Rene E Mai

mair@rpi.edu linkedin.com/in/reneemai https://relisemai.github.io/

Professional Profile

Technical patent litigation attorney turned mechanical engineering PhD student focusing in controls, modeling, and evaluation of symbiotic autonomy systems and human-autonomy teaming methods. Prior experience as an attorney included project management, persuasive writing, and extensive technical analysis from standards compliance to source code interpretation. Always a part of the "A team."

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 (under review).
- 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

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*

- Participant in the national-level 2022-23 and 2023-24 *Academic Leadership for Women in Engineering* cohorts.
- Attendee at the 2022 Annual Conference, representing university section.
- Dramatic increase in 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.

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

[1] National awards