Kashif Liaqat

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Education

- **Doctor of Philosophy in Mechanical Engineering** — Aug 2022 - Present
  Rice University; CGPA: 4.0/4.0 — *Houston, TX, USA*
  Research Focus: *Energy Systems, Thermal Fluids, Computational Modeling/Optimization, & Artificial Intelligence*
- **Master of Science in Mechanical Engineering (Fulbright Scholar)** — April, 2021
  Florida State University (FSU); CGPA: 3.89/4.0 — *Tallahassee, FL, USA*
  Thesis: *Modeling, Optimization, and Software Development for Concentrated Solar Power (CSP) Plants*
- **Bachelor of Science in Mechanical Engineering (Presidential Award, Gold Medalist)** — Oct, 2018
  Balochistan University of Information Technology, Engineering and Management Sciences (BUITEMS); CGPA: 3.92/4.0 — *Quetta, Pakistan*

Work Experience

- **Energy Systems Lab - Rice University** — Aug 2022 – Present
  Graduate Research Assistant, Department of Mechanical Engineering — *Houston, TX, USA*
  - Researching novel low-cost hybrid energy systems for energy efficiency and waste heat recovery.
  - Applying machine learning to optimize renewable energy deployment and carbon mitigation.
- **Center For Academic and Professional Communication - Rice University** — Aug 2024 – Present
  Graduate Communication Consultant — *Houston, TX, USA*
  - Provide strategic communication consulting to students across academic levels and disciplines.
- **Commonwealth Scientific and Industrial Research Organisation (CSIRO)** — Sept 2024 – Nov 2024
  Visiting Scientist — *Newcastle, NSW, Australia*
  - Conducting a techno-economic analysis of CSP-integrated gas power plants for low-cost energy.
- **Apex Clean Energy Inc.** — June 2023 – Nov 2023
  Resource Assessment Associate — *Charlottesville, VA, USA*
  - Developed software tools to validate Openwind versions and automate technical report generation.
- **National Renewable Energy Laboratory (NREL)** — Jun, 2020 – Dec, 2020
  Graduate Intern - Thermal Optimization — *Golden, CO, USA*
  - Developed Heliostat Aimpoint and Layout Optimization Software (HALOS) for Solar Tower Plants
- **Center for Advanced Power Systems (CAPS)** — Sep 2019 - April 2021
  Graduate Researcher - Thermal Management — *Tallahassee, FL, USA*
  - Modeled and optimized CSP plants to enhance solar thermal efficiency and energy yield.
- **Balochistan University of IT, Engineering & Management Sciences (BUITEMS)** — Dec 2018 – Aug 2019
  Research Associate, Department of Mechanical Engineering — *Quetta, Pakistan*
  - Researched nanofluid-enhanced solar collectors, achieving higher thermal efficiency for CSP systems.

Teaching Experience

- **Rice University** — Aug 2022 – Present
  Graduate Teaching Assistant, Department of Mechanical Engineering — *Houston, TX, USA*
  - Assisted in instruction for undergraduate courses including *Thermodynamics* and *Junior Laboratory II*
  - Occasionally delivered guest lectures on energy topics in *Renewable and Advanced Energy Systems.*
  - Supervising multiple undergraduate researchers as part of the Energy Systems Lab.
- **Balochistan University of IT, Engineering & Management Sciences (BUITEMS)** — July 2021 – Aug 2022
  Lecturer (Teaching Faculty), Department of Mechanical Engineering — *Quetta, Pakistan*
  - Taught courses: *Internal Combustion Engines*, *Power Plants*, & *Health, Safety, and Environment.*
  - Supervised senior design projects focused on sustainable energy and thermal system optimization.

Honors, Fellowships, and Awards

- **1st Prize, Poster Competition**, *2025 IEEE SusTech Conference*, USA (Apr 2025)
- **Outstanding Student-led Paper Award**, *ASME Energy Sustainability Conference*, USA (July 2024)
- **Emerging Scientist Travel/Conference Award**, *National Science Foundation (NSF)*, USA (May 2024)
- **Wagoner Foreign Study Scholarship**, *Rice University*, USA (Dec 2023)
- **The Ken Kennedy Institute Scott Morton Memorial Fellowship**, *Energy HPC Conference*, USA (Nov 2023)
- **Outstanding Paper Award**, *ASME Energy Sustainability Conference*, USA (July 2023)
- **1st Prize, Poster Competition**, *2023 IEEE SusTech Conference*, USA (Apr 2023)
- **Graduate Student Travel Award**, *Rice Engineering Alumni*, Rice University, USA (Mar 2023)
- **Ph.D. Fellowship**, Dept. of Mechanical Engineering, Rice University, USA (Aug 2022 - May 2028)
- **Fulbright Scholarship**, U.S. Department of State (Aug 2019 - May 2021)
- **Gold Medal in BS Mechanical Engineering**, *BUITEMS*, Pakistan (Oct 2018)
- **Merit Scholarship**, *National Testing Service*, Pakistan (Aug 2014 - Aug 2018)

Skills Summary

- **Domains**: Thermal Engineering, Energy, Optimization, Machine Learning, Deep Learning, Software Development
- **Languages**: Python, R, MATLAB, C++, Engineering Equation Solver (EES)
- **Libraries**: Scikit-learn, Tensorflow, Keras, Pandas, PyTorch, Matplotlib, Pysolar, Pyomo, Coolprop, ggplot, ASLR
- **Tools**: Git, Microsoft Office Suite, Solidworks, SolidEdge, AutoCAD, Siemens NX, Ansys, Mathematica, System Advisor Model (SAM), NREL PVWatts, GeoSpatial Toolkit, SolarPILOT, HALOS, Arduino, GitHub, LaTeX
- **Certifications**: Python (Coursera), Data Science (IBM), Microsoft Office Specialist (MOS-2016), Climate Change AI

Grants

U.S. Department of Energy

- *Contributed significantly to two successful research grants led by Prof. Laura Schaefer (Ph.D. Advisor), focused on advancing concentrated solar power and hybrid waste heat recovery technologies.*

Publications (Peer Reviewed)

1. **K Liaqat**, and L Schaefer, "Small-Scale CST for Industrial Heat: Performance and Uncertainty Analysis of Parabolic Troughs on Urban Brownfields" (2025) Solar Energy *(Under Review)*
2. **K Liaqat**, and L Schaefer, "Techno-Economic Analysis of a Solar Thermal-Boosted Organic Rankine Cycle System for Data Center Heat Recovery" (2025) Solar Energy *(Under Review)*
3. MS Hassan, **K Liaqat**, and L Schaefer, "A Comprehensive Review of Characterizing CO_2-Brine Interfacial Tension in Saline Aquifers using Machine Learning" (2025) Environmental Science: Advances *(Under Review)*
4. **K Liaqat**, D Preston, and L Schaefer, "Interfacial Tension Prediction of CO_2 and NaCl Aqueous Solution Using Machine Learning Algorithms" (2025) Scientific Reports. *(Revision Under Review)*
5. **K Liaqat**, W Stein, and L Schaefer, "Techno-Economic Analysis of a Novel CSP and sCO_2-Based System for Waste Heat Recovery in Gas Turbine Power Plants" (2025) ASME International Energy Sustainability Conference. *(Accepted)*
6. **K Liaqat**, G Schulke, and L Schaefer, "Feasibility Analysis of Implementing Small-Scale CSP System for Industrial Process Heat on Urban Brownfields" (2025) ASME International Energy Sustainability Conference. *(Accepted)*
7. **K Liaqat**, and L Schaefer, "Energy Efficiency in Data Centers: Solar Thermal-Boosted Organic Rankine Cycle for Waste Heat Utilization" 12th IEEE Conference on Technologies for Sustainability (SusTech 2025). DOI:10.1109/SusTech63138.2025.11025721
8. **K Liaqat**, S Soleimani, and L Schaefer, "Low-Grade Heat Utilization: Techno-Economic Assessment of a Hybrid CO_2 Heat Pump and Organic Rankine Cycle System Integrated with Photovoltaics and Thermal Storage" (2025) Applied Thermal Engineering. DOI:10.1016/j.applthermaleng.2025.125959
9. S Soleimani, **K Liaqat**, and L Schaefer, "Sustainable Heating: Operational Optimization of a CO_2 Heat Pump Integrated with Renewable Energy and Thermal Storage for Waste Heat Utilization" (2024). DOI:10.2139/ssrn.4803472
10. MS Hassan, **K Liaqat**, and L Schaefer, "Adarmer: An Adaptive Transformer for Direct Normal Irradiance Forecasting" (2024) International Conference on Machine Learning and Applications (ICMLA).DOI:10.1109/ICMLA61862.2024.00036
11. MS Hassan, **K Liaqat**, L Schaefer, and A Zolan, "Modern Deep Neural Networks for Direct Normal Irradiance Forecasting: A Classification Approach" (2024) e-Prime - Advances in Electrical Engineering, Electronics and Energy. DOI:10.1016/j.prime.2024.100853
12. **K Liaqat**, S Soleimani, S Leibowitz, J Temming, H Kösters, and L Schaefer, "From Waste to Resource: A Techno-Economic Evaluation of a CO_2 Heat Pump and ORC Combined System with Photovoltaic Integration and Thermal Storage" (2024) ASME International Energy Sustainability Conference. DOI: 10.1115/ES2024-130180
13. S Soleimani, **K Liaqat**, J Temming, H Kösters, and L Schaefer, "The Optimal Operation of a District Heating System using a PV-Assisted CO_2 Heat Pump and Thermal Energy Storage" (2024) ASME International Energy Sustainability Conference. DOI: 10.1115/ES2024-130332
14. S Soleimani, L Schaefer, **K Liaqat**, A Cole, J Temming, and H Kösters, "Enhancing CO_2 Water-to-Water Heat Pump Performance Through the Application of a Multi-Objective Evolutionary Algorithm" (2024) ASME Journal of Energy Resources Technology. DOI: 10.1115/1.4064657
15. S Soleimani, L Schaefer, **K Liaqat**, A Cole, J Temming, and H Kösters, "An Optimization Study of CO_2 Heat Pump Water Heaters Using NSGA-II" (2023) ASME International Energy Sustainability Conference. DOI: 10.1115/ES2023-107445
16. **K Liaqat**, J Ordonez, L Schaefer, and A Zolan, "Design and Techno-Economic Analysis of a 150-MW Hybrid CSP-PV Plant" (2023) 10th IEEE Conference on Technologies for Sustainability (SusTech 2023). DOI: 10.1109/SusTech57309.2023.10129553
17. **K Liaqat**, and J Ordonez, "Design and Optimization of CSP Power Plants for Pakistan: A Comparative Study" (2023) Clean Energy. DOI: 10.1093/ce/zkad018

18. **K Liaqat**, A Zolan, and J Ordonez, "Performance Assessment of Pakistani Central Receiver Plant Case Study Using Aimpoint Strategy Optimization Tools" 27th SolarPACES (Solar Power and Chemical Energy Systems) Conference, 2021. DOI: 10.1063/5.0148516
19. A Zolan, W Hamilton, M Wagner, and **K Liaqat**, "Solar Field Layout and Aimpoint Strategy Optimization" National Renewable Energy Lab.(NREL), Golden, CO (United States), 2021. DOI: 10.2172/1813972
20. **K Liaqat**, and J Ordonez, "Molten Salt Based Nanofluids for Solar Thermal Power Plant: A Case Study" (2021) 8th IEEE Conference on Technologies for Sustainability (SusTech 2021). DOI: 10.1109/SusTech51236.2021.9467470
21. A Zolan, W Hamilton, **K Liaqat**, and M Wagner, "Heliostat Aimpoint and Layout Optimization Software (HALOS)" National Renewable Energy Lab.(NREL), Golden, CO (United States), 2021. DOI: 10.11578/dc.20210616.1 Public repository: github.com/NREL/HALOS
22. **K Liaqat**, "Modeling, Optimization, and Software Development for Concentrated Solar Power (CSP) Plants" Masters Thesis, Florida State University, United States, 2021
23. **K Liaqat**, A. Ali and A. N. Mengal, "Design and Simulation of Molten Salt Based Solar Thermal Power Plant using LFR Technology in Pakistan" (2018) International Conference on Computing, Electronic and Electrical Engineering. DOI: 10.1109/ICECUBE.2018.8610990
24. **K Liaqat**, M Anss, A Ali and A Nawaz Mengal, "Modeling and Simulation of a 100 MW Concentrated Solar Thermal Power Plant Using Parabolic Trough Collectors in Pakistan" (2018) International conference on Advances in Engineering Technologies. DOI: 10.1088/1757-899X/414/1/012032

Presentations

1. **K Liaqat**, and L Schaefer, "Enhancing Data Center Energy Efficiency with a Solar Thermal Boosted Waste Heat Recovery System"(2025) Energy High-Performance Computing Conference, Houston, TX. *(Oral + Poster)*
2. **K Liaqat**, and L Schaefer, "Data-Driven Solutions for CO_2 Sequestration and Thermal Optimization in Energy Systems"(2024) ASME International Mechanical Engineering Congress and Exposition, Portland, OR. *(Poster)*
3. **K Liaqat**, MS Hassan, L Schaefer, and A Zolan, "DNI Prediction Using Deep Learning for Optimization of Concentrated Solar Power (CSP) Plants"(2024) International Symposium on Advances in Computational Heat Transfer, CHT-24, Istanbul, Turkey. *(Oral)*
4. **K Liaqat**, and L Schaefer, "Modeling, Simulation, and AI for Energy Systems"(2023) Energy High-Performance Computing Conference, Houston, TX. *(Poster)*
5. **K Liaqat**, and L Schaefer, "DNI Prediction Using Deep Learning for Optimization of Concentrated Solar Power (CSP) Plants" (2023) 10th IEEE Conference on Technologies for Sustainability, Portland, OR. *(Poster)*

Academic Service and Scholarly Reviews

- **Technical Committee Member**
  Renewable Energy and Energy Conversion (REEC), American Society of Mechanical Engineers (ASME).
- **Journal Reviewer**
  Reviewed multiple articles for prominent journals in the energy systems domain.
- **Conference Reviewer**
  Reviewed papers and abstracts for: SolarPACES, ASME Energy Sustainability, and ASHRAE Winter Conference
- **Engineering Competition Judge**
  Oshane Engineering Design Kitchen (ODEK), Rice University (2023)
  Capital Regional Science and Engineering Fair, Tallahassee, FL (2020 & 2021)

Undergraduate Internships

- **Zarghun Gas Field, Mari Petroleum Company Limited (MPCL),** Quetta, Pakistan
  Worked on analysis & pump selection for field's Hot Oil Section - Maintenance Department *July - Sept, 2018*
- **Department of Mechanical Engineering, BUITEMS** Quetta, Pakistan
  Contributed in equipment procurement & setup new Labs in the department *Feb - Mar, 2018*
- **Habibullah Coastal Power Company** Quetta, Pakistan
  Performed Exergy analysis of combined cycle power plant - Maintenance Department *Jan - Feb, 2018*
- **Voice of Balochistan, Center for Strategic & Contemporary Research, Pakistan** Virtual
  Wrote articles on different social/educational aspects/concerns of Balochistan *June - Aug, 2017*
- **Thermal Power Station (1340 MW)** Muzaffargarh, Pakistan
  Performed preventive maintenance & Studied daily demand and supply variations *Jan - Feb, 2017*
- **Millat Tractors Limited** Lahore, Pakistan
  Rotational Job: Machining unit, Engine Assembly Line, Testing Bed and Performance Evaluation *Jan - Feb, 2016*

Volunteer Experience / Community Service / Extra Curricular Activities

- **2025 Middle East and North Africa Machine Learning (MenaML) Winter School** — Doha, Qatar
  Advanced training on state-of-the-art Gen AI and LLMs. — *Feb, 2025*
- **TEX-E Bootcamp - Greentown Labs** — Houston, TX, USA
  Climate Change, Energy Transition, and Entrepreneurship — *Sept, 2023*
- **Rice Pakistani Student Association (RPSA)** — Houston, TX, USA
  President (Current), Treasurer (2022-2024) — *Dec 2022 - Present*
- **University of Oregon, Pre-Academic Training, Fulbright Award** — Eugene, OR, USA
  Introduction to American Culture, Community, and importance of cultural exchange. — *Aug - Sept, 2019*
- **LEADS Academy of Excellence (Co-Founder, Speaker, Organizer)** — Quetta, Pakistan
  Workshops for career counseling, higher educational opportunities and international scholarships. — *2017, Present*
- **Youth Mobilization Campaign, Voice of Balochistan** — Pakistan
  Represented my university at a national youth mobilization and training program. — *2017*
- **Association for Academic Qualities (AFAQ)** — Quetta, Pakistan
  Volunteered to organize leadership camps and also served as a motivational speaker. — *July, 2013 - Aug, 2014*
- **AFAQ Leadership Camp for the Talented Students of Balochistan (Participated Twice)** — Pakistan
  Only two students were nominated to represent our high school at the leadership skill building camp. — *2009 & 2010*