

Subramanian Ramasamy

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Areas of Expertise

- Mechanical Engineering
 - Mathematical Programming
 - Reinforcement Learning
 - Object oriented programming
 - Combinatorial Optimization
 - Dynamic programming
 - Data structures and algorithms
 - Vehicle Routing Problem
 - Operations Research
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EDUCATION

PhD in Mechanical and Industrial Engineering | UIC, College of Engineering, Chicago, IL, Expected 2023 (GPA: 4.0/4.0)

Coursework: Data Science, Python programming masterclass, Time Series Analysis and Forecasting, Operations Research, Transportation Networks, Mechatronics, Dynamic Systems Analysis and Control

Bachelor of Engineering in Mechanical Engineering | Anna University, Chennai, TN, India, 2019 (CGPA: 8.36/10)

Coursework: Computer Programming in C, Mechatronics – 1, Statistics and Numerical Methods, Ordinary and Partial Differential Equations, Electrical Drives and Controls, Manufacturing Technology–1, Manufacturing Technology–2

TECHNICAL SKILLS

Platforms:	Linux (Ubuntu), MS Office, Github (version control system)
Languages:	C, C++, Python, ROS, SQL, R, HTML, CSS
Solvers:	Gurobi Optimizer, IBM CPLEX, Google OR-Tools
Packages:	Pytorch, Tensorflow, Scikit-learn, Numpy, Pandas, OpenCV
Software:	AUTODESK(CAD/CAM/CNC), LINGO, Minitab, MATLAB, Simulink, Adobe Illustrator

EXPERIENCE HIGHLIGHTS

AMTRAK, Washington, DC, **05/2022 – Present**

Operations Research Intern

- Developed algorithms to implement Predictive Maintenance of trainset components.
- Performed text mining analysis to concentrate on critical subset of components.
- A model is developed to estimate Remaining Useful Life of critical components that predict failures before happening and a mathematical optimization model is developed subsequently to prescribe optimal repair times.

UNIVERSITY OF ILLINOIS AT CHICAGO, IL, **10/2020 – Present**

Graduate Research Assistant

- Working on route optimization of US Army's autonomous ground and aerial systems (UAVs and UGVs) by implementing novel algorithms using mathematical programming and heuristic methods.
- Results are validated in custom-GUI application which is developed in MATLAB for user visualization.
- Implemented novel algorithms and local search heuristics to optimize UGV and UAV routes by developing a software in **Python**. Optimal route planning for the vehicle systems is achieved.
- Implemented global optimization algorithms like Genetic algorithm for UGV optimization and local search heuristics for UAV optimization to perform hierarchical bi-level optimization in any generic scenario map.
- Applied Reinforcement Learning algorithms for UAV optimization to improve the potential of applying such vehicle routing problems to dynamic scenarios.

Projected plans: Extend such machine learning and global optimization algorithms to optimize a fleet of ground and aerial vehicles.

CHENNAI METCO, Chennai, TN, India, **11/2019 - 12/2019**

Data Analyst Intern

- Data analysis is performed by converting raw data into an organized data
 - Achieved data preparation, data cleaning and data validation of products purchased.
 - Created models (regression, pareto-chart analysis) to identify the variables that impact the cost (response) and thereby mitigate annual cost of purchase of industrial products.
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ACADEMIC PROJECTS

Implementation of Genetic Algorithm for hyperparameter optimization of Unmanned Ground Vehicle routing

- Performed global optimization methods such as Genetic Algorithm to optimize the route hyperparameter of the Unmanned Ground Vehicle.
- These optimized hyperparameters are used to optimize the Unmanned Aerial Vehicle routing using local search methods in a hierarchical two-level optimization of UAV-UGV routing.

Prediction of human balance using Machine Learning algorithms

- Developed a Machine Learning classification model using **Python** to accurately predict the fall risk of humans.

Implementation of Reinforcement Learning to solve combinatorial optimization problem

- Developed a program to perform Reinforcement Learning using Neural Networks to solve Vehicle Routing Problem.

Automated path planning and control of an AGV (Autonomous Guided Vehicles)

- Developed a mathematical program to explore shortest path of an AGV between any two locations given by executing a path-finding algorithm (A* algorithm) and solved it using the **Python** code.

Software development for Electric Vehicle modeling using MATLAB and C++

- Involves modeling of the electric vehicle by optimizing the parameters of the powertrain and **development of controllers and software** (motor, brake and battery controllers) to reduce total energy consumption and increase efficiency thereby improving performance.

Graphical User Interface (GUI) for visualizing the path planning of Unmanned Systems

- Assisted in developing a GUI in MATLAB to animate the results obtained from route optimization. Various features like toggle switches, progress bars are implemented to enable user access to information.

Time Series analysis and forecasting of wind energy generation in USA

- Developed a mathematical model using **R programming** to forecast the wind energy generation in US. This project applies a class of models known as Autoregressive Moving Average (ARMA) models.
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PUBLICATIONS

Coordinated route planning of multiple fuel-constrained Unmanned Aerial Vehicles with recharging on an Unmanned Ground Vehicle for mission coverage – Journal of Intelligent and Robotic Systems. Published Date: September 17, 2022

Heterogeneous Vehicle Routing: Comparing Parameter tuning using Genetic Algorithm and Bayesian Optimization– Published Date: July 26, 2022. Link: <https://ieeexplore.ieee.org/abstract/document/9836044>

Cooperative route planning of multiple fuel-constrained Unmanned Aerial Vehicles with recharging on an Unmanned Ground Vehicle – Published Date: July 20, 2021. Link: <https://ieeexplore.ieee.org/document/9476848>