(612) 814-7892
Minneapolis, Minnesota
sivrmn@umn.edu

Sivaraman Rajaganapathy

Ph.D. Candidate, University of Minnesota-Twin Cities

sivrmn.github.io/
linkedin.com/in/sivrmn

A control engineer with experience in machine learning and data analysis for biophysics & biomedical systems and 2 years of industry experience looking forward to contributing to research projects.

Education

Ph.D. in Electrical Engineering with Computer Science Minor **Dec 2022** (Expected)
University of Minnesota, Twin-Cities GPA: *3.789/4* Advisor: *Murti Salapaka*

Master of Technology in Systems and Control **2013**
Indian Institute of Technology, Bombay GPA: *9.82/10* Advisor: *Paluri S V Nataraj*

Bachelor of Engineering in Electrical Engineering **2011**
University of Mumbai GPA: *79.04/100*

Research Experience

Performance Improvement of Non-equilibrium Experiments **JUN 2020 — PRESENT**
Ph.D. Project

- Developed algorithm for quantifying errors in non-equilibrium experiments *[Presented in APS 2022]*
- Released Python based toolbox for error quantification and validated on Optical Tweezers

Modeling Nano-Mechanics of Muscle Proteins **JAN 2017 — PRESENT**
Ph.D. Project

- Collaborated with biochemists to design force spectroscopy experiments characterizing single molecules of proteins linked to muscular dystrophy ***[Published in Nature - Scientific Reports 2019]***
- Implemented robust force control in an atomic force microscope *[Presented in ISPM 2018]*
- Developed Monte Carlo methods to capture molecules' observed behaviors
- Devised statistical tests to evaluate proteins for potential therapy
- Conducted experiments revealing effect of expression system on proteins *[Presented in BPS 2020]*
- Automated experimental analysis, reducing processing time from 1 work day to 2 hours

Change Detection Algorithm **JUL 2016 — JUL 2020**
Ph.D. Project

- Constructed a python-based toolbox for detecting abrupt jumps in system parameters under low signal to noise ratios using dynamic programming ***[Published in Automatica 2022]***
- Explained the behavior of a popular change detection algorithm and found its limits of performance

Intelligent Identifier & Auto-Tuner **JUL 2012 — JUN 2013**
Received Institute Silver Medal - Master's Thesis

- Developed an expert system to start controlling a plant with limited human supervision from a cold start
- Created algorithm that found models with >60% fit for a large class of systems
- High performance controllers validated on hybrid tank, thermal & motor control systems

Professional Experience

Research Intern **JUN 2021 — AUG 2021**
Rhythm Management, Boston Scientific Inc. *Arden Hills, MN*

- **Deep Learning Performance Analysis:** Identified limitations in the training dataset that lead to the prediction errors
- **Data Augmentation:** Created methods to augment limited training data for improved machine learning model performance

Research Intern **JUN 2019 — AUG 2019**
Rhythm Management, Boston Scientific Inc. *Arden Hills, MN*

- **Rhythm Classification:** Developed deep learning models to classify electrocardiograms from implantable devices
- **Deep Learning Automation:** Built framework for hyper-parameter search (model optimization) and for using unlabeled data

Systems Validation Engineer **SEPT 2013 — JUN 2015**
Cypress Semiconductor Corporation *Bengaluru, India*

- **Generic Automation Platform:** Developed a generic test system which can be used for automated validation of all Programmable Systems on Chips (PSoC)
- **Validation:** Designed tests for functional validation of CAN and CapSense blocks and performed preliminary EMI/EMC certification of PSoCs

Applications Engineer **JUN 2013 — SEPT 2013**
Cypress Semiconductor Corporation *Bengaluru, India*

- **CapSense Algorithm Development:** Developed firmware algorithms for auto-tuning capacitive touch sensors and gesture detection using 4 sensors

Intern **JUL 2010 — APR 2011**
Siemens Limited (Part Time) *Mumbai, India*

- Built a corona detector for finding electrical discharges in air to aid quality testing of transformers
- Diagnosed & reduced noise problems to achieve a detection range of 40m in air

Projects

Deep Reinforcement Learning for Multi-Agent Interaction **SEPT 2017 — DEC 2017**
- Investigated conditions that promote agent-agent language evolution from scratch
- Measured performance improvements for bridge crossing when using agent derived communication

Robustness of Control Via Deep Reinforcement Learning **JAN 2017 — MAY 2017**
- Evaluated the robustness of control obtained via reinforcement learning
- Improved stability of derived controllers, validated on openAI Gym's unstable cart-pole system

Automating Deep Learning for Game Playing **SEPT 2016 — DEC 2016**
- Created an unsupervised agent that learned to play the game Super Hexagon using only video data
- Reinforcement learning used to train a neural network to achieve survival times 3x random actions

Conveyor Belt Tracking for on the Fly Machine Operations **FEB 2012 — MAY 2012**
- Developed digital PID controllers to enable machine tools to operate on moving objects, with the aim to reduce production time and energy wastage in assembly lines

Modeling & Control of Vehicle with Four Wheel Steering **JAN 2012 — APR 2012**
- Estimated dynamic models (ARX, ARMAX) for vehicle dynamics from input-output data
- Designed and simulated optimal pole placement controllers with Kalman filters for improved performance and safe operation

Skills

Technical	**Python**, **MATLAB**, Simulink, Labview, C, C++, R
Knowledge Base	Machine Learning, Artificial Intelligence, Optimization, Filtering, Estimation, Identification

Positions of Responsibility

Teaching Assistant **SEPT 2016 — PRESENT**
University of Minnesota, Twin-Cities

- Mentored students on practical control application
- Consistently rate > 5 out of 6 in student feedback
- Upgraded aging hardware and manuals for 2 labs
- Awarded college level John Bowers Excellence Award (2020)

Lab Safety Officer **SEPT 2018 — PRESENT**
Salapaka Lab | University of Minnesota, Twin-Cities

Graduate Student Mentor **MAR 2022 — PRESENT**
Electrical and Computer Engineering | University of Minnesota, Twin-Cities

Grants Review Committee **MAR 2021 — AUG 2022**
Council of Graduate Students | University of Minnesota, Twin-Cities

Alumni Student Mentor **MAY 2018 — MAY 2020**
Alumni Association | IIT Bombay

Department Placement Coordinator **JUL 2012 — MAY 2013**
Career Cell | IIT Bombay

Chair **JUL 2012 — MAY 2013**
IEEE Students' Chapter | Fr. C.R.I.T, University of Mumbai