



# Karan Bharaj

## Machine Learning Engineer

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## SUMMARY

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Driven Chartered Engineer with experience in various domains such as machine learning, data science, and mechanical engineering. Having experienced the potential of machine learning models in overcoming major challenges in my previous roles, I decided to hone my skills by pursuing a Master's in Machine Learning from Georgia Tech. Recently emigrated to Canada on Permanent Residency status, and eager to apply expertise to tackle significant challenges and contribute to ambitious and innovative problems in machine learning and data science.

## EXPERIENCE

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### Tech Lead

Plas-kit Limited

10/2019 - 04/2023

As the primary architect of engineering and technology strategies for a B2B Injection Mold-making enterprise, I spearheaded groundbreaking initiatives and achieved significant milestones like:

- Developed advanced ML models, using Gradient Boosting and Logistic Regression, which automated the quotation process, freeing up to 30% of the engineering team's time.
- Implemented automated Python Scripts for the generation of CAD models using CADQuery, and automated CAM program generation leveraging Autodesk Fusion 360.
- Acquired expertise in using AWS SageMaker to manage the entire lifecycle of ML models.
- Led the integration of next-generation technologies such as 3D scanning, Moldflow analysis simulation, and laser engraving, catalyzing a YoY growth of approximately 20%
- Managed a team of six engineers, leading their recruitment and subsequent professional development. Finally, introduced Daily Scrum team stand-ups to enhance collaboration and expedited problem-solving.

### Data Scientist / Advanced Process Engineer

Rolls-Royce plc

04/2018 - 09/2019

Lead engineer for the technical progression of automated composite manufacturing processes, leveraging a data-first approach to advance the manufacturing of carbon-fiber composite fan blades for R-R's next-generation UltraFan® jet engine. Projects and achievements include:

- Developed Machine Learning models, including Neural Networks and Gradient Boosting, to predict the probability of blade defects using real-time in-process metrics. This approach yielded a ~90% accuracy rate, leading to substantial savings - potentially up to £100k per month, by enabling the early detection and removal of defective blades.
- Utilized Python Visualization Libraries like Plotly/Dash and Bokeh, allowing fellow engineers to visualize and analyze process variables and metrics on-site effectively. This was crucial in promoting a data-driven culture over an intuition-based one.
- Pioneered the introduction of novel technologies such as automated infrared heating.

### Graduate Engineer

Rolls-Royce plc

09/2016 - 03/2018

Voted UK's best Engineering Graduate Scheme in 2016. Completed four attachments across various supply chains. Key projects and achievements include:

- Designed and deployed a novel handling methodology for next-generation composite fan blades (for the UltraFan® engine)
- Created a patentable flexible joint design for Aerospace Engine ducts. Had demonstrated potential for a 52% reduction in cost.

## EDUCATION

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### Machine Learning

2023

Georgia Institute of technology - Computer Science

Graduated GPA of 3.90 (4.0 on ML modules). Relevant projects include:

- Machine Learning (ML)- Employed supervised and unsupervised ML models, including LightGBM, Logistic Regression, and Neural Networks, on large patient datasets about Heart Disease and Breast Cancer. Executed using PyTorch, Keras, and scikit-learn. Also involved feature engineering and optimization techniques like cross-validation.
- Reinforcement Learning (RL)- Interpreted and replicated significant research papers in RL, like 'Temporal Difference' by Sutton. Developed advanced Deep RL algorithms, including PPO, Apex-DQN, and IMPALA, for use in OpenAI's 'Lunar Lander' and Google Research Football environments, attaining top grades in the latter two projects.
- Deep Learning- Constructed various Convolutional Neural Networks (CNNs) for recognizing ingredients from the 'Food-101' dataset. Conducted trials with ResNet-50, DenseNet-161, and Inception-V3. Improved accuracy by leveraging data augmentation, surpassing previous research outcomes, and achieving a perfect grade.
- Artificial Intelligence- Gained expertise in Natural Language Processing (NLP), search, and planning problems. Triumphed in the class competition, 'Prison Dodgeball', through the application of Finite State machines using C# in Unity.

### Mechanical Engineering

2016

The University of Sheffield - Masters in Mechanical Engineering

Included a year-long internship at Rolls-Royce plc, as part of the Manufacturing Systems team. I led the deployment of Data-Driven Improvement (DDI) and Right First Time (RFT) systems.

## CERTIFICATES

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Chartered Engineer (from the Institution of Mechanical Engineers)

02/2023 - Present

Publication in the Journal of Engineering Manufacture- "Fabricating poly(methyl methacrylate) parts using high-speed sintering"

05/2019 - Present

## SKILLS

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Python

Jupyter Lab

PyTorch & TensorFlow

Django

SQL

Scrum & Agile

R

AWS SageMaker

Git

Docker