

NAZANIN MINAIAN

MECHANICAL ENGINEER

Objective

Ph.D. in Mechanical Engineering with a focus on **bioinspired design**, **smart materials**, and **fluid-structure interaction**. My research centers on electroactive polymer-based sensing systems modeled after biological flow detection, bridging conceptual design with analytical modeling and experimental validation. Skilled in COMSOL, additive manufacturing, and image-based modeling, I approach engineering problems with both rigor and creativity. I thrive in collaborative environments, enjoy mentoring students, and find inspiration in the intersection of engineering, biology, and science fiction.

Education

2018 - Est. 2025	University of Nevada, Las Vegas PhD Mechanical Engineering
	Dissertation: "Bio-Inspired Electroactive Polymer (EAP) Sensors for Surface and Canal Flow Sensing in Dynamic Environments" Advisor: Dr. Kwang J. Kim (www.kwangjinkim.org)
2018 - 2024	MS Aerospace Engineering
	GPA: 3.98 Awarded as part of UNLV's Integrated BS-PhD Subplan 6 program, utilizing graduate-level coursework completed during the Ph.D. in Mechanical Engineering. Relevant Coursework: <i>Advanced Thermodynamics, Introduction to Fuel Cell, Transport Phenomena in Bioengineering, Finite Element Applications in Mechanical Engineering, Advanced Topics: Small Systems, Special Topics: Imaging and Image Processing, Mathematical Physics I, Observational Astronomy Techniques, Computational Fluid Dynamics, Advanced Fluid Mechanics I, Advanced Fluid Mechanics II, Aerodynamics</i>
2015 - 2018	BSE Mechanical Engineering
	GPA: 3.91 Graduated <i>magna cum laude</i> Minored in Technology Commercialization

Honors and Awards

2024	Innovating Distributed Embedded Energy Prize (InDEEP), Phase I Winner Awarded by the U.S. Department of Energy via HeroX for novel work in distributed embedded energy systems.
2023	UNLV Graduate Poster Symposium – Mechanical Engineering 1st place award for poster on electroactive polymer gel-based flow visualization sensor system.
2021	SPIE Smart Structures + NDE – Best Student Paper Award 2nd place award recognized for paper “Continuing the Investigation of the Sensing Response of Ionic Polymer-metal Composites: Effects of Geometry and Orientation” at SPIE Bioinspiration, Biomimetics, and Bioreplication conference.
2020–2021	Nevada Space Grant Consortium Fellowship NASA-affiliated fellowship supporting graduate research in smart materials and sensing technologies.
2020	College of Engineering CS/E Research Fellowship Awarded for excellence in research within computer science and engineering at the graduate level.
2020–2021	Marjorie & Victor Kunkel Scholarship Merit-based scholarship recognizing outstanding graduate engineering students.
2019	Best Paper Award, AMSM 2019 (4th Intl. Conf. on Active Materials and Soft Mechatronics) Selected for coauthored paper “Spiral Shape Energy Harvester with Silicone Finger Bending Model Using PVDF.”
2018	Atkins Global Interdisciplinary Award Awarded 1st place for capstone project “Laminar Flow Faucet-less Smart Sink” combining CAD, fluid dynamics, and user-centric design.

Research and Engineering Experience

2018 – 2025	<p>Dissertation UNLV Active Materials and Smart Living (AMSL) Lab Advisor: Dr. Kwang J. Kim Graduate Research Assistant</p> <ul style="list-style-type: none"> Designed, modeled, and fabricated biomimetic lateral-line-inspired flow sensing mechanisms using ionic polymer-metal composites (IPMCs) and electroactive plasticized polymer gels (EPPGs). Developed custom transfer functions and frequency response models validated via COMSOL and experimental testing. Integrated 3D-printed flow canal platforms into underwater environments to evaluate sensing behavior under hydrodynamic excitation.
-------------	---

2022 - 2025	<p>DICOM-Based 3D Printing Collaboration AMSL Lab U.S. Navy Marine Mammal Program (NMMP) Project Lead</p> <ul style="list-style-type: none"> • Processed California sea lion CT DICOM images into printable anatomical models for medical and research use. • Fabricated a multi-material training phantom of the California sea lion pelvis for blood extraction training. • Mentored two undergraduate students on image segmentation, post-processing, and mold-based manufacturing techniques.
2023 - 2024	<p>IPMC Cilia Array for Ocean Wave Energy Harvesting UNLV AMSL Lab Presented at VEH 2024, New Zealand Project Lead</p> <ul style="list-style-type: none"> • Designed a biomimetic, pier-mounted IPMC sensor system inspired by the passive sessile nature of barnacles. • Modeled and tested passive energy harvesting behavior under hydrodynamic stimulation in a Brett-type flume. • Awarded Phase I of the U.S. Department of Energy's InDEEP Prize for innovation in distributed energy systems for concept and proposal.
2022 - 2023	<p>Searching for an Effective Filler Material used in Barrier Coatings (Industry Collaboration) UNLV Koshee Researcher</p> <ul style="list-style-type: none"> • Co-authored a white paper and prepared technical presentation materials for an anti-fouling surface coating proposal. • Project was selected for support during a graduate symposium hosted by Koshee, a local startup. • Explored filler additives to improve thermal regulation and reduce biological fouling in textured proprietary polymer-based pool deck materials.
2020 - 2021	<p>Field-Deployable Modular 3D Printer UNLV AMSL Lab Proposal & Commercialization Contributor</p> <ul style="list-style-type: none"> • Coauthored the original funding proposal for a modular, transportable 3D printer concept for sports equipment applications. • Led market research on the Sports Equipment Manufacturing Industry (SEMI) to inform proposal scope and commercialization potential. • Proposal received funding and media coverage; project later resulted in a granted U.S. patent (US12162218B2, not listed as inventor). • Supported documentation and external communication efforts including podcast promotion materials.

2019 - 2022	AMSL Fluid-Structure Interaction (FSI) Facility Setup UNLV AMSL Lab Project Lead <ul style="list-style-type: none"> • Spearheaded lab infrastructure setup for dynamic fluid interaction studies. • Oversaw procurement, installation, and safe operation of recirculating flume, PIV System, and 3-phase variable frequency drive for facility power and control. • Wrote SOPs and designed custom laser enclosure and safety protocols for Class 4 laser integration.
2019	Spiral PVDF Energy Harvester Korea Institute of Science and Technology (KIST) Soft Mechatronics & Robotics Lab Visiting Research Assistant <ul style="list-style-type: none"> • Co-developed a spiral-shaped PVDF energy harvester embedded in a silicone-based finger bending model. • Designed and fabricated a test rig simulating joint motion; evaluated energy output under mechanical stress. • Co-authored award-winning conference paper at AMSM 2019 with Yeunhee Kim.
2019	Computer Vision-Based FSI Tracking Tool UNLV AMSL Lab Originated as course project in <i>Special Topics: Imaging and Image Processing</i> <ul style="list-style-type: none"> • Created a Mathematica-based notebook for tracking of object deflection, velocity, and fluid movement using video data. • Applied tool to visualize and analyze sensor deformation in underwater flow environments for validation of IPMC-based sensors. • Correlated IPMC voltage output to dynamic bending displacement using custom image processing workflow.
2019	MEMS-Scale Vortex Flow Sensor UNLV AMSL Lab Originated as course project in <i>Advanced Topics: Small Systems</i> <ul style="list-style-type: none"> • Designed and fabricated a miniaturized vortex shedding flow meter using ionic polymer-metal composite (IPMC) sensors. • Implemented a 5 mm IPMC cantilever to detect vortex frequency via open-circuit voltage response. • Verified fluid-structure interaction via COMSOL simulations and compared against empirical flow data.

Teaching Experience

Fall 2024

University of Nevada, Las Vegas, USA
Instructor, Mechanical Engineering

- Taught ME 453 – *Mechanical Vibrations*, a junior/senior-level undergraduate course. Topics included harmonic motion, damping, forced response, and multi-DOF systems.
- Designed and delivered weekly lectures; created all course materials including slides, worksheets, homeworks, quizzes, and exams.
- Implemented an effort-based homework grading system to promote learning over perfectionism and reduce grade anxiety.
- Revised the syllabus and grading structure to better align with ABET accreditation standards.
- Facilitated out-of-class engagement by creating an optional online community space to encourage student questions, collaboration, and informal discussion.
- 4.86/5.00 average instructor rating, exceeding department averages in all categories

Publications

[Google Scholar Link](#)

Books Chapters

- 2020 **Minaian, N.**, Olsen, Z.J., & Kim, K.J. (2020). Ionic Polymer-Metal Composite (IPMC) artificial muscles in underwater environments: review of actuation, sensing, controls, and applications to soft robotics. In *Bioinspired Sensing, Actuation, and Control in Underwater Soft Robotic Systems*.

Journal Publications

- 2025 Fisher, D., **Minaian, N.**, McClain, A., & Kim, K.J. (2024). Scalable DICOM 3D-Printed Phantoms Mimicking Marine Mammal Bone and Soft Tissue. Authors contributed equally. Submitted to *Scientific Reports*.
- 2018 Shen, Q., Stalbaum, T., **Minaian, N.**, Oh, I.K., & Kim, K.J. (2018). A robotic multiple-shape-memory ionic polymer-metal composite (IPMC) actuator: modeling approach. *Smart Materials and Structures*, 28(1), 015009.

Conference Proceedings / Presentations

- 2025 **Minaian, N.**, Fisher, D., Sennain, A., & Kim, K.J. (2025). Scalable, 3D-Printed Phantom of a California Sea Lion Pelvis for Veterinary Blood Extraction Training with Real-Time Feedback. In *Biologically Inspired Materials, Processes, and Systems (BIMPS) XXV*, PC1343001. Presented by D. Fisher
- 2024 **Minaian, N.**, Washington, A., & Kim, K.J. (2024). Artificial Neuromast: Mimicking Nature for Underwater Energy Capture. In *Proceedings of the 5th International Conference on Vibration and Energy Harvesting Applications (VEH 2024)*, Auckland, New Zealand.

- 2024 **Minaian, N.**, Fisher, D., & Kim, K.J. (2024). Sensing like aquatic organisms: using electroactive polymers (EAPs) in an artificial lateral line system. In *EAPAD XXVI*, PC129450G.
- 2024 Fisher, D., A. Sennain, **Minaian, N.**, & Kim, K.J. (2024). From bioimaging to artificial anatomy: 3D printing biomimetic marine life structures. *Bioinspiration, Biomimetics, and Bioreplication XIV*, PC1294407.
- 2023 **Minaian, N.**, Neubauer, J., & Kim, K.J. (2023). Flexible electroactive polymer gel-based artificial skin: flow sensing and visualization. In *EAPAD XXV*, PC124820K.
- 2022 **Minaian, N.**, Olsen, Z.J., & Kim, K.J. (2022). An IPMC open-circuit sensing model with the addition of fluid-structure interaction (FSI). In *Electroactive Polymer Actuators and Devices (EAPAD) XXIV*, PC120420J.
- 2022 Krystek, D., Faccinto, J., Washington, A., Neubauer, J., **Minaian, N.**, Olsen, Z., & Kim, K.J. (2022). Development of a modular 3D printer for customizable wearable technology. In *Nano-, Bio-, Info-Tech Sensors and Wearable Systems*, PC1204501.
- 2021 **Minaian, N.**, & Kim, K.J. (2021). Continuing the investigation of the sensing response of ionic polymer-metal composites: effects of geometry and orientation. In *Bioinspiration, Biomimetics, and Bioreplication XI*, Proc. SPIE 11586, 115860B.

Poster Presentations

- 2023 **Minaian, N.**, Neubauer, J., & Kim, K.J. (2023). Artificial Skin Sensors: Soft Polymer Gel Flow Sensing and Visualization. *Poster presented at UNLV Graduate Symposium 2023. Awarded First Place, Mechanical Engineering Category.*
- 2022 **Minaian, N.**, Olsen, Z.J., & Kim, K.J. (2022). COMSOL Modeling of Electroactive Polymer (EAP) Sensing with Fluid-Structure Interaction (FSI). *Poster presented at UNLV Graduate Celebration 2022.*
- 2020 **Minaian, N.** (2020). *Poster presented at Nevada NASA Space Grant Virtual Poster Competition, Nevada NASA Space Grant Consortium, April 2020.*
- 2019 **Minaian, N.**, Stalbaum, T., & Kim, K.J. (2019). A feasibility study in the use of ionic polymer-metal composites in rectangular cantilever form as flow sensor devices. *Poster presented at SPIE Smart Structures + NDE, EAPAD XXI, March 2019.*

Professional Training

2019	PIV Workshop: Advanced Solutions for Volumetric PIV TSI Inc., Seattle, WA
	Participated in a technical workshop on advanced solutions for Particle Image Velocimetry (PIV), covering experimental setup, data calibration and analysis, and 3D visualization using a 4-camera volumetric system. Included a hands-on session.
2020	On-Site System Installation and Training TSI Inc. UNLV, Las Vegas, NV
	Received one-on-one technical training by TSI's PIV engineer on the operation and maintenance of a full volumetric PIV system with Dense Particle Identification and Reconstruction (DPIR) capabilities. Covered system calibration, laser alignment, and acquisition software (Insight4G + V3V modules).

Technical Skills

Modeling and Simulation	COMSOL Multiphysics, SolidWorks, Autodesk Fusion 360, Simpleware ScanIP
Programming and Data Processing	Python (Jupyter, OpenCV), MATLAB, OriginLab, Wolfram Mathematica, LabVIEW, Tecplot
Experimental Techniques and Instrumentation	Additive Manufacturing (3D Printing), DMA, FFT Analysis, Laser Cutting, Microscopy (Optical, SEM), Particle Imaging Velocimetry (PIV) Systems, TSI INSIGHT 4G/V3V
Imaging and Visualization	DSLR Photography, Planar & Volumetric PIV, Motion Tracking, Computer Vision, DICOM Data Processing
Technical Writing and Communication	Project Reports, SOPs, White Papers, Academic Publications, Grant Proposals, Presentations, Posters, Graphic Arts and Animations

Certifications and Licensure

2018	Fundamentals of Engineering (FE) – Mechanical Discipline National Council of Examiners for Engineering and Surveying (NCEES)
------	--

Professional Affiliations

2018 - Present	Tau Beta Pi, Engineering Honor Society Member inducted for academic excellence and leadership during undergraduate studies.
----------------	---

Professional Service

2023 - Present	Peer-Reviewed Articles for: Intelligent Service Robotics (Springer Nature)
----------------	--

Community Service

2023 - 2024	Technical Advisor, UNLV Senior Design Competition Department of Mechanical Engineering, UNLV
	<ul style="list-style-type: none">Served as technical advisor for two award-winning undergraduate Senior Design teams as part of UNLV's College of Engineering Capstone Competition.Provided guidance on system development, smart material integration, and flow sensing strategies.Both teams received First Place in their respective categories:<ul style="list-style-type: none">Sea Lion Surgical Phantom Project (Daniel Fisher & Abdul Sennain): First Place Mechanical Engineering Award (Fall 2023)IPMC-Based Wave Energy Converter Project (Jonathan Barboza-Zarate & Joel Trujillo): First Place Sustainability Award (Fall 2024)
2019	Tesla Robotics Academy of Nevada Student Volunteer, Las Vegas, NV
	<ul style="list-style-type: none">Supported STEM engagement activities with local educatorsContributed to education outreach through hands-on robotics demonstrations

Languages

English	Native language
Farsi	Advanced Listener, Intermediate Speaker, Novice Reading and Writing
French	Novice Listening, Speaking, Reading, and Writing
Korean	Novice Listening, Speaking, Reading, and Writing

Interests

Art (Painting, Sketching, Digital Art), DIY (Crafts, Home Repair, Decor), Video Games, Tabletop Games, and other general nerd things. Recently getting into indie video game development!