Michael R. Martin

Curriculum Vitae

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[Email](#) **|** [GitHub](#) **|** [Website](#) **|** [ResearchGate](#) **|** [Scholar](#) **|** [Orchid](#) **|** [LinkedIn](#)

Research Interest

Real-time computer graphics and GPU-accelerated rendering; immersive VR/AR systems and interactive simulation; neural and volumetric representations for 3D/4D data and generative visual models; AI/ML methods for visual computing and scientific visualization; and human–computer interaction for immersive and intelligent visual systems.

Education

Ph.D. Student, Computer Science, University of California, Davis (2025 – Present)
Visualization & Interface Design Innovation (VIDi) Lab
Advisor: Dr. Kwan-Liu Ma

B.Sc., Computer Science & Engineering *(Major)*; Digital Interactive Game Design *(Minor)*
University of Nevada, Reno (2020 – 2025)
GPA: 3.69 / 4.00

Undergraduate Studies in Computer Science
University of Washington, Bothell (2019 – 2020)
GPA: 3.77 / 4.00

Research Experience

Graduate Student Researcher, VIDi Lab (Visualization & Interface Design Innovation), University of California, Davis (June 2025 – Present)
Advisor: Dr. Kwan-Liu Ma

- **ProneVR** – **Immersive Therapeutic VR System —** Developed and implemented an immersive therapeutic VR environment integrating real-time rendering, shader-based visual effects, interactive simulation, spatial audio, and AI-driven agent behaviors. Developed the full codebase and prototype. Contributed to a pilot clinical evaluation conducted at the UC Davis Pain Clinic. Preparing a first-author manuscript for peer-reviewed submission based on system design, performance analysis, and pilot-study findings. ([Code](#) · [Demo](#))
- **Gaussian-Splatting VR Volume Visualization —** Designed and authored a research proposal for real-time VR visualization of unstructured volumetric data using Gaussian splatting and neural-guided sampling. Developing a scalable OpenXR-based system supporting multivariate transfer-function editing and AI-accelerated rendering.
- **Real-Time VR Volume Rendering —** Developed an OpenXR interface for a GPU-based volume renderer and explored Gaussian-splatting techniques for interactive visualization.
- **GPU-Accelerated 4D Volume Rendering.** Contributed CUDA-based pipelines for high-performance 4D volumetric visualization.
- **Explainable AI for Text-to-Image Generative Models —** Developed a perturbation pipeline and analytical framework to investigate robustness and feature-level explainability in text-to-image generative models. Preparing a first-author manuscript for peer-reviewed submission based on model-behavior analysis and XAI findings. ([Code](#) · [PDF](#) · [ResearchGate](#))

- **Mentorship** – Mentored a master's student on ProneVR system components and on XAI techniques for image generative models; provided guidance on system integration, experimental design, and methodological development.

SensePhase — Independent Research (2025 – Present)
Conducting independent research on computer graphics, immersive VR/AR systems, neural rendering, and AI-driven techniques for interactive visual computing, exploring new prototypes and experimental workflows outside formal lab projects.

NASA Research Fellow, Nevada NASA Space Grant, Desert Research Institute (DRI) & University of Nevada, Reno (June 2024 – June 2025)
Advisors**:** Dr. Lei Yang and Dr. Hans Moosmüller • Program Director: Dr. Eric Wilcox
- Independently developed and authored the full NASA research proposal.
- Designed and developed ensemble and deep learning models for wildfire behavior and smoke-dispersion prediction. Analyzed large-scale NASA satellite datasets. ([ResearchGate])
- First author of a manuscript for peer-reviewed publication and presented research at the UNR Data Science Conference and the NV NASA Statewide Meeting.

Research Fellow, SMART Lab (Science & Mathematics of AI Modeling for Research and Technology), Desert Research Institute (June 2023 – June 2024)
Supervisor: Dr. Hans Moosmüller • Mentors: Dr. Lei Yang and Dr. Kailong Li
- Developed scientific computing pipelines for NASA EPSCoR projects, including ML model development, validation, XAI analyses, and large-scale data processing.
- Co-authored two peer-reviewed papers (one published, one under review) and contributed to ML components for proposals submitted to NOAA and CAL FIRE.
- Presented research at the American Meteorological Society national conference.

Research Assistant, Organic Analytical Lab, Desert Research Institute (June 2022 – June 2023)
Supervisor: Dr. Andrey Khlystov • Mentor: Dr. Kevin Axelrod
- Developed code supporting data analysis and visualization in an NIH-funded research project.
- Processed large-scale datasets and contributed to analytical discussions.
- Prepared technical reports summarizing research findings.

Research Intern, Robotics Lab**,** University of Nevada, Reno (Sept 2018 – June 2019)
Advisor: Dr. Monica Nicolescu
- Assisted with C++ modules for robotic simulation

Peer-Reviewed Journal Publications

Stepwise Clustered Ensemble (SCE): An R Package for Interpretable Robust Regression in Environmental Modeling.
Li, K., **Martin, M. R.**, Wang, X., Hosseinpour, F. (2025). Journal of Environmental Modelling and Software. Under review. (Manuscript #ENVSOFT-D-25-02742)

Impacts of Wildfire Smoke Aerosols on Radiation, Clouds, Precipitation, Climate, and Air Quality. Barjeste Vaezi, R., **Martin, M. R.**, Hosseinpour, F. (2025). Atmospheric Environment X, Elsevier, 26, 100322. Published. [Article]
https://doi.org/10.1016/j.aeaoa.2025.100322

Manuscripts in Preparation

ProneVR: Design and Evaluation of a Controller-Free Immersive Virtual Reality System for Pain Management in Prone Procedures.
Martin, M. R., Chan, G., Jung, M.J., Ma, K.-L. (2025). In Preparation

Visualizing the Impact of Data Perturbation on Text-to-Image Models using Explanative AI.
Martin, M. R., Chan, G., Ma, K.-L. (2025). In Preparation.

Deep Learning Framework for Predicting Wildfire Smoke Dispersion from Satellite Remote Sensing Data.
Martin, M. R., Yang, L., Moosmüller, H. (2025). Ready for Submission.

Conference Publications and Presentations

XAI for Analyzing the Impacts of Data Purification on Image Models.
Martin, M. R. & Chan, G. (2025). University of California, Davis. Talk.
https://doi.org/10.13140/RG.2.2.21023.42408

Harnessing Machine Learning and NASA Satellite Big Data for Enhanced Wildfire Smoke Prediction.
Martin, M. R., Yang, L., Hosseinpour, F. (2025). UNR Data Science Conference. Invited Talk.
https://doi.org/10.13140/RG.2.2.28208.06406

Advancing Earth Science Predictive Modeling through Machine Learning and Deep Learning.
Martin, M. R., Yang, L., Moosmüller, H. (2025). Nevada NASA Statewide Meeting. Poster.
https://doi.org/10.13140/RG.2.2.28797.06881

Leveraging Machine Learning and NASA Satellite Data to Improve Wildfire Smoke Prediction.
Martin, M. R., Yang, L., Hosseinpour, F. (2025). UNR Data Science Conference. Poster.
https://doi.org/10.13140/RG.2.2.32402.36808

Predictive Modeling in Environmental Science with Machine Learning Algorithms.
Martin, M. R., Mehdizadeh, G., Barjeste Vaezi, R. B., Erfani, E., Hosseinpour, F. (2024).
American Meteorological Society 104th Annual Meeting. Poster. Abstract ID: 2024AMS-10440178N
https://doi.org/10.13140/RG.2.2.18875.18729/2

Machine Learning for Exploring Wildfire Smoke Emissions: A Data-Driven Approach.
Brjeste Vaezi, R., **Martin, M. R.**, Hosseinpour, F. (2024). Nevada NASA Statewide Meeting. Oral.
https://doi.org/10.13140/RG.2.2.32342.05449/1

Machine Learning Approach for Enhanced Understanding of California's Wildfire Smoke.
Barjeste Vaezi, R., Mehdizadeh, G., **Martin, M. R.**, Hosseinpour, F. (2024). American Meteorological Society 104th Annual Meeting. Poster.
https://doi.org/10.13140/RG.2.2.23069.49120/1

Development of a Mentorship Platform: Plato.
Martin M. R., Cao R., Mamaril J., Marsala M. (2024). UNR Innovation Day Competition. Poster.
https://doi.org/10.13140/RG.2.2.27012.95361

Cloud Seeding Effects on Snowfall: Insights from Microphysical Model and Satellite Remote Sensing.
Mehdizadeh, G., Hosseinpour, F., **Martin, M. R.**, Barjeste Vaezi, R., Erfani, E., McDonough, F. (2024).
American Meteorological Society (AMS) 104th Annual Meeting. Poster.
https://doi.org/10.13140/RG.2.2.36071.83369/1

Innovative Mentorship Platform: Plato.
Martin M. R., Cao R., Jones J., Mamaril J., Marsala M. (2024). UNR Sontag Entrepreneurship. Oral.
https://doi.org/10.13140/RG.2.2.33723.84006

Research Proposals

AI for Volumetric Exploration in Reality (AIVER) – Real-Time Virtual Reality Visualization of Unstructured Volumes Using Gaussian Splatting and AI-Accelerated Rendering (2025)
Martin, M. R. — Conceived ideas, designed methodology, and wrote the full proposal.

Visualizing the Impact of Data Perturbation on Text-to-Image Models using Explanative AI (2025)
Martin, M. R. — Led conceptual development, designed methodology, and wrote a full proposal.
https://doi.org/10.13140/RG.2.2.15151.39849

*Advancing Predictive Modeling in Earth Science through AI (*NASA Space Grant Proposal, 2024)
Martin, M. R.— Conceived the project concept, designed methodology, and wrote the full proposal.
https://doi.org/10.13140/RG.2.2.18624.34567

Enhancing Wildfire Predictability with A Physics-Guided AI/ML. (CAL FIRE proposal, 2024)
Martin, M. R., Yang, L., Moosmüller, H.
Contributed to conceptual development, proposal narrative, and ML methodology.

Final Technical Reports

Advancing Predictive Modeling in Earth Science through Artificial Intelligence.
Martin, M. R. (2025). NASA-funded final research report.
https://doi.org/10.13140/RG.2.2.18624.34567

Plato Mentorship Platform.
Martin, M. R., Cao, R., Mamaril, J., Marsala, M. (2024). Undergraduate Capstone Project technical report, University of Nevada, Reno, 171 pp.
https://doi.org/10.13140/RG.2.2.23657.51043

Fellowships & Grants

Excellence Graduate Fellowship, University of California, Davis, Computer Science (2025 – 2026)
Fully funded fellowship (tuition + stipend) for academic and research excellence.

Graduate Dean's Merit Scholarship, University of Nevada, Reno (2025 – 2026)
University-wide merit scholarship awarded to top incoming doctoral candidates.

NASA Space Grant Undergraduate Fellowship, Nevada NASA Programs (2024 – 2025)
NASA-funded research fellowship supporting independent work in physics-based AI/ML for environmental modeling.

NSF CREATE Scholar, University of Nevada, Reno (2020 – 2024)
Four-year merit award supported by a National Science Foundation $1M grant.

Millennium Scholarship (Merit-Based), Nevada State Treasurer's Office (2020 – 2024)
Statewide academic merit scholarship awarded for sustained academic excellence.

Merit-Based Undergraduate Fellowship, University of Washington, Bothell (2019 – 2020)
Competitive fellowship recognizing strong academic performance and research promise in computing.

Selected Honors & Awards

ACM Hackathon Public Choice Award, University of Nevada, Reno (2025)
Recognized for an interactive real-time simulation showcased at an ACM-sponsored hackathon.

Public Choice Award, Innovation Day Competition, University of Nevada, Reno (2024)
Awarded for a high-impact engineering capstone project presented to a university-wide audience.

Round 2 Winner, Sontag Entrepreneurship Competition, University of Nevada, Reno (2024)
Advanced in a highly competitive university-wide entrepreneurship competition.

Top Nevada Finalist, MathCON National Competition, University of Chicago (2016)
Selected as a top statewide finalist in the national mathematics competition.

U.S. President's Award for Outstanding Academic Excellence (2016)
National recognition awarded by the U.S. Department of Education for academic distinction.

Teaching Experience

Tutor, University Tutoring Center, University of Nevada, Reno (2020 – 2022)
Courses: CS 135 (Intro to Computer Science), PHYS 180/181 (Physics for Scientists & Engineers)

Tutor – Robert McQueen High School, Reno (2017 – 2019)
Subjects: AP Physics, AP Calculus, Trigonometry, Geometry, Algebra

Technical Skills

Languages	C++, Python, Java, JavaScript, C#, Lua, SQL, GDScript, Scheme, Arduino C++
Graphics & Rendering	OpenGL, GLFW, shader programming, Assimp, Unity (C#), Blender, Ogre3D; real-time rendering, advanced shading, GPU-accelerated visualization pipelines
VR/AR Systems	Unity (C#), Godot; real-time interaction, raycasting, physics-based simulation, immersive environment design, AR/AR system development, AI agent behaviors, audio/visual feedback modeling
AI & Machine Learning	PyTorch, TensorFlow, scikit-learn; deep learning (CNNs, RNN/LSTM), ensemble methods, predictive modeling, explainable AI (XAI)
Scientific Computing	NumPy, Pandas, NoSQL, JSON; big-data processing, pattern recognition, time-series analysis, and scientific visualization
Audio & Acoustics Simulation	Spatial audio scripting, acoustic and environmental acoustics modeling, procedural sound design, real-time acoustic simulation for VR/AR systems; digital-audio tools for spatial-audio prototyping (Ableton Live, Logic Pro, FL Studio, Audacity)
Web Development	HTML, CSS, JavaScript, Svelte/SvelteKit, Firebase, Cloudflare; full-stack development, API workflow, cloud deployment
Software & Tools	Git/GitHub, Linux/Unix, VS Code, Jupyter Notebook; version control, prototyping, testing workflows

Selected Projects & Leadership

Real-Time VR Volume Rendering System — UC Davis (2025 – Present)
Developing a VR volume-rendering pipeline integrating OpenXR with the OVR renderer and exploring Gaussian-splatting acceleration. Collaborator: Dr. David Bauer (Meta) • Advisor: Dr. Kwan-Liu Ma.

ProneVR Project — UC Davis (2025 – Present)
Developed an immersive therapeutic VR platform integrating real-time rendering, shader-based visual effects, spatial acoustics, and AI-driven interactive simulation. Advisor: Dr. Kwan-Liu Ma [Code] [Demo]

Explainable AI for Text-to-Image Generative Models — UC Davis (2025 – Present)
Investigating the impact of data perturbation on image generative models using explainable AI techniques to analyze model behavior, robustness, and feature-level responses to artist-focused poisoning methods. Collaborator: Garrick Chan • Advisor: Dr. Kwan-Liu Ma [Code] [PDF] [ResearchGate]

Fire Season Simulation Project — ACM Hackathon (2025)
Developed a real-time wildfire simulation featuring procedural terrain generation, raycasting interaction, adaptive AI balancing, and interactive UI components in Godot.

VR Software for Medical/Ocular Diagnosis (2024)
Developed a VR-based visual field assessment prototype in Unity, combining interface design with desktop simulation workflows to explore software-based ophthalmic diagnostics. (Patent in progress)

Plato Mentorship Platform – Capstone Project (2023 – 2024)
Built a scalable web-based platform using Svelte/SvelteKit, Firebase, and API integrations. Developed matching logic, user interface systems, and performance-optimized workflows. [GitHub]

Interactive Media & Simulation Prototypes – Independent (2016 – 2024)
- Built real-time interactive simulation systems with 2D/3D animation, rendering, procedural visual generation, physics engines, AI behavior modeling, audio-visual integration, spatial acoustics, raycasting, database systems, and optimized performance pipelines in Unity and Godot.
- Created simulation prototypes, including a naval navigation system with AI pathfinding [GitHub], a solar system model [GitHub], a Breakthrough chess variant with AI opponent [GitHub], and an 8-Puzzle solver visualizing search algorithms [GitHub].

Electronic Music, Spatial Audio & Sound Design – Independent (2016 – Present)
Independent exploration of digital sound design, spatial audio, and acoustics simulation with applications to interactive and immersive media, including VR environments.

Relevant Graduate Coursework

Virtual Reality, Computer Graphics, Explainable AI using Visualization, Computer & Information Security, Pattern Recognition, Human-Computer Interactions, Advanced Game Design, Game Engine Architecture, Big Data

Professional Affiliations

Member, Association for the Advancement of Artificial Intelligence (AAAI) (2024 – Present)
Member, Association for Computing Machinery (ACM) (2018 – Present)
Member, Google Developer Groups (GDG) (2024 – Present)
Member, American Meteorological Society (AMS) (2023 – Present)

Professional Development

NeuralStorm Workshop, University of California, Davis (2025)
Skills-focused program in neuroengineering methods with hands-on projects in Python, neural data processing, and machine learning

Teaching Assistant Training, University of California, Davis (2025)

Machine Learning Certificate, AMS Short Course: *Machine Learning in Python for Environmental Science Problems* (2024)