Souravik Dutta

www.souravikdutta.com @souravikdutta souravik001@e.ntu.edu.sg

EXPERIENCE

Nanyang Technological University (NTU) Dec 2025 – May 2026
Research Fellow *Singapore*

- Developed computational model of nonverbal communication based on Laban Movement Analysis mapping cognitive and affective states onto robot motion sequences to define expressive robot behaviors
- Worked on universal framework of expressive robot motion generation based on Principles of Animation using Dynamic Movement Primitives (DMPs) for trustworthy and adaptive Human-Robot Interaction (HRI)
- Prepared research proposals for National Research Foundation (NRF) Singapore's Competitive Research Programme (CRP) grants

University of Alberta May 2024 – Dec 2025
Postdoctoral Fellow *Edmonton, Canada*

- Led the research project titled Building Information Modeling (BIM)-Integrated Multi-Robot Platform for Automated Prefabrication of Panelized Steel Components in Offsite Construction, funded by National Research Council (NRC) of Canada
- Conducted research on Design for Robotic Manufacturing and Assembly (DfRMA) of panelized steel building components integrating product-resources-operations ontology and multi-objective optimization
- Prepared research proposals for Natural Sciences and Engineering Research Council Canada (NSERC) Alliance grants
- Led the research work group on Autonomous Systems for a modular planning and control framework of a mobile manipulator
- Supervised graduate students (MSc and PhD) and research assistants

Nanyang Technological University (NTU) Aug 2017 – Jul 2021
Research and Teaching Assistant *Singapore*

- Conducted research on tower crane path planning and re-planning for the project Smart Integrated Construction System (SICS), sponsored by Housing and Development Board (HDB) Singapore
- Supervised Laboratory MA3071 incorporating the application of 3D Experience software for e-scooter design and kinematic simulation
- Supervised undergraduate students and research interns

Indian Institute of Technology (IIT) Kharagpur Aug 2015 – Jun 2017
Junior Research Fellow *Kharagpur, India*

- Prepared virtual laboratories of Mechanical Signal Processing Systems and Automotive Systems
- Designed digital environments and simulations of experiments for the virtual laboratories using open-source tools

EDUCATION

Nanyang Technological University (NTU) Jul 2017 – Apr 2022
Doctor of Philosophy *Singapore*

- **Field of Study**: Robotics and Automation
- **Thesis**: Intelligent Lift Motion Planning for Autonomous Tower Cranes in Dynamic BIM Environments
- **CGPA**: 4.13 out of 5

Jadavpur University Aug 2010 – Jun 2014
Bachelor of Engineering (Honours) *Kolkata, India*

- **Field of Study**: Mechanical Engineering
- **Courses**: Engineering Mechanics, Mechanism Design, Kinematics and Dynamics of Machines, Robotics.
- **CGPA**: 8.22 out of 10

SKILLS

Languages: MATLAB, Python, C++

Software: Gazebo, ROS, MuJoCo, 3DS Max, AutoCAD, CATIA, SolidWorks, Revit, Simulink

Algorithms and Architectures: Multiobjective Optimization, Evolutionary Computation, Model Predictive Control (MPC), Reinforcement Learning (RL), Vision-Language-Action (VLA) models

PUBLICATIONS

Preprints

- **S Dutta**, R Bector, L Luo, BJ Schmitt. 2026. "From Internal States to Embodied Communication: A Research Agenda for Expressive Motion of Nonanthropomorphic Robots". Submitted to *22nd ACM/IEEE International Conference on Human-Robot Interaction (HRI 2027)*.
- R Bector*, **S Dutta***, P Ramachandran†, RY Yeoh†, JH Tan, D Campolo, BJ Schmitt. 2026. "Anatomy of Uncertainty: Expressive Descriptors of Robot Motion for Nonverbal Human-Robot Communication". Submitted to *22nd ACM/IEEE International Conference on Human-Robot Interaction (HRI 2027)*. DOI
- **S Dutta**, Y Cai. 2024. "Design and Simulation of Time-energy Optimal Anti-swing Trajectory Planner for Autonomous Tower Cranes". *arXiv*. DOI
- **S Dutta**, Y Cai, J Zheng. 2023. "Multi-objective Anti-swing Trajectory Planning of Double-pendulum Tower Crane Operations using Opposition-based Evolutionary Algorithm". *arXiv*. DOI

Journal Articles

- M Afaq, **S Dutta**, AH Gourabpasi, F Jalaei, R Ahmad. 2026. "Robotics and AI for prefabrication of steel building components: Systematic review and future roadmap". *Automation in Construction*, 190, 107107. DOI
- L Huang*, R Pradhan*, **S Dutta**, Y Cai. 2022. "BIM4D-based scheduling for assembling and lifting in precast-enabled construction". *Automation in Construction*, 133, 103999. DOI
- L Huang, **S Dutta**, Y Cai. 2020. "Laser scanned real environment for intelligent virtualization of crane lifting". *Virtual Reality & Intelligent Hardware*, 2(2), 87-103. DOI
- **S Dutta**, Y Cai, L Huang, J Zheng. 2020. "Automatic re-planning of lifting paths for robotized tower cranes in dynamic BIM environments". *Automation in Construction*, 110, 102998. DOI

Conference Proceedings

- D Valenzuela-Robles, **S Dutta**, R Ahmad. 2026. "Design and Simulation-Based Optimization of a Virtual Learning Factory for Structural Steel Prefabrication". In *Proceedings of the 16th Conference on Learning Factories (CLF 2026)*. Accepted.
- R Ahmad, **S Dutta**. 2026. "Applying the 10P Cycle for Success to the Green Hydroponics Learning Factory: A Case Study". In *Proceedings of the 16th Conference on Learning Factories (CLF 2026)*. Accepted.
- L Huang, Y Zhang, J Zheng, P Cai, **S Dutta**, Y Yue, N Thalmann, Y Cai. 2018. "Point cloud based path planning for tower crane lifting". In *Proceedings of Computer Graphics International 2018 (CGI 2018)*, pp. 211-215. DOI
- **S Dutta**, TK Naskar. 2013. "Synthesis of adjustable offset slider-crank mechanism for simultaneous generation of function and path using variable-length links". In *Proceedings of the 1st International and 16th National Conference of Machines and Mechanisms (iNaCoMM 2013)*, pp. 18-20. PDF

MISCELLANEOUS

Awards: *Best Researcher of 2025* by SMART Lab at University of Alberta | *NTU Research Scholarship* by Nanyang Technological University (NTU)

Leadership: *Vice President (Welfare)* of NTU Graduate Students' Association (GSA) | *Director of Recreation* of NTU Graduate Students' Association (GSA) | *Founder and Chairman* of NTU Graduate Students' Association (GSA) Dance Crew

Review Work: Automation in Construction | Swarm and Evolutionary Computation | IEEE Transactions on Automation Science and Engineering | IEEE Transactions on Systems, Man, and Cybernetics: Systems | Nature Scientific Reports

*†Equal Contribution

REFERENCES

Bernhard Johannes Schmitt — Nanyang Technological University
Associate Professor — *School of Art, Design and Media*

- **Website**: Academic Profile
- **Email**: bjschmitt@ntu.edu.sg

Dr Domenico Campolo — Nanyang Technological University
Professor — *School of Mechanical and Aerospace Engineering*

- **Website**: Academic Profile
- **Email**: d.campolo@ntu.edu.sg

Dr Rafiq Ahmad — University of Alberta
Associate Professor — *Department of Mechanical Engineering*

- **Website**: Academic Profile
- **Email**: rafiq.ahmad@ualberta.ca

Dr Yiyu Cai — Nanyang Technological University
Associate Professor — *School of Mechanical and Aerospace Engineering*

- **Website**: Academic Profile
- **Email**: myycai@ntu.edu.sg