Sheeraz Athar

https://sheerazathar.github.io/

Email : sathar@purdue.edu
Mobile : +1 765-767-2722

RESEARCH INTERESTS

Multimodal tactile sensing, Soft robotics, Robotic manipulation, Underwater sensing and robot development , Robot perception, AI-driven sensor fusion for dexterous manipulation.

EDUCATION

Purdue University, West Lafayette, IN, USA   2022 – Present
Ph.D., Industrial Engineering   *Advisor: Dr. Yu She   (MARS Lab)*

The Hong Kong University of Science and Technology (HKUST), Hong Kong   2019 – 2021
M.Phil., Mechanical Engineering   *Advisor: Prof. Michael Yu Wang*

Aligarh Muslim University (AMU), Aligarh, India   2014 – 2019
B.Tech., Mechanical Engineering   *Advisor: Prof. M. Muzammil*

AWARDS & HONORS

- **Postgraduate Studentship**, Hong Kong University of Science and Technology (HKUST), 2019–2021 Competitive fellowship providing annual financial support for graduate research.

- **Sir Syed Global Scholar Award**, Sir Syed Society of North America, 2018 Awarded for outstanding academic performance and potential among international scholars.

- **S.N. Bose Scholars Program**, Government of India & U.S. NSF, 2018 Selected for a prestigious research internship program facilitating U.S.India scientific collaboration.

- **Mitacs Globalink Research Internship**, École de Technologie Supérieure (ÉTS), Canada, 2018 Fully funded international research internship awarded to top undergraduate researchers.

- **University Merit Financial Award**, Aligarh Muslim University, 2017–2019 Awarded for academic excellence within the Mechanical Engineering program.

- **S.K. Kashyap Merit Scholarship**, Department of Mechanical Engineering, AMU, 2017 Awarded for exceptional academic standing among undergraduate cohorts.

- **Young Researcher Award (Second Prize)**, HWWE Conference, 2017 Recognized for research on EEG-based exoskeleton for rehabilitation therapy.

- **Young Researcher Award (Third Prize)**, HWWE Conference, 2017 Awarded for finite element modeling of human mandible under orthodontic loading.

ACADEMIC APPOINTMENTS AND RESEARCH EXPERIENCE

Graduate Research Assistant, MARS Lab   *Purdue University, USA*
Advisor: Prof. Yu She, School of Industrial Engineering   *2022 – Present*

- Lead researcher on multimodal tactile sensing systems including *VisTac*, *VibTac*, and *FibTac*, integrating visual, vibratory, and fiber-based cues for dexterous robotic manipulation.

- Developed *TacScope*, a miniaturized vision-based tactile sensor for surgical tools (e.g., tumor detection).

- Contributed to the *MOTHERSHIP* project on passenger underwater robots by designing a hybrid gliderdrifter vehicle and its sensing architecture. More details: *here*.

- Developed *AnyTouch*, a thermal tactile sensor capable of perceiving solids, liquids, and gases.

- Collaborated with **Prof. Qiang Qiu** (Purdue ECE) and **Prof. Jun Ueda** and **Prof. Ye Zhao** (Georgia Tech) on multimodal signal modeling, tactile perception algorithms, and experimental validation for the *VisTac* and *VibTac* system.

Graduate Research Assistant, Robotics Institute   *HKUST, Hong Kong*
Advisor: Prof. Michael Yu Wang   *2019 – 2021*

- Conducted M.Phil. thesis research on 3D printable soft actuators inspired by origami architectures. Thesis: *link*.

- Designed an origami-inspired rotary actuator used as a generic rotary joint for soft robots; demonstrated applications in grippers and quadrupeds.

- Proposed an origami bi-directional actuator generating linear motion in two orthogonal directions; explored programming frameworks for adaptability.

- Developed a 3D printing method to fabricate fiber-reinforced foldable structures with a custom nozzle and extruder for Kevlar reinforcement.

Research Intern, Biomechanics Group   *ÉTS, Canada*
Advisor: Prof. Eric Wagnac   *Jun 2018 – Aug 2018*

- Modeled the human spine (T11L1) using finite element analysis; evaluated ligament injury risk under flexion/extension and trauma loading.

- Project report: *link*.

Undergraduate Researcher   *AMU, India*
Department of Mechanical Engineering   *2016 – 2019*

- **EEG-based Exoskeleton for Finger Rehabilitation** (B.Tech. thesis). Developed a linkage-based exoskeleton controlled via EEG signals; received 2nd prize (Young Researcher category) at HWWE 2017. Thesis: *link*.

- **Finite Element Modelling of Human Mandible.** Built CT-derived FE models of the mandible to study orthodontic loading; work presented at HWWE 2017.

PUBLICATIONS

Under Review Journal Articles

- **S. Athar**, X. Zhang, M. R. I Prince, V. G. Duffy, Y. She. "*FibTac*: A Pneumatic-based Fiber Gripper with Embodied Tactile Sensing," *Under Review in Nature Machine Intelligence.*

Refereed Journal Articles

- MRI Prince, **S. Athar**, P. Zhou Y. She, *TacScope*: A miniaturized vision-based tactile sensor for surgical applications, *Advanced Robotics Research*, Wiley, 2025. doi: 10.1002/adrr.202500117 *Video*

- **S. Athar**, X. Zhang, J. Ueda, Y. Zhao, Y. She, *VibTac*: A high-resolution, high-bandwidth tactile sensing finger for multi-modal perception in robotic manipulation, *IEEE Transactions on Haptics*, 2025. doi: 10.1109/TOH.2025.3561049 *Video*

- **S. Athar**, G. Patel, Z. Xu, Q. Qiu, Y. She, *VisTac*: Towards a unified multimodal sensing finger for robotic manipulation, *IEEE Sensors Journal*, vol. 23, no. 20, pp. 2544025450, 2023. doi: 10.1109/JSEN.2023.3310918 *Video*

Conference Proceedings

○ S. Liu, **S. Athar**, M.Y. Wang, Vacuum Driven Auxetic Switching Structure and Its Application on a Gripper and Quadruped, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2020, pp. 88298834. doi: 10.1109/IROS45743.2020.9341338

○ B.A. Khan, A.R. Usmani, **S. Athar**, A. Hashmi, O. Farooq, M. Muzammil, EEG-Based Exoskeleton for Rehabilitation Therapy, *Humanizing Work and Work Environment (HWWE)*, 2017. doi: 10.1007/978-981-15-9054-2_75

○ **S. Athar**, A.R. Usmani, A.A. Khan, P.K. Chaudhari, M. Tariq, Demonstration of Physical Effects on the Assembly of Modeled Teeth and Mandible through Finite Element Analysis, *HWWE*, 2017. doi: 10.1007/978-981-15-9054-2_10

Preprints

○ **S. Athar**, S. Liu, M.Y. Wang, Origami-inspired Bi-directional Actuator with Orthogonal Actuation, *arXiv preprint*, 2023. arXiv:2310.10959

Patents

○ S. Athar, Y. She, "*FibTac: A Pneumatic Fiber-Based Tactile Gripper for Embodied Sensing and Manipulation*," Patent in Preparation, 2025.

GRANTS & PROPOSAL WRITING EXPERIENCE

○ **NSF Foundational Research in Robotics (FRR) Proposal** Contributing researcher on proposal preparation, including drafting the technical narrative and preparing preliminary experimental results. (PI: Prof. Yu She)

○ **USDA Proposal** Assisted with early-stage idea development and preparation of preliminary figures and results for a project on designing a robot for corn grain monitoring. (PI: Prof. Yu She)

TEACHING EXPERIENCE

Graduate Teaching Assistant, Purdue University   *2022–Present*

○ **IE 574: Industrial Robotics and Flexible Assembly** Led robotics and perception laboratories using CoppeliaSim, TMFlow, Python APIs, and FetchCore. Guided student teams on real-time object detection, visual servoing, and multi-robot coordination. Representative student projects: [1], [2], [3], [4].

○ **IE 370: Manufacturing Processes** Supported instruction in traditional and advanced manufacturing methods. Led weekly lab sessions, clarified conceptual topics, and provided individualized student support.

○ **IE 472: Imagine, Model, and Make** Taught 3Ds Max for 3D design, rendering, and animation. Supervised project-based learning and evaluated final design submissions.

Graduate Teaching Assistant, Hong Kong University of Science and Technology   2020–2021

○ **Design and Manufacturing** Instructed SolidWorks for mechanical design, assembly modeling, and system-level CAD. Led project-based coursework in which students developed a complete go-kart assembly over the semester. Provided guidance on design reviews, manufacturability, and documentation.

MENTORSHIP

○ **Cindy (Sijie) Huang (Undergraduate, University of Notre Dame)** Mentored through Purdues SURF program on the design and prototyping of an underwater robotic vehicle. Provided guidance on subsystem integration, testing workflows, and research poster preparation. SURF abstract available: link.

- **Andrew Song** (Undergraduate, Purdue University) Advised on mechanical design tasks, fixture development, experimental setup, and data acquisition for tactile sensing research in the MARS Lab.

- **Craig Hillyer** (Undergraduate, Purdue University) Supervised work on fabrication and testing of tactile sensor prototypes, including characterization procedures and device evaluation for robotic manipulation.

- **Oscar Yu** (Masters Student, Purdue University) Guided research on perception and sensing modules, including integration of tactile sensing with robotic manipulation pipelines and evaluation of sensor performance.

OUTREACH

- Conducted lab tours, demonstrations, and hands-on robotics activities for students from underrepresented and minority communities through Purdue FIRST Programs, helping promote early engagement with STEM.

- Participated in outreach initiatives organized by the Minority Engineering Program (MEP) including the Multi-Ethnic Introduction to Engineering (MITE) summer program and the Pre-Freshman and Cooperative Education (PREFACE) program, mentoring high-school students exploring engineering careers.

- Delivered robotics demonstrations and lab tours to visiting high-school groups from Indianapolis, IN and Kettering, OH, introducing them to sensing, perception, and autonomous systems.

- Advisor / Mentor for the Autonomous Robotics Club (ARC), guiding students on robot design, perception pipelines, and competition preparation.

- More details can be found on my website using this link

PROFESSIONAL SERVICE

- **Lab Operations and Procurement Management, MARS Lab, Purdue University** Solely responsible for managing all purchasing and account-related operations for the MARS Lab, including preparing purchase requests, maintaining budget awareness, and placing orders through Purdues procurement platforms such as Ariba. Coordinate with vendors, internal financial offices, and lab members to ensure timely acquisition of research equipment and materials.

- **Organizer, Weekly Research Seminar**, Institute of Control, Optimization, and Networks (ICON), Purdue University Coordinated speaker invitations, weekly logistics, and seminar operations for the ICON research community.

- **Organizer, Student Research Conference**, ICON at Purdue University Assisted with planning, scheduling, event logistics, and student presentations.

- **Vice-Chairperson**, American Society of Mechanical Engineers (ASME) AMU Student Chapter Organized technical events, seminars, and a university-wide educational tour to Pragati Maidan (India International Trade Fair).

- **Member**, IEEE Robotics and Automation Society

- **Student Member**, IEEE

- **Student Coordination Committee Member**, ZHCET, AMU Facilitated communication between students and administration; contributed to discussions on curriculum updates for undergraduate engineering programs.

- **Organizing Committee Member**, RecruFest (University Job Expo) Supported event logistics and studentindustry engagement activities.

- **Student Ambassador**, ZHCET North America Alumni Association Acted as liaison between alumni and current students; coordinated workshops and information sessions on GRE/TOEFL preparation.

- **National Cadet Corps (NCC) Cadet** Participated in annual training camp and service activities.

WORKSHOPS & CONFERENCES

- **IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)** Detroit, MI, USA October 15, 2023

- **IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)** Las Vegas, NV, USA October 2529, 2020

- **Humanizing Work and Work Environment (HWWE) International Conference** Aligarh Muslim University, India 2017 Presented research on EEG-based rehabilitation exoskeleton and finite element modeling of the mandible.

- **Workshop on Fluid Mechanics & Applications** Department of Mechanical Engineering, AMU, India March 29, 2017 One-day technical workshop on experimental and computational fluid mechanics.

SKILLS

Physical Robot System: Franka Panda, UR-5, UR-10, TM-5, Fetch/Zebra AMR, Staubli
Programming: Python, MATLAB, C++, ROS
Robotics & Simulation: CoppeliaSim, TMFlow, FetchCore
CAD & Design: SolidWorks, Inventor, Fusion 360, AutoCAD
Fabrication: 3D printing, soft robotics fabrication, silicone molding
FEA: ANSYS, Abaqus, HyperWorks, Siemens NX
Computation Tools: MATLAB, NumPy, SciPy
Documentation: LaTeX, MS Office
Operating Systems: Windows, Linux
Languages: English, Urdu, Hindi   *For related documents click here*