Rene E Mai

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Education

Rensselaer Polytechnic Institute, *Troy, NY* **August 2021 – Current**

Mechanical Engineering Ph.D. Student GPA 4.0

- Candidacy date: expected August 2024
- Focus: controls and machine learning for symbiotic autonomy and autonomous systems; human-machine interaction; controls for complex systems
- Relevant coursework: Systems Analysis Techniques; Nonlinear Control; Optimal Control; Multivariable Control; Introduction to Spacecraft Navigation; System Identification: Machine Learning from Data; Machine Learning for Autonomy; Machine Learning for Autonomy; Safe Autonomy; Perception & Action.

University of Texas at Austin School of Law, *Austin, TX* **2010-2013**

Juris Doctor GPA 3.14

- Focus: Litigation; intellectual property law; human rights law

Texas A&M University, *College Station, TX* **2006-2010**

B.A. in Physics with Mathematics and Women's Studies minors GPA 3.56

- Relevant coursework: Linear Algebra; Differential Equations; Partial Differential Equations; Computational Physics; Advanced Mechanics; Statics & Dynamics; Quantum Mechanics; Principles of Electrical Engineering

Research Experience

Rensselaer Polytechnic Institute **August 2021 – Present**

Graduate Research Assistant *Troy, NY*

- Research focuses on dynamical system modeling for symbiotic autonomy systems.
- Supervise and mentor master's and undergraduate researchers; unofficial mentor to less senior PhD students.

Publications:

- R. Mai, A. Julius, and S. Mishra. "Analysis of human steering behavior differences in human-in-control and autonomy-in-control driving." *5th IFAC Workshop on Cyber-Physical Human Systems (CPHS)*, June 2024 (submitted).
- M. Saephan, G. Sadler, and R. Mai. "A Queueing Theory Approach to Pilot-Controller Coordination for m:N Operations." 2025 AIAA SciTech. (under review).
- R. Mai, K. Sears, G. Roessling, A. Julius, and S. Mishra. "Generalized two-point visual control model of human steering for accurate state estimation." *ASME Letters in Dynamic Systems and Control* (joint submission to the *2024 Modeling, Estimation and Controls Conference*)(under review). Available: http://arxiv.org/abs/2406.03622.
- R. Mai, S. Mishra, and A. Julius. "Human-as-advisor in the loop for autonomous lane-keeping." in *2023 American Control Conference (ACC)*. IEEE, May 2023. Available: https://ieeexplore.ieee.org/document/10156374/

Presentations:

- "Human-as-advisor in the loop for autonomous lane keeping" - 2023 American Controls Conference
- Building a pipeline for large language model fine-tuning, with a semantic search application - August 2023 Presentation to Ames Research Center, Moffett Field, CA
- Patents, IP Litigation, and Entrepreneurship - March 2023 Presentation to University of Kentucky Paducah
- Human-as-Advisor for Human-in-the-Loop Control - August 2022 Presentation to Army Research Laboratory Humans in Complex Systems Group, Aberdeen, Maryland

Teaching Experience

Rensselaer Polytechnic Institute

Graduate Teaching Assistant, Mechatronics *August 2023-May 2024*

- Overall rating: 4.81/5 (Spring 2024) and 4.50/5 (Fall 2023)
- Used group learning to teach students to work together, tackling higher-level problems with less direction.
- Prepared physical and written materials for interactive lecture assignments.
- Updated labs and other assignments for clarity, adding key takeaways from each lab to guide student progress.
- Revised the assignment structure for the second project, magnetic levitation, to follow the engineering design process and help guide students through solving the problem themselves, rather than with explicit direction.
- Graded assigments, projects, and other items quickly and fairly, meeting tight deadlines to notify students in danger of failing the course.

Graduate Teaching Assistant, Modeling & Control of Dynamic Systems *August-December 2022*

- Overall rating: 4.26/5
- Built a core group of students who attended nearly every office hour each week.

- Taught through lecture-style examples, individual solutions guidance, and forming homework groups to build a community of students.
- Coordinated immediate grading of over 150 exams, with 2 day turnaround for final grades.

New Visions STEM

Guest Lecturer *August 2021-present*

- Revised electric car project to include motor modeling and feedback and feedforward controls, including providing lectures explaining basic control theory at a high school level.
- Developed content for several core lessons in the government and engineering domains.

Illustrative lessons include:

- Intellectual Property Rights, IP Litigation, Economics, and Innovation - core lesson on the intersection of engineering and government.
- Introduction to reinforcement learning - developed an interactive lecture to introduce the basic concepts of reinforcement learning for high school students, and a physics exercise that simulates reinforcement learning and cements the concepts for students.
- Academic ethics and responsible studying in the age of ChatGPT - Socratic-style discussion about the nature of LLMs and the implications of their use on academic ethics, concluding with an exercise in simualted autoregression.

Engineering Experience

NASA Ames Research Center **January 2023 – Present**

Pathways Intern - Digital Information Platform and Human-Autonomy Teaming Lab *Troy, NY*

- Monitor human-autonomy teaming research for potential development and cross-collaboration, with an emphasis on disaster recovery and complex human-autonomy teaming scenarios.
- Develop large language model training and evaluation pipeline for future aviation-specific LLM development, including aviation-specific semantic search application to showcase training pipeline.
- Identify key areas for future NASA research on LLM development.
- Aid undergraduate interns in learning about LLMs, engineering projects, and professional communication.

Legal Experience

Weil, Gotshal & Manges LLP **May 2017 – December 2020**

Patent Litigation Associate *Houston, TX*

- Promoted a full year upon hire. The go-to attorney for technical analysis of electrical and mechanical technologies.
- Set and tracked deadlines for projects across multiple high-dollar value patent litigation cases.
- Worked with industry leaders and client experts to develop cohesive technical litigation strategies for Fortune 500 and Fortune 50 clients.
- Wrote winning briefs on case scheduling, discovery conflicts, patent interpretation, and expert testimony.
- Created successful persuasive technical presentations in diverse technologies, from high-speed modems to solar cells.

Pillsbury Winthrop Shaw Pittman LLP **July 2014 – May 2017**

Patent Litigation Associate *San Diego, CA and Houston, TX*

- Hired as a patent agent and quickly promoted to technical patent litigation attorney.
- Set and tracked deadlines across multiple cases for one of the firm's highest-value clients.
- Created educational slides that won a case by educating a judge on the difference between digital logic performed on binary numbers and arithmetic with real values.
- As a key member of the International Trade Commission (ITC) team, won an exclusion order for a Fortune 500 client, resulting in a key competitor being barred from importing products for sale in the United States.
- One of the youngest attorneys to sit second chair for expert witness questioning at trial.

Awards and Fellowships

- 2024-2025 Link Foundation Modeling, Simulation & Training Fellowship[1]
- 2024 Boeing Summer Fellowship
- 2023-2024 Founder's Award of Excellence, Rensselaer Polytechnic Institute
- 2021-2022 NDSEG Honorable Mention, United States Department of Defense[1]
- 2021-2022 SMART Scholarship Semi-Finalist[1]
- 2021-2022 Rensselaer Graduate Fellowship, Rensselaer Polytechnic Institute
- 2011-2013 School of Law Scholarship, University of Texas at Austin School of Law
- 2010-2011 Endowed Presidential Scholarship in Law, University of Texas at Austin School of Law
- 2010 University Honors Certificate, Texas A&M University
- 2010 Foundation Honors Certificate, Texas A&M University
- 2006-2010 University Scholar, Texas A&M University
- 2006-2010 President's Endowed Scholar, Texas A&M University

[1] National awards

Technical Background

- Implementation and analysis of machine learning and reinforcement learning algorithms
- Modeling, analysis, and design of electrical and mechanical systems using MATLAB and Python
- Source code analysis and interpretation in MATLAB, Python, C, C++, Java, Fortran, and Assembly
- Analysis and interpretation of 3GPP, 3GPP2, IEEE, and IETF communication devices and standards
- Computer-aided design and additive manufacturing workflow
- Persuasive technical and non-technical writing and speaking

Leadership and Mentoring

Rensselaer Polytechnic Institute

Mechanical, Aerospace, and Nuclear Engineering (MANE) Student Advisory Committee Member *October 2023-present*

- Represent MANE students to the department faculty and staff.
- Provide student input on faculty hires, curriculum changes, and other department functions.
- Elicit feedback from students to inform input and feedback to department.

Middle States Accreditation Self-Study Committee Member *March 2023-present*

- Research and document the student experience at RPI for self-study accreditation report.
- Provide feedback and edits to self-study report.
- Interface with institute faculty and administration to facilitate self-study process.

Graduate women's mentoring circle founder; MANE Department *March 2022-present*

- Initiate and organize networking and professional development luncheons for women graduate students and faculty members in MANE department.
- Develop topics and foster discussion to provide mentoring to graduate students and junior faculty members.
- Coordinate future sessions, including potential guest speakers and joint events for other underserved groups and allies.

Society of Women Engineers Graduate Student Committee Secretary *October 2021-present*

- Selected for the national-level 2022-23 and 2023-24 **Academic Leadership for Women in Engineering** cohorts.
- Chosen to attend 2022 Annual Conference to represent university section.
- Dramatically increased graduate section engagement through recruiting events and outreach.
- Propose, organize, and plan events tailored to graduate student interests.
- Organize meeting agendas, take notes during meetings, and organize items for follow-up as needed.
- Update main Society of Women Engineers about graduate student events and coordinate between graduate committee and undergraduate activities.

New Visions STEM

Volunteer Tutor *August 2021-present*

- Develop curriculum to teach high school students how STEM fields interact with U.S. and international government, policy, and economics, including the use of laws and policy to promote STEM goals.
- Lead activities to teach students how policies are developed, implemented, and modified.
- Provide supplemental lectures and content about the economic and governmental incentives behind intellectual property rights, development, and protection, including proposed reforms.
- Individual and group tutoring on physics, engineering, scientific and persuasive writing, and presentation skills.

NASA Lucy Student Pathway Accelerator and Competency Enabler (L'SPACE)

NASA Proposal Writing and Evaluation Experience Academy *May-August 2022*

- Led a team of undergraduate students to propose a unique solution to astronaut hand injuries during EVA.
- Implemented NASA proposal review standards and procedures during proposal assessment phase.

Nidan, Shotokan Karate

Second Degree Black Belt *Achieved May 2021*

- Recognized by multiple worldwide organizations including SKIF, JKS, and JKA.
- Formal and informal mentoring and teaching of students from beginning to advanced levels in all age groups.

Interests

Formula 1 Racing | Martial Arts | 3D Printing and Design | Horseback Riding | Baking | Writing | Crochet