spanish