

# Sreeja Roy-Singh

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## Summary of Relevant Professional Experience

### NURO AI, California, U.S.A.

November 2019 – present

**Title:** Senior Director of Engineering & Head of Systems Engineering and Autonomous Vehicle Validation

- Seeded a new organization reporting to the CTO and growing it to ~30 multi-layered engineers who collaborate closely with ML Autonomy, SW Infra, Product, HW, Ops, Legal for highly matrixed projects and external partnerships. Annual KPIs (2024) reported our org to have among the highest performance, engagement, and retention scores in Nuro.
- Evaluate the directional and benchmarked performance of Nuro's AI Driver using exhaustive metrics, scenarios, test automation, architectural coverage, and validated end-to-end behavioral readiness for driverless deployments.
- Recommend and support the build of simulation and ML tooling capabilities to evaluate autonomy, devices, firmware.
- Own the functional safety concept, architecture, requirements, test plans, launch readiness of Nuro's AI platform.
- Responsible for system architecture, eval, verification, validation of safe performance of full stack AI Autonomy for:
  - Uber-Nuro-Lucid partnership to launch a global robotaxi service starting with the U.S. in H2 2026.
  - Town-scale deployment of the driverless R3 fleet in the Bay Area and HOU, unlocking the second largest geographic area serviced by L4 (driver-out) technology in the U.S. Continuous operations since November 2024, with commercial deliveries for Uber and keeping the bar intact of zero accidents or safety events.
  - Neighborhood-scale deployment of the driverless R2 fleet in Palo Alto, MTV, HOU from 2022-24, becoming the third U.S. company to achieve L4. No accidents or safety events in 2.5 years of continuous operations.
- Led the strategic oversight and technical launch readiness of the world's first driverless, passenger-less robot on public roads in three states (CA, AZ, TX) in 2020 followed by commercial deliveries for Dominos' Pizza in TX in 2021.

### START-UP CONSULTANCY, U.S.A.

April – May 2013, November 2017 – February 2019

- *Spire Global Inc.* – Formulated and prototyped the initial architecture of Spire's automated, optimized scheduler to operate its 75+ satellite fleet with 4+ heterogeneous payloads, 30+ ground stations, and a diverse portfolio of products and requirements. Spire IPO'd in 2021 via SPAC at a valuation of \$1.6 billion.
- *Swarm Technologies* – Programmed Swarm's first simulator to plan the architecture and technical parameters for their scaled constellation as a function of spacecraft bus, instruments, global target and coverage requirements. Developed a network simulator to model the performance of the constellation in terms of market-driven access, throughput and latency needs. We closed a \$25 million Series A during my tenure; SpaceX acquired Swarm for \$524 million in 2021.
- *Shell TechWorks* – Supported the founding team of Royal Dutch Shell's internal 'Skunkworks' in raising their seed round by using aerospace concepts applied to the energy industry. Founded for rapid prototyping of technology solutions in the oil and gas industry, TechWorks grew into Shell's commercial start-up arm over the next 10+ years.

### NASA AERONAUTICS AND SPACE ADMINISTRATION (NASA), California, U.S.A.

June 2014 – present

**Title:** Principal Investigator at NASA Ames Research Center, Goddard Space Flight Center, and BAER Institute

- Seeded a lab within NASA, grew it with permanent and rotational hires, led projects, and secured ~\$8 million in funding over ~6y via competitive proposals and support contracts from 4 NASA mission directorates (*italicized below*)
- *Science Technology*: Founded D-SHIELD – a suite of AI-based software tools that helps schedule payload operations of a large constellation with heterogeneous payloads, where the collect and downlink of spaceborne data, constrained by the flight constraints (e.g., orbital mechanics), resources (e.g., power) and subsystems (e.g., attitude control), to optimize value for smart, responsive remote sensing. D-SHIELD is [currently applied](#) to tasking passive microwave satellites to collect high-res data of active wildfires and provide new/enhanced products for fire danger estimation to responders.
- Architected and prototyped the Executive Driver of the open access 'Tradespace Analysis Tool for Constellations'.
- *Space Technology*: Systems Engineering of the Distributed Spacecraft Autonomy Experiment on the Starling Mission, a cluster of 4 inter-communicating spacecraft, demonstrating the ability to measure Total Electron Content in the Plasmasphere by coordinating the selection of appropriate channels on their GPS receivers (payload) autonomously.
- Built the orbital mechanics simulator for designing new NASA missions. Examples: a satellite constellation to perform atmospheric studies using solar occultation, a Cubesat mission for coral reef monitoring from space.
- *Aeronautics Research*: Led the architecture definition and software prototype development for a Space Traffic Management concept of operations. Co-led the NASA-FAA's Communication/Navigation group for unmanned aerial vehicles (UAV) Traffic Management. Developed intelligent ADS-B tech for UAV surveillance and airspace monitoring.

- *Exploration Systems*: Led the development of a ground-based algorithm for satellite pointing and schedule optimization for agile, responsive, planetary imaging. Updated the algorithm to support decentralized, onboard scheduling with Delay Tolerant Networking (DTN) for inter-satellite comm in collab. with NASA Jet Propulsion Laboratory.

**MASSACHUSETTS INSTITUTE OF TECHNOLOGY, Massachusetts, U.S.A. September 2009 – May 2014**

**Title:** Graduate Research Fellow in Aeronautics and Astronautics Engineering

- Architected and wrote the simulator for a nano-satellite constellation within imaging payloads to measure angular variations of reflectance from Earth's surface and improve estimation of global bidirectional reflectance products.
- Developed prototype software tools to analyze distributed space mission architecture trades and select optimal designs by cost, risk and performance for the Software Engineering Division of NASA Goddard Space Flight Center.
- Led the SPHERES Zero Robotics Program 2011-12 in collaboration with DARPA, NASA HQ, Aurora Flight Sciences. Designed and developed software infrastructure for robots and conducted robotics programming tournaments on the International Space Station. The robots are SPHERES satellites and participants programmed them using our tools to play challenging space research games. Logged ~1800 users, ~180000 sims within 4 months.
- Designed Cubesat radiometer constellations for estimating global outgoing radiation, with Draper Laboratory, MA
- Supported the DARPA System F6 Program in collaboration with Orbital Sciences Corporation HQ, Virginia; Performed comparative benchmarking and optimization of fractionated spacecraft by value-centric design.
- Proposed a laser communication downlink from the moon for the Google Lunar X-Prize in collaboration with MIT Lincoln Laboratory. Our communication architecture showed data rates of more than 2 Mbps with mW scale power and within the Lab's available capabilities, modulation schemes, aperture, gimbal, and detector technologies.

**EUROPEAN SPACE AGENCY (ESTEC), Noordwijk, The Netherlands**

**June – September 2010**

**Title:** International Research Fellow at the Advanced Concepts Team – Artificial Intelligence

Demonstrated the scatter maneuver technique for satellite clusters using swarm intelligence and behavior-based path planning based on artificial potential fields. The algorithms were tested in the MIT SPHERES simulation, ground Laboratory, and shipped for validation to the International Space Station.

## Selected Awards and Recognitions

- *NASA FireSense Technology*, first recipient of the program's decadal nation-wide competitive grant, 2023-26
- *NASA Advanced Information Systems Technology* competitive bi-annual grants 2015-17, 2017-19, 2019-2024
- *Engineer of the Year*, Aerospace and Robotics, American Society of Engineers of Indian Origin, 2022
- *Young Alumni Achievement Award*, Indian Institute of Technology Kharagpur, 2021
- *IEEE Opening Keynote Speaker* at the International Geoscience and Remote Sensing Symposium, presented the parallels between self-driving and satellite robotics hosted by the Government of Belgium in Brussels, July 2021
- *Invited Speaker and Awardee* at AeroIndia 2019, Bangalore India; Participated in 2 televised panels - synergy between aerospace/defense start-ups and governments, and women in aviation - moderated and broadcast live on CNBC
- *Outstanding Paper Award for Young Scientists*, Committee on Space Research (Astrodynamics), Pasadena 2018
- *NASA Game Changing Development* grant 2018-21 (flight mission demonstration with Air Force Research Lab)
- *NASA New Investigator Program/Early Career* competitive grant 2018-2020
- *NASA Honor Award for Group Achievement*, NASA Ames Research Center, June 2017
- *Best Presentation Award*, IAA Latin American Symposium on Small Satellites, Buenos Aires, Argentina March 2017

## Academic Leadership and Service

- *Panelist and Selection Committee Reviewer for 8 NASA Research and Flight Programs*: Small Business Innovation Research (SBIR), Small Business Technology Transfer (STTR), Heliophysics Technology Demonstration Mission of Opportunity (TechDemo MO), Heliophysics Technology and Instrument Development for Science (H-TIDeS), Space Technology Research Fellowship (NSTRF), Planetary Science Deep Space SmallSat Studies (PSDS3) program, Decadal Survey Incubation (DSI) Program, and the Early Career Faculty (ECF) Grant.
- *Reviewer for Flanders Research Foundation*, Belgium, to select for commercial spaceflight funding in the European Union.
- *Session Co-Chair and Technical Committee Member* of the IEEE Aerospace Conference, and ESA's 4S Symposium, IWPPS
- *Invited Expert in NASA Headquarters' Weather Focus Workshop* (April 2015) to participate in planning the strategic goals of NASA Earth Science - Weather Focus Area and *Workshop Organizer* (June 2016) for OSSE impact on Weather
- *NASA representative* for FCC/RTCA reviews to approve new satellite-based telecommunication networks
- *NASA Internship Research Advisor* to 5 students from MIT, Stanford, Purdue, U.C. Berkeley and International Space University for durations between 3 months to 1 year; Thesis co-supervisor of 1 student

## Education

### MASSACHUSETTS INSTITUTE OF TECHNOLOGY, U.S.A.

PhD. Space Systems Engineering, Department of Aeronautics and Astronautics, June 2015

*PhD. Thesis:* Design and Evaluation of Distributed Spacecraft Missions for Multi-Angular Earth Observation

S.M. Aeronautics and Astronautics Engineering, June 2012

S.M. in Technology and Policy, Engineering Systems Division, June 2012

*Dual S.M. Thesis:* Collaborative Competition for Crowdsourcing Spaceflight Software and STEM Education using SPHERES Zero Robotics (a program that allows laymen to write spaceflight satellite code)

### INDIAN INSTITUTE OF TECHNOLOGY, KHARAGPUR, India

M.S. in Exploration Geophysics, August 2009 (*Thesis in collaboration with University of California, Berkeley*)

B.S. in Exploration Geophysics with Minor Electives in Electrical Engineering, August 2009

## Relevant Publications (from 136 patents, journal articles, conference proceedings, book chapter, talks, posters)

1. A. Yildiz, S. M. Thornton, C. Hildebrandt, S. Roy-Singh, M. J. Kochenderfer, *SCOUT: A Lightweight Framework for Scenario Coverage Assessment in Autonomous Driving*, IEEE Intl. Conf. on Intelligent Transportation Systems, Nov 2025
2. R. Levinson, V. Ravindra, S. Roy-Singh, *Optimal Planning to Coordinate Science Data Collection and Downlink for a Constellation of Agile Satellites with Limited Storage*, Proceedings of the IJCAI (main track), Canada, August 2025
3. S. Roy-Singh, et al, "Optimal Planning and Machine Learning for Responsive Tracking and Enhanced Forecasting of Wildfires using a Spacecraft Constellation", IJCAI Workshop on AI for Sustainability, a Springer publication, Canada, August 2025
4. S. Roy-Singh, A. P Li, V. Ravindra, R. Lammers, M. Sanchez Net, *Agile, Autonomous Spacecraft Constellations with Disruption Tolerant Networking to Monitor Precipitation and Urban Floods*, RSS Space Robotics Workshop, LA, June 2025
5. S. Roy-Singh, S. Kolekar, D.P. Bonny, K. Foss, *Fractional Collisions: A Framework for Risk Estimation of Counterfactual Conflicts using Autonomous Driving Behavior Simulations*, CVPR DDADS Workshop, Nashville TN, June 2025
6. S. Nag, S.M. Thornton, *Methods and apparatus for failover behavior of autonomous vehicles*, US Patent 12.128.909 (2024)
7. S. Nag, *Framework for validating autonomy and teleoperations systems*, US Patent 11.892.838 (2024)
8. S. Nag, *Methods and apparatus for using scene-based metrics to gate readiness of autonomous systems*, US Patent 11.886.193 (2024)
9. P.H. Kopardekar, S. Nag, D.D. Murakami, *Space traffic management system architecture*, US Patent 11.780.612 (2023)
10. R. Levinson, S. Niemoeller, S. Nag, V. Ravindra, *Planning Satellite Swarm Measurements for Earth Science Models: Comparing Constraint Processing and MILP methods*, Proceedings of the ICAPS (main track), June 2022
11. B. Gorr, V. Ravindra, A. Melebari, A. A. Jaramillo, S. Nag, M. Moghaddam, D. Selva, *Multi-Objective Optimization of an Intelligent Soil-Moisture-Monitoring Satellite Constellation*, Journal of Spacecraft and Rockets 60 (2023), pp 1284-1296
12. R. Lammers, A.S. Li, V. Ravindra, S. Nag, *Prediction Models for Urban Flood Evolution for Satellite Remote Sensing*, Journal of Hydrology 603 (2021), pp 127175.
13. S. Nag, et al, *Prototyping Operational Autonomy for Space Traffic Management*", Acta Astronautica 180 (2021), 489-506.
14. V. Ravindra, S. Nag, A.S. Li, *Ensemble Guided Tropical Cyclone Track Forecasting for Optimal Satellite Remote Sensing*, IEEE Transactions on Geoscience and Remote Sensing 59 (2020), 3607-3622.
15. J.J. Le Moigne, J. Adams, S. Nag, *A New Taxonomy for Distributed Spacecraft Missions*, IEEE JSTARS 13 (2020), 872-883.
16. J. Cappaert, S. Nag, *Network Control Systems for Large-Scale Constellations*, Handbook of Small Satellites (2020), Springer
17. S. Nag, A. S. Li, V. Ravindra, M. Sanchez Net, K.M. Cheung, R. Lammers, *Autonomous Scheduling of Agile Spacecraft Constellations with Delay Tolerant Networking for Reactive Imaging*, ICAPS SPARK Workshop, Berkeley CA, July 2019
18. K. Knobelspiesse, S. Nag, *Aerosol remote sensing with small satellites in formation flight*, AMT 11 (2018), 3935-3954.
19. S. Nag, A.S. Li, J.H. Merrick, *Scheduling Algorithms for Rapid Imaging using Agile Cubesat Constellations*, COSPAR Advances in Space Research - Astrodynamics 61, Issue 3 (2018), 891-913.
20. S. Nag, T. Hewagama, G. Georgiev, B. Pasquale, S. Aslam, C. K. Gatebe, *Multispectral Snapshot Imagers onboard Small Satellite Formations for Multi-Angular Remote Sensing*, IEEE Sensors Journal 17, no. 16 (2017), 5252-5268.
21. S. Nag, J. L. Rios, et al, *CubeSat Constellation Design for Air Traffic Monitoring*, Acta Astronautica 128 (2016), 180-193.
22. S. Nag, C.K. Gatebe, D.W. Miller, O.L. de Weck, *Effect of Satellite Formation Architectures and Imaging Modes on Global Albedo Estimation*, Acta Astronautica 126 (2016), 77-97.
23. S. Nag, J.A. Hoffman, O.L. de Weck, *Collaborative and Educational Crowdsourcing of Spaceflight Software using SPHERES Zero Robotics*, International Journal of Space Technology Management and Innovation (IJSTMI), vol 2, no. 2, 2012.
24. S. Nag, J.G. Katz, A. Saenz-Otero, *Collaborative Gaming and Competition for CS-STEM Education using SPHERES Zero Robotics*, Acta Astronautica 83 (2013), 145-174.
25. S. Nag, L. Summerer, *Behavior-based, Autonomous and Distributed Scatter Maneuvers for Satellite Swarms*, Acta Astronautica 82 (2013), 95-109.

**Computer Languages:** Python, MATLAB, C, C++, Fortran, SQL