# Chethana Nilesh Suriyarachchi

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## Fields of Interest

- Autonomous Vehicle Control and Planning
- Cooperation and Communication between Autonomous Vehicles
- Robust Control, Optimization and Deep Reinforcement Learning
- Autonomous Navigation and Exploration Algorithms
- Mobile robot Localization Algorithms

## Education

- **University of Maryland College Park** — **Maryland, USA**
  *Ph.D. in Electrical and Computer Engineering* **- Ongoing** — *2018 – Present*
  - Research Advisor: **Prof. John S. Baras**
- **University of Moratuwa, Faculty of Engineering** — **Moratuwa, Sri Lanka**
  *B.Sc.Eng (Hons) in Electronic and Telecommunication Engineering (First Class)* — *2013 – 2017*
  - **GPA - 4.03** (out of 4.2) **- Class rank - 3rd (out of 100) - Dean's List**

## Honors and Awards

- **Best Student Paper Award** *IEEE International Conference on Intelligent Transportation Systems, 2021*
- **Student Best Paper Award** *IEEE International Conference on Control, Automation and Systems, 2017*
- **Dean's Fellowship** *University of Maryland, College Park, 2018/2019*
- **Migara Ratnatunga Trust Award for University Undergraduates, Industrial Training** *IESL, 2016/2017*
- **Dean's List - All Academic Semesters** *Faculty of Engineering, University of Moratuwa, 2013-2017*
- **Mahapola Higher Education Merit Scholarship** *Government of Sri Lanka, 2013-2017*
- **Dr. G.C.L. Memorial Prize for distinctions in both A/L and O/L examinations** *Royal College, 2011*

## Publications

- Nilesh Suriyarachchi, Faizan M. Tariq, Christos N. Mavridis and John S. Baras, "*Real-time Priority-based Cooperative Highway Merging for Heterogeneous Autonomous Traffic*," *in proceedings of the Intelligent Transportation Conference* (ITSC), 2021. (**Best Student Paper Award**)
- Nilesh Suriyarachchi and John S. Baras, "*Shock Wave Mitigation in Multi-lane Highways using Vehicle-to-Vehicle Communication*," *in proceedings of the Vehicular Technology Conference* (VTC), 2021.
- Nilesh Suriyarachchi, Peshala G. Jayasekara and Takashi Kubota, "*3D Pose Tracking for GPS-denied Terrain Rovers by Fast State Variable Extension and Enhanced Motion Model*," *in proceedings of the IEEE International Conference on Control, Automation and Systems* (ICCAS), 2017. (**Student Best Paper Award**)

- Christos N. Mavridis, Nilesh Suriyarachchi and John S. Baras, "*Reinforcement Learning Robot Control with Progressive State-Action Aggregation*," *in proceedings of the Conference of Decision and Control* (CDC), 2021.
- Christos N. Mavridis, Nilesh Suriyarachchi and John S. Baras, "*Detection of Dynamically Changing Leaders in Complex Swarms from Observed Dynamic Data*," *in proceedings of the Conference on Decision and Game Theory for Security* (GameSec), 2020.
- Fatemeh Alimardani, Nilesh Suriyarachchi, Faizan M. Tariq and John S. Baras, "*Intelligent Highway Routing for Human-Driven and Connected-and-Automated Vehicles*," *in Transportation Systems for Smart, Sustainable, Inclusive and Secure Cities* edited by Prof. Stefano De Luca, 2021.
- Faizan M. Tariq, Nilesh Suriyarachchi, Christos N. Mavridis and John S. Baras, "*Autonomous Vehicle Overtaking in a Bidirectional Mixed-Traffic Setting*," *in proceedings of the American Control Conference* (ACC), 2022. (submitted)

## Submitted Patents

- US PATENT : US 62/604,673 : **Method For Localizing a Mobile Robot in a Dynamic Indoor Environment**

## Professional Experience

- **Graduate Research Assistant** — **University of Maryland College Park, USA**
  *Department of Electrical and Computer Engineering* — *2018 Aug – Present*
- **Robotics Engineering Intern** — **Nokia Bell Labs, NJ, USA**
  *Cloud based SLAM Research* — *2020 Jun – 2020 Aug*
- **Robotics Engineering Intern** — **STEER Tech, MD, USA**
  *Autonomous Vehicle Research* — *2019 May – 2019 Aug*
- **Electronic Engineer** — **Zone24x7 (Pvt) Ltd, Sri Lanka**
  *Retail Robotics Unit* — *2017 Apr – 2018 Jul*
- **Robotic Systems Consultant** — **Kohl's Innovation, Milpitas, California, USA**
  *Retail Robotics Sector* — *2017 Jul – 2018 Jul*
- **Trainee Associate Electronic Engineer** — **Zone24x7 (Pvt) Ltd, Sri Lanka**
  *Retail Robotics Unit* — *2015 Nov – 2016 Jun*

## Teaching Experience

- **Mentoring** — **Zone24x7 (Pvt) Ltd. Sri Lanka**
  *Fields: Exploration Algorithms, Navigation Algorithms* — *2017 Aug – Present*
- **Volunteer teacher** — **Josef Stephan Technical School, Trieste, Italy**
  *Subjects: Electronics, Mechanics, Programming, Chemistry, English* — *2013 Dec - 2014 Jan*
- **Student Development Lecturer** — **Achievers Lanka Business School, Sri Lanka**
  *Subjects: Business Mathematics, Management Accounting Fundamentals* — *2011 Dec - 2012 Apr*

## Technical Skills

- **Programming Languages**
  Coding experience: *Python, C, C++, Java, MikroC, Matlab, OpenCV, Arduino, Verilog, VHDL*
- **Software and Systems**
  - SUMO, Carla and Gazebo simulation frameworks
  - Pytorch based Deep-RL algorithms
  - Gurobi optimization and Matlab framework
  - Robot Operating System (ROS)
  - Solidworks and Auto-CAD based design

## Projects Involved

- **Nokia Bell Labs Internship - Focus on Cloud based systems for autonomous indoor Visual SLAM and navigation**

  Leverage cloud based computing capabilities to perform indoor navigation, localization and task assignment on low cost robotic platforms with simple sensor modules such as IMU, depth and RGB cameras.

- **STEER Tech Internship - Focus on Navigation and Control problems for Autonomous Vehicle Parking. "Your car needs to park. You don't."**

  Participate in development and refinement of spot detection algorithm, parking maneuver algorithm, PID control and various speed models.

- **Undergraduate Research Project - 3D Pose Tracking for GPS-denied Terrain Rovers by Fast State Variable Extension and Enhanced Motion Model**

  Research on using a particle filter based approach to achieve real time 3D position tracking of a GPS denied terrain rover. Terrain data as well as the rover's 2D pose is used to accurately predict the 3D pose via a process named Fast - State Variable Extension. An Enhanced Motion Model was also developed capable of detecting and correcting wheel slippage in 2D pose estimation.

- **Undergraduate Final Year Project - Autonomous exploration and 3D mapping of indoor retail environments using an active-SLAM capable mobile robot platform**

  Development of a robotic platform incorporating an exploration algorithm which provides autonomous navigation goals to aid loop closing during SLAM to obtain better 2D maps. 3D maps were also generated by combining localization data with RGB-Depth data.

- **AZIRO - Autonomous Inventory Management Robotic Platform** (*Zone24x7*)

  Design and implementation of a robotic platform for inventory management using autonomous scanning of retail environments using RFID technology. Project sub sections include, robot hardware design, robot structural design, robot navigation and localization algorithms, exploration algorithms, sensor fusion, robot firmware design, RFID antenna design, RFID tag localization algorithms and environment mapping.

- **Robot localization system with slip detection** (*Zone24x7*)

  Implementation of an adaptive Monte Carlo based localization system with added slip detection, and slip error correction using particle filter re-initialization capabilities.

- **RFID research and RFID tag localization algorithm** (*Zone24x7*)

  Research into modelling of RFID tag, RFID reader and antenna behavior. Data obtained used in the development of a RFID tag localization algorithm for an autonomous retail robot.

- **AZIRO Robot Store Test - Macy's Systems and Technology - Atlanta, Georgia** (*Zone24x7*)

  Deployment and testing of the AZIRO robotic platform at a store test in the Macy's Store, Gwinett Mall, Atlanta. Tasks included robot assembly, mapping, navigation tuning, data collection and test monitoring.

- **Rapidly Exploring Random Tree based multi-agent exploration using Deep RL** (*Project - UMD*)

  Development of RL based multi-agent RRT based exploration and planning algorithm for indoor environments.

- **SLRC 2014 Autonomous Robot and Remote Controlled Manual Robot** (*Sri Lanka Robotics Competition*)

  Development of two robotic platforms. One with line following, grid solving, object detection and gripping capabilities and another with gripping arm and remote controlled rough terrain navigation.

- **REMACS (Remote Electronic Monitoring and Control System)** (*Electronic Design & Realization project*)

  Design of a home automation system capable of remotely controlling home appliances.

- **Automatic Railway Crossing System** (*Engineering Design project*)

  Design of a magnetometer based train detection sensor system for independent automated railway crossing gates in remote areas.

## Personal Skills

- English language proficiency (*TOEFL Score - 116, GRE Verbal Score - 166*)
- Strong Communication / Presentation skills
- Strong Team Work skills

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## Service and Other Activities

- **National Representative - JENESYS 2016 - Tokyo, Japan**
  Electronic & Telecommunication workshop - Japan SAARC Network Program of People-to-People Exchange
- **Youth Model United Nations - 2011 Conference - Sri Lanka**
  Vice Chairperson - General Assembly 2
- **Management Accounting**
  Chartered Institute of Management Accounting - *CIMA Adv. Dip MA*
- **Social Service**
  - Rotaract Club of University of Moratuwa
    *Project Chair of "Healing Hands" 2015* (*Medical Camp for a rural village*)
    *Organizing Committee of "Inspirer" 2014* (*Student language and soft skills development program*)
    *Organizing Committee of "Gift a Smile" 2014* (*Enrichment program for children with special needs*)
  - Interact Club of Royal College
    *Organizing Committee of "Abstract" 2009, 2010* (*Sports festival for multiple orphanages in Colombo*)
- **Leadership Training Camp**
  Leadership training program held at the Advanced Naval Training Center – SLNS Nipuna, Sri Lanka
- **Professional Development**
  - Sri Lanka Robotics Competition – Participant & Organizing committee member
  - Batch Representative (2012 Batch) – Department of Electronics and Telecommunication Engineering
- **Sports**
  - Rugby – Under 18 Rugby team of Royal College
  - Athletics – Medalist in 100m, 200m, 200×4 Relay and High Jump in years 2003 to 2008
  - Basketball – Under 16 Basketball team of Stafford International School
- **Music and Singing**
  Member of the school senior and junior choirs, obtaining national level victories in multiple choir competitions. Play both the piano and guitar as a hobby.

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