Sean Jafari

Houston | (281) 726-4229 | sinajafari1993@gmail.com | Residency Status: US Permanent Resident

PROFESSIONAL SUMMARY

Mechanical Engineer with over 5 years of experience in optics, photonics, semiconductors, thermal analysis, process optimization, and process modeling. Proven expertise in developing and applying advanced computational methods for optics, photonics, and radiative heat transfer, including RCWA, FDFD, and comprehensive electromagnetic wave analysis, and also data analysis. Adept in both experimental and computational analysis with strong technical skills in Python, MATLAB, COMSOL, Thermal Desktop, and machine learning for energy efficiency improvements and heat transfer optimization.

EDUCATION

PH.D. Mechanical Engineering (Photonics and Radiative Heat Transfer), GPA: 3.9 — 2021-May 2025
- University of Houston, TX, USA

M.SC. Mechanical Engineering, GPA: 3.7 — 2016-2019

B.SC. Mechanical Engineering, GPA: 3.8 — 2012-2016

ACADEMIC EXPERIENCE

RESEARCH ASSISTANT

University of Houston, Houston, TX, Sep. 2021-Present

- Implemented Finite-Difference Frequency-Domain (FDFD) analysis to study the electromagnetic mode conversion in a waveguide system.
- Implemented Rigorous Coupled-Wave Analysis (RCWA) to design high performance nonreciprocal thermal emitter and also design emitters for radiative cooling.
- Developed a numerical method to solve complex dispersion relations.
- Developed a physics-based optimization algorithm to optimize the performance of radiative thermal systems, improving solar thermophotovoltaic system efficiency to 93.3%.
- Applied Bayesian optimization techniques for design and process improvements in thermal emitters.
- Conducted hands-on, high-impact research in emissivity and reflectivity, leveraging Fourier Transform Infrared (FTIR) and Ultraviolet-Visible (UV-vis) Spectroscopy to enhance process control in thermal systems.
- Designed a Heat Circulator and Heat Rectifier by creating a new code package using ray tracing technology in thermal systems.
- Won the best presentation award at the ASME International Mechanical Engineering Congress & Exposition.

RESEARCH ASSISTANT

Sep. 2016 - July 2019

- Designed a microfluidic PCR system and simulated thermal behaviors using COMSOL, applying statistical models for process development and performance improvement.
- Fabricated the designed PCR using Photo-lithography, Physical Vapor Deposition, and Soft-Lithography. Experienced with Scanning Electron Microscope (SEM), contributing to process optimization in material deposition techniques.
- Optimized thermal control processes for microfluidic devices, leading to significant improvements in operational efficiency and thermal management.
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INTERNSHIP

R&D ENGINEER INTERN *(Helix Earth Technology LLC, Houston, Texas)* — 2024-2025
- Thermal design, modeling, and manufacturing of a new type of thermal system for air cooling consuming 50% less energy.
- Designed a new heat exchanger for cooling down the hot humid air and hot concentrated liquids, with 20% higher efficiency.
- Assist in the scale-up and manufacturing processes of systems and components at a startup level.

TECHNICAL SKILLS

Programming Languages: Python, MATLAB, SQL
Software: COMSOL Multiphysics, Thermal Desktop, ANSYS Fluent, SolidWorks, AutoCAD, CATIA, Power BI, Excel
Machine Learning: Developing and implementing custom algorithms and data-driven models to solve complex problems
Process Engineering: Process optimization, process development, process control, and process modeling

ADDITIONAL PROJECTS

ENTREPRENEUR LEAD OF NATIONAL SCIENCE FOUNDATION'S INNOVATION CORPS PROGRAM
Spring 2024
- Derived the customer discovery process of new proposed technology called Nonreciprocal Solar Thermophotovoltaics.
- Conducted 100+ interviews to understand challenges in the renewable energy industry, focusing on solar cells and wind turbines.

GREENTOWN LABS; THE MARTIN TRUST CENTER FOR MIT ENTREPRENEURSHIP — **May 2023-Present**
TEX-E Fellow (Texas Entrepreneurship Exchange for Energy)
- Selected through a competitive process to facilitate partnerships between Texas universities, MIT, industry, and innovation centers to foster energy innovation.
- Work on cutting-edge research projects in climate change.
- Hold conferences related to clean energy and reaching Net Zero by 2050.

MIT ENERGY AND CLIMATE HACK **September 2023**

New Ideas for Preventing Global Warming Using AI and Clean Energies

- Designed AI-driven solutions for global warming mitigation, resulting in a significant cost reduction for green data centers.

PUBLICATIONS AND PATENT

SELECTED PUBLICATIONS

- **Jafari Ghalekohneh, S.**, Do, B., Adebiyi T., Zhao B., and Zhang R., "Automated design of nonreciprocal thermal emitters via Bayesian optimization", Journal of Quantitative Spectroscopy and Radiative Transfer, 2024.
- **Jafari Ghalekohneh, S.**, Du, C., and Zhao, B., "Controlling the Contrast Between Absorptivity and Emissivity in Nonreciprocal Thermal Emitters", Applied Physics Letters, 2023. **[Editor's Pick] [Featured Article]**
- **Jafari Ghalekohneh, S.** and Zhao, B., "Nonreciprocal Solar Thermophotovoltaics", Physical Review Applied, 2022. **[World-Wide Media Reports]**

PATENTS

- U.S. Patent application 63/330,426, "Nonreciprocal Solar Thermophotovoltaics", April 13, 2022.
- U.S. Patent application under preparation, "Perfect Heat Rectification and Circulation with Nonreciprocal Radiative Surfaces in the Far Field", 2025