LAKSHAY ARORA

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EDUCATION

Doctor of Philosophy, Aerospace Engineering *September 2020 - Present*
Carleton University, Ottawa, Canada

- Research topic: **Path planning(Guidance and control) for Spacecraft rendezvous and proximity operations under uncertainties, using Machine Learning techniques**

Master of Science (Thesis-based), Aerospace Engineering *August 2017 - May 2020*
Wichita State University, Wichita, United States

- Area of Study: Dynamics and Control
- Thesis title: **Reinforcement Learning Framework for Spacecraft Low-Thrust Orbit Raising**

Bachelor of Technology, Aeronautical Engineering *August 2013 - May 2017*
Manipal Institute of Technology, Udupi, India

SKILLS

- **Programming languages**: MATLAB, Python, Julia, R, C++
- **Modelling and simulation software**: ANSYS(CFD), CATIA V5, Solid Edge, Simulink
- **Frequently used**: NumPy, Pandas, Scikit-learn, Keras, TensorFlow, matplotlib, PySpark, IBM Watson Studio, Jupyter Notebook, NLP, SQL, Tableau, SPSS, Microsoft Office- Word, PowerPoint, Excel, Neuralworks Pro II, LaTeX
- **Language skills**: English, Hindi and German (A2 level)
- **Soft skills**: Confident, Articulate, Able to work with minimum supervision, Self-Motivated, Communication, Team Player

WORK EXPERIENCE

Graduate Research Assistant *September 2020 - Present*
Spacecraft Robotics and Control Laboratory, Carleton University, Ottawa, Canada

- Developing a novel **path planning** algorithm for spacecraft rendezvous and proximity operations, using machine learning.

Graduate Research Assistant - Machine Learning *May 2022 - September 2022*
Mitacs Business Strategy Internship - AI Quest Inc and George Brown College, Toronto, Canada

- Performed text processing in Python and data analysis on large-scale drug datasets (40GB) to discover and analyze relationships between drug compound structure and Adverse drug reactions.

Graduate Teaching Assistant *September 2021 - December 2021*
Mechanical and Aerospace department, Carleton University, Ottawa, Canada

- Conducted theory and labs tutorials for the course MAAE 3202 A, graded weekly assignments, labs, reports, etc, and proctored examinations held for the course.

Lab Assistant *July 2018 - August 2019*
Project Innovation Hub, Wichita State University, USA

- Assisted undergraduates in their projects related to 3D printing, CNC machine, and all the types of equipment available in the lab.

Summer Research Intern *June 2016 - July 2016*
4 Base Report Depot, Indian Air Force Station, Kanpur, Uttar Pradesh, India

- Analyzed various types of jet engines such as Viper, M-53P2, R-29 and cargo plane AN-32 used by Indian Airforce for flight training purposes and observed the overhauling processes for the jet engines.

PROJECTS

Image Classification for Cifar10 Dataset *October 2022*
Applied Artificial Intelligence, Carleton University, Ottawa

- Deep learning project regarding the classification problem of the CIFAR-10 dataset using Convolutional Neural Networks. Best accuracy is provided by Optimizer - SGD for the best model with 83 % accuracy.

Adaptive Control of Robotic Arm under Time-varying Uncertainties *December 2020*
Nonlinear Systems Analysis, Carleton University, Ottawa

- Implemented Function Approximation Technique (FAT) adaptive control scheme for 2-DOF robot arm carrying uncertain time-varying payload and also tested for different desired trajectories and cases to check the tracking performance of the controller.

Flight Ticket Fare Prediction *July 2020*
Personal Project

- A complete end-to-end project to predict the domestic flight prices in India depending on various features using **Random Forest Regressor** and **XGBoost Regressor** which is then deployed as a Flask Web Application on Heroku.

Pseudo-Inverse Boat Controller *May 2019*
Neural Networks Model/Control, Wichita State University, Wichita

- Successfully created a **Neural network psuedo-inverse** controller for the boat described by a specified dynamic model in order to generate a path till a given position. Best training RMS error : 0.7 %

HR Analysis on Graduate Turnover *May 2019*
Big Data Analytics in Engineering, Wichita State University, Wichita

- Project based on the graduate employee turnover dataset which consists of HR information collected at the time of recruitment process which contains scores and ratings. Predicted graduate turnover based on their personal traits and other assessment scores using **Logistic regression** and **Decision trees** in **R** programming language.

Numerical Investigation of Performance and Dynamics Over A Class of Hybrid Airships
Undergraduate Final Project, Manipal Institute of Technology, Udupi *January 2017 - May 2017*

- Conducted batch airfoil analysis on XFLR5 for obtaining optimum airfoils, Designed different models on CATIA V5 as well as Solid Edge 7, Performed the mesh and flow analysis for these models using ANSYS, Coded and analyzed performance and dynamic analysis as per the CFD results with the help of MATLAB R2016a.

PUBLICATIONS/POSTERS

Arora L., Dutta A.
Reinforcement Learning for Sequential Low-Thrust Orbit Raising Problem *January 2020*
30th AAS/AIAA Space Flight Mechanics Meeting in conjunction with the AIAA Science and Technology Forum and Exposition (SciTech 2020)

- Developed a reinforcement learning algorithm, Deep Q-learning to be more specific, using **MATLAB** for optimal tuning of the weights of the objective function for the electric orbit-raising problem of the spacecraft. Best MSE: 0.0025.

Dutta A., Arora L.
Objective Function Weight Selection for Sequential Low-Thrust Orbit-Raising Optimization Problem *January 2019*

- Explored the impact of weights the objective function components on the optimality gap of computed orbit-raising trajectories, and numerical examples based on a variety of orbit-raising scenarios are used to illustrate this effect.

Poster: **Rarefied Hypersonic Flow**
Manipal Research Colloquim-2016

- Designed two blunt bodies on CATIA V5, Analyzed and compared flow results over those two bodies for Mach numbers 5, 10 and 15 using ANSYS

CERTIFICATIONS

IBM Data Science Professional Certificate *December 2019*

- Provided hands-on in the IBM Cloud using real data science tools and real-world data sets.
- Included 9 courses with latest job-ready skills and techniques covering a wide array of data science topics including: open source tools and libraries, methodologies, Python, databases, SQL, data visualization, data analysis, and machine learning.

ACTIVITIES AND LAURELS

- Recipient of the James Sutherland Garvey International Center Scholarship, Wichita State University, May 2018
- Alumni of Controls and Optimization Research and Education (CORE) Laboratory, Wichita State University
- Organizer for Annual Technical festival of Manipal Institute of Technology, Manipal, October 2014
- Secured B-certificate in National Cadet Corps exam held under the authority of Ministry of Defense, Government of India, March 2015