

# LAKSHAY ARORA

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## EDUCATION

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Doctor of Philosophy, Aerospace Engineering  
**Carleton University, Ottawa, Canada**

*September 2020 - Present*

- 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  
**Wichita State University, Wichita, United States**

*August 2017 - May 2020*

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

Bachelor of Technology, Aeronautical Engineering  
**Manipal Institute of Technology, Udupi, India**

*August 2013 - May 2017*

## SKILLS

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- **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, L<sup>A</sup>T<sub>E</sub>X
- **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

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Graduate Research Assistant  
**Spacecraft Robotics and Control Laboratory, Carleton University, Ottawa, Canada**

*September 2020 - Present*

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

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

*May 2022 - September 2022*

- 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  
**Mechanical and Aerospace department, Carleton University, Ottawa, Canada**

*September 2021 - December 2021*

- 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  
**Project Innovation Hub, Wichita State University, USA**

*July 2018 - August 2019*

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

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

*June 2016 - July 2016*

- 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

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

*December 2020*

- Function Approximation Technique (FAT) adaptive control scheme for 2-DOF robot arm carrying uncertain time-varying payload is implemented 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

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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

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### 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

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- 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
- Volunteer for Annual Technical festival of Manipal Institute of Technology, Manipal, October 2013
- Attended 10 days camp hosted by 18 KARNATAKA BATTALION NCC, Mangalore, March 2014
- 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