

Exponent®
Engineering & Scientific Consulting

Varundev Sukhil, Ph.D.

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Professional Profile

Dr. Varundev Sukhil is a computer scientist with extensive research, development, testing, and validation experience in autonomous systems, cyber-physical systems, complex software systems, and robotics. He has experience building systems and algorithms for consumer electronics and developing digital twin environments.

Before Exponent, Dr. Sukhil developed a digital twin simulation environment for a Department of Defense installation using Google Maps 3D tiles, Cesium API, and Unity. He implemented this environment within the Autoware framework and managed backend simulations on Azure. Dr. Sukhil's significant contributions in the field of autonomous racing include his role as the lead controls and navigation engineer at Cavalier Autonomous Racing, where he developed the ARGOS framework for fully autonomous head-to-head racing and implemented a hybrid-kinematic bicycle model control system that used a customized mission-specific numeric solver. He was instrumental in integrating and testing the software stack used in autonomous racing during the Indy Autonomous Challenge.

Experienced as a robotics engineer, Dr. Sukhil has developed micro-mobility devices such as a self-balancing sidewalk delivery robot and has experience with swarm robotics from deploying a multi-agent autonomous warehouse robot. Dr. Sukhil has designed controller software, hardware, and high-power PCB/A for such robots.

Dr. Sukhil has contributed to technology used by government agencies such as building a heavy-lift UAV for the National Radio Astronomy Observatory (NRAO) and expanding the USDOT CARMA software stack for cooperative driving automation and testing in scaled and controlled environment. He made significant contributions to F/10, an autonomous racing robot testbed that has won multiple international competitions and is used as a teaching aid at universities across the world.

Dr. Sukhil is proficient in various software languages, including C/C++, Python, and MATLAB, and has experience with data frameworks like PyTorch and SciPy. His hardware skills encompass PCB design, 3D prototyping, and CNC milling. He has authored several publications in reputable conferences and journals, focusing on autonomous systems and robotics.

Academic Credentials & Professional Honors

Ph.D., Computer Engineering, University of Virginia, 2022

M.Sc., Computer Engineering, University of Virginia, 2018

B.Eng., Electronics Engineering, Visvesvaraya Technological University, 2014

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Academic Appointments

Co-Instructor:

· F1/10 Autonomous Racing – Learn to build, code, and race a scaled autonomous racecar (Fall 2018, Fall 2019, Fall 2020)

Graduate Teaching Assistant:

· Human Robot Interaction with Aldebaran's Nao Robot (Fall 2016)

· Fundamentals of Electronics (Fall 2017)

· Applied Mathematics II for Engineers (Spring 2018)

Graduate Research Assistant at the Engineering Cyber-Physical Systems Link Lab (2017 - 2019)

Prior Experience

Computer Scientist, Plainspoken (Aug 2023 – May 2024)

Lead Controls and Navigation Engineer, Cavalier Autonomous Racing (Nov 2020 – May 2023)

Robotics Software Engineer, Hyprlabs, Inc. (Dec 2022 – May 2023)

Robotics Software Engineer, Nimble Robotics (May 2022 – Nov 2022)

Professional Affiliations

IEEE, AIAA, ACM, and SAE

Patents

US-11399715: Device and method for capturing, analyzing, and sending still and video images of the fundus during examination using an ophthalmoscope.

Publications

F1/10: An Open-Source Autonomous Cyber-Physical Platform. V Sukhil and M O'Kelly Et al. International Conference on Cyber-Physical Systems (IEEE-ICCPS 2017) in Porto, Portugal

Adaptive Lookahead Pure-Pursuit for Autonomous Racing. V Sukhil and M Behl. International Conference on Intelligent Robots and Systems (IEEE-IROS 2018) in Torino, Italy.

The Precision Radio Instrument for Antenna Measurement (PRIAM). K Makhija and V Sukhil Et al. 34th General Assembly of the International Union of Radio Science (GASS-URSI 2021) in Singapore

ARGOS: Automaton Referencing Guided Overtake System. V Sukhil and M Behl. IEEE – RAL 2023. Presented at Consumer Electronics Showcase (2022) during the Indy Passing Challenge in Las Vegas, NV.

Threading the Needle: Overtaking Framework for Multi-Agent Autonomous Racing. V Sukhil and M Behl. Special Edition on Autonomous Racing (IJAR 2021) by the Society of Automotive Engineers (SAE).

f1tenth.dev: An Open-Source ROS Based F1/10 Autonomous Racing Simulator. V Sukhil and M Behl. International Conference on Automation Science and Engineering (IEEE-CASE 2020) presented virtually.

Bezier-Curve Based End-to-End Trajectory Synthesis for Agile Autonomous Driving. T Weiss and V Sukhil Et al. Presented during the special session on autonomous driving held alongside the International Conference on Intelligent Robots and Systems (IEEE-IROS 2022) in Kyoto, Japan.

Peer Reviews

International Conference on Intelligent Robots and Systems (IROS) 2018, 2022, 2023

International Conference on Robotics and Automation (ICRA) 2018, 2019, 2020

International Conference on Automation Science and Engineering (CASE) 2019, 2022