Narendiran Gopinathan Chembu

Project Associate - Indian Institute of Technology Madras

www.cgiotics.tech cgnarendiran@gmail.com cgnarendiran +91 8754997789

Education:

Program	Institution	CGPA / %	Year of completion
B. Tech (Stream: Mechanical Engineering) (Minor: Industrial Engineering)	Indian Institute of Technology Madras, Chennai, India	CGPA: [8.78/10]	2017
XII (Central Board of Sec. Edu.)	Maharishi International Residential School, Chennai	96 %	2013
X (Matric)	Sri Saradha Balamandir Mat. Hr. Sec. School, Salem	96.2 %	2011

Publications:

- **Conference Paper:** *(accepted)* "An approach for including evaporation in a model for predicting spray penetration" - 2016
  – 18th Annual Conference on Liquid Atomization and Spray Systems (ILASS) - Asia chapter, Chennai, India *(Gautham Krishnan, Narendiran CG and Shamit Bakshi)*
- **Journal Paper*:** *(accepted)* "Aqueous Dispersions of Lipid Nanoparticles Wet Hydrophobic and Superhydrophobic Surfaces" - 2017
  – Soft Matter, Royal Society of Chemistry *(Manoj Kumar, Mayuresh Kulkarni, Narendiran Chembu, Arun Banpurkar, Guruswamy Kumaraswamy)*

Research and Technical Experience:

Embodied Cognition: (Dec '16 – ongoing)

Guide: Dr. Balaraman Ravindran

- **DRDO[1]** funded project to build a robot with **affordance learning** schemes that allow it to autonomously acquire skills (in terms of the ability to interact with novel objects/in novel situations) and demonstrate learned schemes in the domain of open world planning
- Fabricated the **perception-guided grasping** pipeline on the Moveit! stack (of ROS[2] framework) as an atomic task to build the behavior repertoire of the robot (includes arm manipulation with gripping capabilities and autonomous navigation)

Autonomous Ground Vehicle (Intelligent Ground Vehicle Competition (IGVC), Michigan, USA): (Sep '16 - Jul' 17)

Guide: Dr. Nithin Chandrachoodan

- Qualified 13th among 31 international teams in debut stint in **globally held competition** comprising several difficult challenges
- Implemented the **navigation stack** fusing IMU and wheel encoders' sensor information for localization **utilizing GPS waypoints**
- Designed and simulated the robot in Gazebo - a virtual physics environment to test SLAM[3] and lane detection CV[4] algorithms

Terrain Estimation and Dynamic Obstacle Avoidance: (Aug '17 - ongoing)

Funding Credits: Industrial Consultancy and Sponsored Research (ICSR) funded Student Innovative Projects

- Constructed 3D occupancy grid map of the estimated terrain and parsed dynamic obstacles using **stereo vision cameras** in ROS
- Accelerated the speed of feasible path selection by path planners using parallel computation in CUDA and graphics processors (nVidiaTx1)

Evaporative fuel spray – droplet model: (Aug '15 - Nov' 16)

Guide: Dr. Shamit Bakshi

- Evaluated the diffusive and convective evaporative constants and co-related the drag slip co-efficient with entrained air velocity in the fuel spray model. Validated the proposed model for non-evaporative case with experimental results
- Analyzed the variation of the deterministic parameters coded in MATLAB. Successfully captured the effect of **evaporation on penetration length** of the fuel droplet spray

Dynamics and deformation of red blood cells in the flow through cylindrical microchannel: (Jan '16 - Mar' 17)

Guide: Dr. Ashis Kumar Sen

- Study on behavior of soft mesoscopic particles especially RBCs and cancer cells and their flow through deformable microcapillaries; behavioral properties help in diagnosis of diseases like malaria and dengue
- Simulated a 3D Poiseuille flow using **LAMMPS[5] for RBCs[6] and cancer cells** using clustered Finite-size Dissipative Particle Dynamics (FDPD) and inspected the implementation of deformable wall boundaries

[1]DRDO-Defense Research Development Organization of India, [2]ROS-Robot Operating System [3]SLAM-Simultaneous Localization and Mapping, [4]CV-Computer Vision, [5]LAMMPS-Large Scale Atomic/Molecular Massively Parallel Simulation, [6]RBCs-Red Blood Cells; *also presented in the meetings of American Physics Society

Technical Skill Set:

- **Languages:** Python, C++, FORTRAN, R (basics), Excel VBA (Visual Basic Advanced)
- **Software:** ROS, Linux, Git, TensorFlow, Arduino, OpenCV, LAMMPS[4], AVR microcontroller programming, MATLAB, Mathematica
- **Simulation and modelling:** AutoCAD, CreoParametric, SolidWorks, Ansys Fluent, ANSA (meshing software)
- **Design:** Adobe Photoshop, Adobe Lightroom

Professional experience:

Research internship at National Chemical Laboratory, Pune (Summer, May '16 - Aug '16)

Guide: Dr. Guruswamy Kumaraswamy

Research Statement: Accounting the difference in diffusive experimental and theoretical timescales for adsorption of cubosome particles on hydrophobic surface; inherent stickiness of these dispersions finds plethora of applications in agriculture and medicine

- Conducted **image analysis** for high-speed captured **drop-impact experiments** and compiled the extracted data for retraction time; determined the effect of charge and trend in size of particles due to variations in ultra-turrax rpm and variation in pluronic concentration
- **Simulated a Monte-Carlo Brownian dynamics** to estimate the number of particles adsorbed; translated initially written MATLAB code to FORTRAN thereby **decreasing the computation time by million times**

Industrial Internship at Caterpillar EDC, Ascendas Tech Park, Chennai (Winter, Dec '15 - Feb '16)

Problem Statement: Backpressure drop calculation for engine exhaust pipes using **1-D tool** (an Ansys-Fluent mimicking software)

- Created flow simulations for diffusers, nozzles, wyes, bends and other standard components caterpillar engineers face
- Re-programmed the 1-D tool using VBA macros in Excel to be user-friendly, **zero cost**, computationally cheap and zero requirements of advanced technical knowledge (Ansys-Fluent or OpenFOAM); the tool predicted values with **95% accuracy**

Relevant Course Work:

**learning currently*

- *Reinforcement Learning (UCL – David Silver)*
- *Deep learning*
- *Fundamentals of Operations Research*
- *Probability and Linear algebra*
- *Machine Learning (Stanford University – Coursera - Andrew Ng)*
- *Game Theory*
- *Neural Networks for Machine Learning (U Toronto – Coursera)**
- *Deep Reinforcement Learning (UCB – Sergey Levine)**

Scholastic Achievements:

- Awarded the coveted **INSPIRE** (Innovation in Science Pursuit for Inspired Research) **award** consecutively for two years 2009 and 2010 by the Department of Science and Technology, India
- Awarded the prestigious **KVPY** (Kishore Vaigyanic Protsahan Yojana) **fellowship** in 2012

Positions of responsibility held in IIT Madras:

Team Lead, Abhiyaan, Center For Innovation (CFI) (2017-*)	▪ Heading and managing a team of **35 members** spanning Software, Electrical, Mechanical, Design, PR and Sponsorship modules
Placement Coordinator (2015-2016)	▪ In liaison with a variety of core-mechanical companies for facilitating on-campus placements ▪ Coordinated with the placement team to **bolster industry-academia relationship**
Coordinator, Sustainability network (2014-2015)	▪ Single-handedly conducted the **campus-wide e-waste collection** in collaboration with **300 NSS (National Service Scheme) volunteers** and disposed them of safely ▪ Implemented **Eco-friendly Diwali celebrations** in IITM campus, reducing ~80% of pollution
Mentor, Avanti (2013-2014)	▪ Volunteered to **teach 50+** underprivileged students at Jawahar Navodhaya (11th grade) and inspired them to excel in their academics ▪ **Mentored two students** personally, who achieved remarkable improvement in their academic performance

Extra and Co-curricular activities:

- Won the final competition at Kaizen Robotics (level 1&2) program organized by Lema labs, 2016
- Exuberant member of photography, media club and fine arts club, IIT Madras
- Active participant in Chennai Terry Fox marathon run, a charity event to raise funds for cancer research