Atyab Azhar

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Education

MIT Centre for Transportation and Logistics   MITx, edx
The MITx MicroMasters® in Supply Chain Management (SCM)   Expected, June 2024
- Program nurtures critical thinking, data analysis, research, application of theory, and innovative supply chain solutions development.

University of Pennsylvania - Penn Engineering   Online
Introduction to Robotics Specialization   July 2023
- Provided insights into robot dynamics, applications, navigation, programming, and various sub-fields.

National University of Sciences & Technology – NUST   Islamabad, Pakistan
B.S. in Mechanical Engineering GPA 3.78/4.0   May 2019
- Participated in four semesters of undergraduate research two semesters under the guidance of Prof. Tariq Mairaj, and two under Prof. Hassan Bukhari latter culminated into an undergraduate thesis.
- 1st Class honors

Research Experience

Research Volunteer at University of Engineering and Technology – UET   Lahore, Pakistan
Advisor: Dr. Kashif Ishfaq   March 2023 to Present

My research focuses on the integration of Industry 4.0, additive manufacturing, and topology optimization, specifically focusing on their symbiotic applications. I apply DFMA principles and advanced TO algorithms to explore and enhance additive manufacturing techniques. My expertise lies in driving topology optimization methodologies to elevate performance and compliance in a wide array of industries.

- Played a key role to leverage additive manufacturing technologies to build complex geometries with remarkable precision, enabling transformative advancements across different industries.
- Developing hybrid mechanisms using enhanced TO algorithms, thus optimizing the efficiency and effectiveness of both compliant and stiff pieces.
- Innovatively utilized augmented reality and digital twins in conjunction with topology optimization to enhance product design visualization and collaboration.
- Conducted extensive research on mitigating cybersecurity risks in AM systems through machine learning algorithms and block chain-based frameworks, aiming to establish new standards for AM system security.

Advisor: Dr. Muhammad Farhan   March 2021 to Present
My research centered around the optimization and performance analyses of renewable energy-powered multi-generation systems, with a specific emphasis on waste-to-energy conversion. This encompasses comprehensive thermodynamic and economic studies of these systems, modeling their potential for simultaneous production of electricity, cooling, heating, and freshwater.

- My work integrates rigorous thermoeconomic analysis methodologies with robust numerical simulations, unveiling the untapped potential of multi-generation systems, and advocating for policies that promote their adoption for a sustainable future. The research led to poster presentation and an abstract publication in the ICEWE 21 – International Conference on Energy Water & Environment
- My research extended to the innovative use of municipal solid waste in a multigeneration system, producing seven outputs including electricity, cooling, heating, and fresh water. Through meticulous energy and exergy analyses, I assessed its performance, emphasizing the potential of waste-to-energy systems in sustainable energy solutions. This research is currently in progress for a full length paper.

NUST Mechanical Engineering   Islamabad, Pakistan
Advisor: Prof. Hassan Bukhari   September 2018 to May 2019

BS Thesis: My research focused on modeling waste-to-energy (WtE) technologies, its global adoption, benefits, underutilization, and the policies encouraging its use. My work combines rigorous thermodynamically-consistent constitutive frameworks with robust numerical implementations.

- We developed a thermodynamically-consistent model to simulate waste-to-energy (WtE) technologies. The model, which has been adjusted to real-world applications, is capable of reproducing both the physical and chemical transformations involved in WtE processes. Using this model, we examined the impact of different waste compositions and processing conditions on the efficiency of energy recovery and emissions.
- We have developed and numerically implemented a multi-scale model that integrates mass and energy balances to simulate the complex WtE process. We have demonstrated through simulations of representative waste scenarios that the energy recovery rate and pollutant emissions are highly dependent on the operational conditions and waste composition.
- I helped devise a computational model to assess policy and economic factors influencing WtE technologies' adoption. This model aids in identifying adoption barriers, suggesting policy solutions, and integrating WtE technical modeling parameters within a broader societal and economic context.

NUST Semester Research Training   Islamabad, Pakistan
Advisor: Prof. Tahir Abdul Hussain Ratlamwala   September to December 2018

This semester-long research training program guided me through a research project focusing on advanced thermodynamic principles. We gained hands-on experience with EES software and delved into the study of energetic and exergetic analyses. The research training was broken down into different modules, allowing us to fully understand and apply these concepts.

- Module 1: Introduction to Thermodynamics and EES Software:
  - Reviewed thermodynamic principles for engineering and introduced Engineering Equation Solver (EES) software.
- Module 2: Conducting Literature Review:
  - Guided on comprehensive literature review, identifying knowledge gaps, and effectively using academic databases.
- Module 3: Mathematical Modeling and Analysis:
  - Learnt energetic and exergetic models, their solution and interpretation via EES.

- Module 4: Data Analysis and Reporting:
  - Learned data analysis techniques, report compilation, addressing limitations, and proposing future research.
- Module 5: Presentation Skills:
  - Developed effective communication skills, enhanced presentation through peer feedback, and prepared for future research.

NUST- PNEC Non Destructive Testing (NDT) Centre   Islamabad, Pakistan
Advisor: Prof. Tariq Mairaj Rasool Khan   January to December 2018

My research concentrated on the design and Computational Fluid Dynamics (CFD) analysis of aircraft fuselage, specifically stress analysis of longerons, stringers, and bulkheads. I employed advanced NDT methodologies and machine learning algorithms to understand and optimize the structural integrity of these critical aircraft components.

- Led the design and stress analysis of an aircraft's nose post-antenna installation and the development of a high-speed drone, demonstrating adeptness in SolidWorks for model analysis and scientific research for theoretical computations. Achievements highlighted by significant creative input, impressive research-backed assumptions, and excellent interpersonal skills in a team setting.
- Voluntarily contributed to the 'Solar Health Assessment' project, employing extensive research skills to determine the remaining useful life of solar-based systems, and earning recognition for exceptional research capabilities.

Research Interests

My research interests are diverse and not limited to:
- Driven by intellectual curiosity, my research interests are multifaceted, extending across Design, Advanced Manufacturing, Sustainable Energy, Robotics, and Thermal Sciences, among others. This diverse focus showcases my adaptability and passion for interdisciplinary innovation.

Undergraduate Mechanics and Materials class
Tutoring to 2nd and 3rd year undergraduate students at NUST   Fall 2018

- Volunteered to teach the junior undergraduate Mechanics and Materials class. Topics included strain, stress, elasticity, fracture, fatigue, plasticity, and viscoelasticity Taught a weekly one hour recitation which reviewed lecture material and solved example problems, and facilitated student laboratory experiments.
- Overall rating 6.4/7

Industry Experience

Powersoft19   Lahore, Pakistan
Experience leading Mechanical Design Projects   July 2019 to Present

- Engaged in designing high voltage line balancing solutions and inverter technologies for Powersoft19's collaborative project with SmartWires, USA.
- Optimized mechanical systems through the application of advanced techniques, including topology optimization and genetic algorithms, resulting in significant weight and cost reduction without compromising performance.
- Utilized simulation and modeling tools such as finite element analysis and computational fluid dynamics to predict and optimize the behavior of mechanical systems and materials.

- Conducted extensive research on innovative manufacturing processes and materials to develop efficient designs for mechanical systems and components.
- Collaborated with research partners from academia and industry, developing and executing joint research projects that enhanced our engineering capabilities.
- Developed rigorous experimental procedures to test and validate new designs and manufacturing processes, leveraging sensors and data acquisition systems for precise results.
- Committed to continuous learning, regularly conducting literature reviews and patent searches to stay abreast of the latest advancements in the field and identify potential research opportunities.
- Contributed to technical report writing, efficiently presenting testing results and research findings to a multidisciplinary team for comprehensive analysis and understanding.
- Demonstrated proficiency in using industry-standard software like CAD, MATLAB, ANSYS, SolidWorks for comprehensive design, simulation, and analysis.
- Demonstrated strong project management skills, efficiently managing multiple projects, prioritizing tasks, and delivering results within stipulated deadlines.

Freelance Projects   2019 to Present
CADZilla & CyberNimbus – Co-owned companies   (w/Clients from Upwork and Fiverr)

Delivered over 50 Finite Element Analysis (FEA) and Computational Fluid Dynamics (CFD) projects using ANSYS, SolidWorks, COMSOL, STAR-CCM+, and ABAQUS. Products varied from electrical appliances, HVAC systems, heatsinks, to formula cars. Catered to global clients, including Siemens, across various continents.

The project scope included:
- Executed comprehensive CFD simulations, specializing in fluid flow, heat and mass transfer, and solar analysis.
- Delivered insightful FEA simulation results, focusing on structural, modal and harmonic analysis, fatigue, and thermal aspects.
- Proficient in seismic analysis, leveraging in-depth knowledge of geophysics and structural mechanics.
- Skilled in performing diverse simulations and analysis, enhancing product performance and reliability.
- Offered design suggestions and improvements, utilizing creative problem-solving abilities.
- Employed advanced machine design, mechanics of materials, and fluid mechanics in design calculations, ensuring robust and efficient product designs.

Fauji Fertilizer Company Limited · Internship   Rahim Yar Khan, Pakistan
Interning Engineer   June to August 2018

- Collaborated on Fauji Fertilizer projects using CAD and MATLAB for equipment modifications and process monitoring.
- Participated in safety training, adhered to protocols, and utilized simulations for predictive maintenance.

Lalpir & Pakgen Power Limited   Muzzaffargarh, Pakistan
Interning Engineer   June to July 2017

- Engaged in design, testing, validation of thermal systems at Lalpir & Pakgen, enhancing safety.
- Assisted troubleshooting, repair of mechanical systems, and improved resource management via BOM modifications and project management tools.

Volunteer, Outreach and Leadership

Engineers without Borders – EWB Canada
Volunteering   April 2023 to Present

- Advancing through membership tiers for personal growth. Applied mechanical design skills, using CAD and simulation tools for sustainable engineering solutions.
- Aimed to overcome engineering obstacles, innovating approaches to create systemic change with EWB.

NUST PNEC Media Club-NPMC   Fall 2015 to 2019

Founded NUST PNEC Media Society to broadcast events, promoting student engagement and culture. Managed executive board (10 members) and club members (20+) to successfully organize festivals, and competitions

- Enabled effective information dissemination, fostering a connected NUST PNEC campus experience.
- Led team to highlight community activities, showcasing PNEC achievements and happenings.
- Organized events such as Blood Donation Drive, TEDx NUST Karachi and Career Fair, exhibiting strong leadership.
- Coordinated philanthropic initiatives and academic sessions, promoting community service and knowledge exchange.

International Youth Math Challenge – IYMC
Brand Ambassador   Sep to Dec 2018

- As IYMC Brand Ambassador, promoted math competition, engaging over 12,500 students from globally.
- Advocated for math education, facilitating participation from 98 countries, challenging them creatively with the opportunity to win prizes worth over 700 USD.

National Cabinets II organized by NED University   Karachi, Pakistan
Brand Ambassador   Nov to Dec 2017

- Promoted youth engagement in National Cabinets, an OpenMicPK project simulating government bodies.
- Supported "Demands from Jawaans" series, highlighting youth's innovative solutions for skill development.
- Participated in discussions on Pakistan's pressing issues across 17 Sustainable Development Goals.

MUNIK IX - Model United Nations held by IBA Karachi   Karachi, Pakistan
Brand Ambassador   Oct to Nov 2017
- Served as Brand Ambassador at MUNIK IX, advocating for student participation and Model UN insights.
- Promoted UN Model Program's mission, guiding students while supporting UN values and SDGs

Licenses, Courses & Certifications

Cybersecurity for Critical Urban Infrastructure   MITx, edx
Issued May 2023
- Completed extensive course on urban infrastructure cybersecurity, mastering defense strategies and social engineering methods through role-play simulations and case studies.

Career Essentials in Project Management   Microsoft & LinkedIn learning
Issued April 2023
- Learnt a broad range of project management concepts, including scheduling, budgeting, team management, stakeholder communication, and risk management.
- Developed proficiency in Microsoft 365 tools for collaboration for efficient project collaboration, management, and optimization. Demonstrated ability to leverage Planner, Project, Lists, and Teams for seamless coordination of project tasks and effective team collaboration.

Programming Foundations: Fundamentals   LinkedIn learning
Issued April 2023
- Gained proficiency in writing source code, working with strings and variables, using conditional code, and effectively troubleshooting errors.
- Mastered various programming languages, transition techniques, decision-making in code, and comment usage.

Agile: It's Not Just for Software   LinkedIn learning
Issued March 2023
- Proficient in applying agile principles to diverse teams and projects, utilizing disciplined Agile.
- Skilled in delivering project value, producing solutions, and implementing retrospective techniques earning PMI recognized Professional Development Units-PDUs.

Six Sigma Foundations   LinkedIn learning
Issued March 2023
- Gained comprehensive understanding of Six Sigma principles, methodologies, and key professional roles.
- Developed skills in DMAIC (Define, Measure, Analyze, Improve, and Control) phases, driving improvements in process, product, and service.

Our Energy Future   UC San Diego, Coursera
Issued April 2019
- Gained 21st-century insights on energy production, environmental impact, and socio-economic implications.
- Explored sustainable energy and food technologies for reducing emissions, fostering a sustainable future.

Awards, Honors and Grants	**Technical Project Lead**	August 2023 - Present

- Entrusted with the responsibility of directing a cross-functional team on a $350M+ project which encapsulates extensive R&D, innovative strategies for new product line, fostering innovation.
- Managing complete project lifecycle from design initiation to product commissioning, including supply chain support and development of detailed IOM manuals.

Team Lead, Recognizing Young leaders   Dec 2020

- Youngest leader at SmartWires conference, spearheading a global team of design engineers, demonstrating outstanding leadership and technical prowess.

Bonus Awards by Powersoft19 and SmartWires, USA   2019 to Present

- Earned multiple bonuses from Powersoft19 and SmartWires for technical expertise, innovation, leadership, and commitment to excellence.

Team Honors – World Economic Forum (WEF) & others   May 2020 to February 2022

- Recognized in World Economic Forum's paper for innovative design in energy sector.
- Our work unlocked 1.7 GW capacity, enabling renewable energy for million homes.
- Achieved customer savings of £395 million through energy transition innovations.
- Received Power & Energy Honors and other prestigious awards for sustainability.

Community service credit award by NUST   January to May 2019

- Devoted two hours weekly for environmental conservation, aiding in a WWF-Pakistan beach cleanup, collecting garbage from six-kilometer shore stretch.
- Collaborated with 800 volunteers, students, and concerned citizens to combat plastic pollution, preserve biodiversity, and promote sustainability as part of CSL-401 (Community Service Learning) course.
- Advocated for environment, addressing plastic pollution, promoting recycling, reusable water bottles.

NUST Rector High Achiever Award   September 2015 to 2018

- Received an award for outstanding academic performance, attaining a high CGPA, showcasing consistent dedication and superior understanding of coursework.

NUST Business idea competition

Organized by 'Momentum', a prominent incubation platform in Pakistan   October 2017

- Secured Runner-up in NUST Business Idea Competition 2017, proposing online platform connecting customers to skilled professionals at homes.

Model United Nations Conferences   September 2016 to February 2017

- Showcased negotiation, public speaking, and diplomacy skills in MUN conferences, earning honorary mentions for contributions.

NUST Sports Competition   2015 and 2016

- Won NUST Inauguration sports competition twice, excelling in teamwork and strategic thinking across sports and activities.

Professional Affiliations	**Member of International Association of Educators and Researchers (IAER)**	August 2018 to Present

- IAER membership expanded global academic and research network, shaping career and fostering innovative initiatives.

Member of International Association of Engineers (IAENG)   August 2018 to Present
- Global network, shaping career, and staying current on engineering advancements.

Student Affiliate Member of Institution of Mechanical Engineers (IMechE)   September 2018 to May 2019
- Gained academic and career support, resources, and networking opportunities for personal and professional growth.

The Society of Digital Information and Wireless Communications (SDIWC)   August to December 2018
- Offered cross-disciplinary collaborations, conferences, tech exposure, and global projects to expand professional network.

Additional Trainings & Workshops

Organizer - SmartWires, USA   July 2019 to Present
- 3d printing training (Mark Two), Markforged, USA
- Failure Modes and Effects Analysis (FMEA), Jira, Agile Change Management, Microsoft Smartsheet and New Product Introduction - NPI Trainings, SmartWires, USA
- Microsoft Project Training, Microsoft, USA
- Playbook: Lean Project Management Software Training, Playbook, USA
- Design for Manufacturing and Assembly (DFMA) training by Chris Tsai, Boothroyd Dewhurst, USA

Organizer – Poweroft19   July 2019 to Present
- Lathe, Mill, CNC, Wire Harnesses, safety, Sheet Metal bending and Laser Cutting Machine Trainings at Rapid Prototyping facility of Powersoft19
- Manufacturing execution system (MES), SolidWorks, Ansys, and Matlab.

Organizer – Pakistan Engineering Council (PEC)
- ARTIFICIAL INTELLIGENCE: Implications for Technologies & Business Strategy April, 2023
- Blockchain for Integrity of Supply Chain   June, 2021
- Entrepreneurship for Engineers   March, 2021

Organizer – NUST   September 2015 to 2019
• Skilled in various workshop tools from hacksaws and chamfers to drill bits and measuring instruments, prioritizing precision and safety.
• Experienced in operating machinery like welders, rolling machines, and drill presses.

Publications (Accepted)

Khan, M. A. A., Farhan, M., Haider, T., Syed, I. A., Altaf, M. A., & Khan, M. D. A. (2021). Multigeneration system with double effect absorption and reheat Rankine cycle using waste as a renewable source. In International Conference on Energy, Water and Environment – ICEWE-2021. Book of Abstracts (pp. 401-405).

Publications (Submitted)

Ishfaq, K., Khan, M.D.A., **Khan, M.A.A**., Mahmood, M.A., Maqsood, M.A. (2023). A Correlation among Industry 4.0, Additive Manufacturing, and Topology Optimization: A State-of-the-art Review. The International Journal of Advanced Manufacturing Technology.

Conferences (Lead Author)

Khan, M. A. A., Farhan, M., Haider, T., Syed, I. A., Altaf, M. A., & Khan, M. D. A. Thermo-economic analysis of multigeneration system with double effect absorption and reheat Rankine cycle using waste as a renewable source.

(In preparation)

Khan, M. A. A., Farhan, M., Haider, T., Syed, I. A., Altaf, M. A., & Khan, M. D. A. (2021, March). Multigeneration system with double effect absorption and reheat Rankine cycle using waste as a

renewable source. In International Conference on Energy, Water and Environment – ICEWE-2021, Poster Presentation.

Skills   **Hardware**: Mill, Lathe, CNC Machining, Injection Molding, PCBA packaging, Arduino, FEA, 3D Printer, Rapid Prototyping
Software: Creo, SolidWorks, Abaqus, Ansys, FlowSim, Matlab, Arduino, Microsoft Office, MS Projects, EES

References   Professor Muhammad Farhan   Dr. Farooq Mukhtar
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