Swarnabha Roy

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Education

- **Texas A&M University** — College Station, TX, USA
  Doctor of Philosophy (PhD) in Electrical and Computer Engineering, GPA: 3.86 — *August'19-July'24*
- **Indian Institute of Technology(IIT) Kharagpur** — Kharagpur, West Bengal
  Bachelor of Technology in Electronics and Electrical Communication Engineering, GPA: 7.96 — *July'14-April'18*

Relevant Coursework

Intelligent Systems and Robotics, Reinforcement Learning, Linear Multivariate systems, Software Engineering, Analysis of Algorithms, Machine Learning, Game Theory, Blockchain Foundations, Natural Language Processing.

Skills and Competencies

- **Programming Languages:** Python, Java, R, C, C++, Visual Basic, Latex, Rails, Verilog, JavaScript
- **Tools:** Robot Operating System (ROS), Docker, Kubernetes, Git, PostgreSQL, SQL, MongoDB
- **Platforms:** Linux, Web, Windows, Arduino, Raspberry, AWS, GCP, Nvidia Jetson
- **Soft Skills:** Leadership, Event Management, Writing, Public Speaking, Time Management

Publications

- **Roy S**, Baruah D, Hernandez S, Kalafatis S. Distributed Computation and Dynamic Load balancing in Modular Edge Robotics. In 2022 IEEE 6th International Conference on Robotic Computing (IRC).
- **Roy S**, Vo T, Hernandez S, Lehrmann A, Ali A, Kalafatis S. IoT Security and Computation Management on a Multi-Robot System for Rescue Operations Based on a Cloud Framework. Sensors. 2022; 22(15):5569.
- Biswas, P., **Roy, S.**, Prabhakar, G., Rajesh, J., Arjun, S., Arora, M., Gurumoorthy, B. and Chakrabarti, A., 2017. Interactive sensor visualization for smart manufacturing system. Electronic Visualisation and the Arts (EVA 2017), pp.1-7.
- Bhandari, A. S., Chaudhuri, A., **Roy, S.**, Negi, S., & Sharad, M. (2017, May). Single chip self-tunable N-input N-output PID control system with integrated analog front-end for miniature robotics. In 2017 IEEE 14th International Conference on Networking, Sensing and Control (ICNSC) (pp. 109-114). IEEE.

Academic Projects & Research Experiences

Modular Robotics Research — Texas A&M University
Instructor: Prof. Stavros Kalafatis — *Aug'19 - Present*

- Developed a smart multi-robot system based on ROS for search and rescue operation protected by Blockchain.
- Analyzed drone images on AWS, implemented the A* path planning algorithm, and sent the coordinates to a ground rover. The ground rover performed the local obstacle avoidance.
- Implemented dynamic load balancing on robots using Lightweight Kubernetes K3S, thereby reducing load by 33%.
- Engineered real-time Weed Detection System for Efficient Site-Specific Weed Management using UAVs with Modular Architecture, having spot spraying capabilities.
- Building a cube-based hardware design of modular robotics to be integrated with the container-based architecture.
- Working with a team of 2 students to create a Unity-based Open Source industrial robotic simulation environment.

Virtual Reality (VR) based research for Construction workers — Texas A&M University
Instructor: Dr. Changbum Ryan Ahn — *May'21 - Jul'21*

- Designed the control board and PCB to control the Electronic muscle stimulation (EMS) signals generated from an off-the-shelf EMS device to provide haptic feedback for VR based training of Construction workers.
- Prevented 67% of work-related deaths in work zones by providing a safe artificial environment for training.

Intelligent Inclusive Interaction Design (I3D) Lab — IISc Bangalore, India
Instructor: Dr. Pradipta Biswas — *May'18 - Jun'18*

- Re-engineered Sensor Fusion for Smart Manufacturing by establishing a smart communication system using RF modules between the various IoT units. The data collected was used for Environment, People and Posture tracking, vibration monitoring, etc. to reduce industrial mishaps.
- Designed a Smart Automobile dashboard that can be controlled using hand gestures, which reduces distraction and cognitive load while driving. This project was sponsored by the Automotive technology company **Faurecia**.
- Developed and tested a cricket bat sensor, in partnership with a budding start-up **StanceBeam** with a data accuracy of more than 98%. Used Machine Learning on the data collected through Optitrack cameras and IMU sensors to characterize backlift angle, bat speed and shot accuracy.

Single Chip Self-Tunable PID Controller for Miniature Robotics Aug'16 - Dec'16
Department of E & ECE, IIT Kharagpur *Instructor: Dr. Mrigank Sharad*

- Designed the System-On-a-Chip (SoC) Design of Self Tuning PID Controller for micro robots based on Flexible Neural Networks for emerging miniature robotics using Matlab.
- Developed the PID tuner utilizing Particle Swarm Optimization and built the design for the overall system, including a hardware implementation using Verilog RTL design on *Xilinx*.

Cognitive Mental Workload Estimation Research BCI-HCI Group, IIT Kharagpur
Instructor: Dr. Pabitra Mitra *Aug'16 - Nov'16*

- Analyzed mental workload by measuring cognitive stress using Machine Learning on EEG signal data collected from the cortical regions of the brain using 14 Channel Neuro-emotive Headset.
- Extracted suitable features like amplitude mean, amplitude, variance, skewness, kurtosis, Hjorth parameters, entropy & spectral power and also performed feature selection using ablation test.
- Achieved highest classification accuracy using ANN model (92.3%).

Autonomous Underwater Vehicle (AUV) Project IIT Kharagpur
Dr.Cheruvu Siva Kumar *Feb'15 - Apr'18*

- Redesigned the Kill Switch mechanism and Power Management System, making the underwater vehicle capable of recharging batteries while operating.
- Worked on Obstacle avoidance using *Hydrophones* that are capable of detecting sound waves underwater.

Professional Experience

Graduate Teaching Assistant College Station, Texas
Senior Capstone Design: ECEN 403/404 *Jan'20 - May'23*

- Coached 15 student groups in each semester consisting of 2-4 members in each team. Individualized milestones or deliverable for the projects assigned to the teams and performed hardware and software testing.
- Facilitated weekly team meetings, helped in SW debugging and subsystem integration for the students.
- Designed the class website using Python. The website can automatically form student groups based on the resume uploaded on the website as per the project description.

Software Development Engineer, OYO Rooms Gurgaon, India
Occupancy and Availability Management Team *Jul'18 - Jul'19*

- Developed *Guest Profiling* service in Java that involves personalizing user experience through a seamless offering of optimized and targeted offers based on past booking experience, thereby increasing company profits by up to 25%.
- Developed the front-end for the *Lifeline* Service in JavaScript that can handle Charter Bookings.

Honors and Awards

- **Recipient of the Aggie Core Values Award 2023:** In recognition of exemplifying the Aggie Spirit by consistently displaying the qualities of leadership, excellence, integrity, loyalty, respect, and selfless service.
- **Winner, 2021 Texas A&M data science competition:** Analyzed the role money in the US Presidential elections. Examined the correlation between the political party spending and donations received to the election outcome and provided future investment recommendations.
- **Runner-Up, 2022 Texas A&M data science competition:** Systematized the successes for Texas A&M research in solving complex problems, and which new collaborations across disciplines could strengthen Texas A&M's response to emerging societal challenges provided future investment recommendations.
- **Winner, 6th Inter-IIT Tech Meet:** Designed a cost-effective and efficient safety mechanism for small-sized fishing vessels in order to prevent collision with larger vessels at night.
- **Recipient of the Margaret Rudder Community Service Award 2023**

Positions of Responsibility and Volunteer Experiences

- **President of the Indian Graduate Student Association (IGSA) at TAMU, 2022-Present**: Leading a team of 60 officers to serve Indian graduate students and their families at Texas A&M University.
- **Vice President of Desi Aggies at TAMU, 2019-2021**: Helped in organizing the *Time4Chai* biweekly on Fridays which is attended by 300+ people where people can network, relax and play board games over chai.
- **Embedded team leader of Autonomous Underwater Vehicle (AUV) research group, IIT Kharagpur**: Led a team of 4 Sophomores for the development of AUV internal electronics for participation in competitions organized by *NIOT, Chennai*, and *AUVSI ROBOSUB, San Diego*.
- **Core Team Member of the Student Welfare Group, Student body under the dean of Student Affairs and Counselling Centre, IIT Kharagpur**: Led the role of campus ambassador and helped the freshmen get acquainted with the campus by organizing Campus tours and fun activities.

Eligibility

Eligible to work in the United States on Curriculum Practical Training without sponsorship.