

Curriculum Vitae

Dr. Somnath Buriuly

📍 Website: <https://somnath3112.github.io/> · 📧 somnath3112@google.com 📞 91 91631 07203 (INDIA)

PROFILE

- » I bring expertise in modeling and solving both continuous and discrete optimization problems, complemented by a solid foundation in systems and control, which allows me to design hybrid solutions tailored to practical applications. I am a fast learner, quick at grasping mathematical fundamentals, and very quick at prototyping software and hardware solutions. I am deeply passionate about research and development and highly committed to the tasks I take on, consistently striving to meet responsibilities despite the challenges.
- » My research interests are: *Optimization - Offline Trajectory Estimation, Trajectory Optimization, Dynamic Programming, Column Generation, Branch-and-cut, Benders' decomposition, Deep Reinforcement Learning; and Control - Extended Kalman Filter, Constrained Optimal Control.*
- » Systems/setup of interest: *Strapdown Inertial Navigation System (considering Earth's manifold and rotation), Multi-agent time-dependent network, Quadrupe, Robotic Arm, Inverted-cart pendulum, Fixed-wing and rotary-wing drones, Unicycle (differential-drive).*

PUBLICATIONS

- » **S. Buriuly**, L. Vachhani, Self-calibrating Offline Trajectory Estimation Technique for Sporadically Observable Systems, Accepted in *Indian Control Conference*, 2024.
- » **S. Buriuly**, L. Vachhani, A. Sinha, S. Ravitharan, S. Chauhan, A novel branch-and-cut algorithm for Rural Postman Problem with Temporal Unavailabilities: Routing and scheduling in railway network., Preprint *arXiv:2411.02822*, 2024, <https://arxiv.org/abs/2411.02822>.
- » **S. Buriuly**, L. Vachhani, A. Sinha, S. Ravitharan, S. Chauhan, Route planning for capacity restricted agents over railway network, without disrupting train schedules, In *IFAC-PapersOnLine*, Volume 55, Issue 1, 2022, pp. 38-45, <https://doi.org/10.1016/j.ifacol.2022.04.007>.
- » **S. Buriuly**, L. Vachhani, A. Sinha, S. Ravitharan, S. Chauhan, Temporal Recurring Unavailabilities in Multi-agent Rural Postman Problem: Navigating railway tracks during availability time intervals, Preprint *arXiv:2101.04950*, 2021, <https://doi.org/10.48550/arXiv.2101.04950>.
- » S.C. Nagavarapu, L. Vachhani, A. Sinha, **S. Buriuly**, Generalizing Multi-agent Graph Exploration Techniques, In *International Journal of Control, Automation and Systems*, 2020, pp. 1-14, <https://doi.org/10.1007/s12555-019-0067-8>.

MANUSCRIPTS IN PROGRESS

- » **S. Buriuly**, L. Vachhani, A. Sinha, S. Ravitharan, S. Chauhan, Moving Horizon Capacitated Arc Routing Problem, Under second review in *Journal of Combinatorial Optimization*, 2023.
- » **S. Buriuly**, V. Yogi, An approximate LQR law with range feedback for state and control constrained problems, *To be submitted in a week*, Feb 2025.
- » **S. Buriuly**, L. Vachhani, A patent is in progress from the pipeline estimation post-doctoral work, *Prior-art review with the IP Team, Indian Institute of Technology Bombay*, Feb 2025.
- » **S. Buriuly**, et. al., EKTOpt - A robust framework for self-calibrating offline trajectory estimation, *Work in progress*.
- » I. Jaiswal, **S. Buriuly**, A. Sinha, Effect of frequency shaping cost on trajectory planner for mitigation of motion sickness, *Work in progress*.

EDUCATION

📅 2016–present

PhD in Systems and Control (IITB) & Mechanical and Aerospace (Monash)
IITB-Monash Research Academy

📍 Mumbai, India

- » CGPA: 9.22/10 (Percentage: 92.2)
- » **Supervisors:** Prof. Leena Vachhani (IITB), Prof. Arpita Sinha (IITB), Prof. Sunita Chauhan (Monash), Prof. of practice (Monash, IRT) Sivapragasam Ravitharan.
- » **Thesis Title:** Multi-agent routing and scheduling for railway track inspection.

📅 2014–2016

M.tech in Electrical Engineering (Control systems)

IIT Kharagpur

📍 Kharagpur, India

- » CGPA: 8.24/10 (Percentage: 82.4)
- » **Thesis Title:** A simple interval type-2 fuzzy PI and PD controller.

📅 2009–2013

B.tech in Electrical Engineering

NIT Durgapur

📍 Durgapur, India

- » CGPA: 7.88/10 (Percentage: 73.8)
- » **Project Title:** Designing PID controller for pressure control system.

WORK

📅 Nov 2022-present

Postdoctoral Fellow (March 2024-present) and Research Associateship

CoEOGE, IIT Bombay

📍 Mumbai, India

- » **Principal Investigator:** Prof. Leena Vachhani, leena.vachhani.sc@gmail.com
- » **Industry Collaboration:** Indian Oil Corporation Ltd (<https://iocl.com>)
- » **Collaborators:** Mr. Shubham Sharma (Asst. Research Manager, IOCL), Mr Siddhesh Girase (Project Research Engineer, IITB), Mr. Jaivardhan Shukla (Intern)
- » **Objective:** Estimating trajectory of pipeline inspection gauge from large-scale IMU readings, odometer readings, and sporadic GPS readings (available once per kilometer of pipeline).

📅 Jul 2017-Jun 2021

Teaching Assistant (during PhD)

IIT Bombay

📍 Mumbai, India

- » Intelligent Feedback and Control (Spring 2020, online), Advanced Topics in Mobile Robotics (Autumn 2019), Linear and Nonlinear Systems Minor (Spring 2018 & 2017), Adaptive Control Theory (Autumn 2018)

📅 Jul 2015-Jun 2016

Teaching Assistant for Electrical lab 101 (during M. Tech.)

IIT Kharagpur

📍 Kharagpur, India

📅 Sep 2013-Dec 2013

Senior Engineer (under training)

GAIL India Limited

📍 India

- » Trainee - learning the gas pipeline processes

TECHNICAL PROFICIENCY

TOPICS EXPLORED FOR RESEARCH

- **Optimization + Estimation:** Trajectory estimation as optimization, Extended Kalman Filter, state-costate gradient computation, and Lagrangian gradient computation, etc.
- **Optimization + Planning:** Integer decision problems, Benders' and Danzig-Wolfe decomposition, polyhedral study, Lagrangian dual solutions, branch-price-and-cut, dynamic programming, etc.

- **Optimization + Control:** Barrier-based optimization, unconstrained optimal control, fuzzy controller, model predictive control, barrier-based optimal control, direct collocation, control barrier function, etc.
- **Optimization (Heuristics):** Genetic Algorithm, Particle swarm optimization, etc.
- **Motion models:** Inverted cart pendulum, Strapdown Inertial Navigation Systems, Unicycle robot s-domain model, Reduced Inertial Sensor Systems, etc.
- **Learning + Planning + Control:** Trajectory optimization, Markov Decision Processes (MDP) and reinforcement learning, deep reinforcement learning, etc.
- **Self Development:** Frameworks for consistent coding, optimization prototyping framework, draft structuring framework, etc.
- **Systems:** Robotic Arm, Quadruped robot, Double inverted pendulum, Linear Inverted Pendulum Model, etc.
- **Embedded + Hardware:** Microcontroller programming, Circuit design and simulation, Server-client setup, etc.

» **More:** <https://somnath3112.github.io/portfolio/>

PROGRAMMING LANGUAGES AND SOFTWARE SKILLS

MATLAB (oop)	● ● ● ● ● ● ● ● ● ●	Simulink	● ● ● ● ● ● ● ● ● ●
Latex	● ● ● ● ● ● ● ● ● ●	ROS-Gazebo	● ● ● ● ● ● ● ● ● ●
Embedded C - firmware	● ● ● ● ● ● ● ● ● ●	Python	● ● ● ● ● ● ● ● ● ●
Microcontroller interface	● ● ● ● ● ● ● ● ● ●	URDF	● ● ● ● ● ● ● ● ● ●
3D modelling - Blender	● ● ● ● ● ● ● ● ● ●	C++/C# (CPLEX & XNA)	● ● ● ● ● ● ● ● ● ●
Tensorflow	● ● ● ● ● ● ● ● ● ●	MuJoCo	● ● ● ● ● ● ● ● ● ●

AWARDS

- » Developed a novel algorithm and software for *geo-tagging pipeline dataset* for IOCL (India) Limited in 2024.
- » Qualified Gate in Electrical Engineering with an *All India Rank of 177* in 2014.
- » Participated in the National level robotics competition Robocon-2011-13 held in Pune.
- » Participated in the robotics competition in Kshitij-2011, organized by IIT-Kharagpur.

REFEREE

- » **Prof. Leena Vachhani**, Systems and Control, Indian Institute of Technology Bombay,
» Contact: leena.vachhani@iitb.ac.in
- » **Prof. Arpita Sinha**, Systems and Control, Indian Institute of Technology Bombay,
» Contact: arpita.sinha@iitb.ac.in
- » **Prof. Sunita Chauhan**, Director at Center for Equitable & Personalized Health, Plaksha University,
» Contact: sunita.chauhan@plaksha.edu.in