

Powered by

upGrad

Master of Science in

Machine Learning & Artificial Intelligence



Now integrated with

Generative AI

Duration 18-21 months



The Era Of Generative AI



The world is at the cusp of Generative AI rapidly changing the world as we know it. At upGrad, we've always believed in imparting learners the skills necessary to thrive in the fast-evolving world of technology. We are hence quite thrilled to pioneer Generative AI as an elective in the Master of Science in Machine Learning & Artificial Intelligence.

With this key inclusion of Generative AI, learners will delve deeper into the fascinating realm of using Data Science to build practical applications like conversational AI chat bots, Image creators, and content recommenders amongst others, to solve real-world challenges. So dive into this brave new world of Generative AI and Large Language Models with us, and watch yourself transform into a 10x Data Scientist.

"IIT Bangalore prides itself in constantly updating cutting-edge topics to its curriculum. Our faculty has shaped this exciting Generative AI elective along with upGrad's industry experts, thus ensuring both academic rigour as well as incorporating the latest advancements in tech"

Dr. V. Sridhar,
Head-Faculty, IITB

"As an organisation that asks professionals to stay updated with the latest skills, we had to be one of the first to teach Generative AI. With this move, we are excited to witness the impact that Generative AI will have on the future, as well as the value our learners will bring to the field with this essential skill."

Mayank Kumar, Co-founder & MD
upGrad

About upGrad, IIITB, and LJMU, UK

upGrad has delivered over 20 million hours of learning, delivering programs by collaborating with universities across the world including IIIT Bangalore and Golden Gate University, among others

Online education is a fundamental disruption that will have a far-reaching impact. **upGrad** was founded taking this into consideration. upGrad is an online education platform to help individuals develop their professional potential in the most engaging learning environment. Since inception, upGrad is focussed on helping working professionals in their bid to learn, grow and move up in their career through a wide-range of programs designed to improve their expertise.

IIITB is a renowned university offering programs specialising in data science, machine learning and artificial intelligence. IIITB's faculty bring with them an average of 15 years of experience. The faculty covers the conceptual depths of topics such as Data Science, Machine Learning and AI, and Big Data Analytics. These will be complemented by industry relevant case studies from major industry verticals by industry leaders with 10+ yrs of experience from upGrad's industry network. The Executive Diplomas in DS and ML has been developed with the experienced faculty of IIITB in collaboration with Industry experts & upGrad to bring you cutting edge-curriculum with industry relevance. The strong placement network, industry mentorship and the credibility of this Executive Diploma from IIITB will provide you with just the right push to accelerate your career in Machine Learning and AI!

With a heritage that stretches back to **Liverpool John Moores University** UK is now one of the largest and well-established universities in the UK. It has been ranked in the Top 100 World Young Universities & Top 50 in the UK by Student Satisfaction. There are 5 Faculties within the university which are: Business & Law, Arts, Professional & Social Studies, Health, Science, Engineering & Technology. The university is well regarded for its esteemed faculty & teaching as well as research & also for student satisfaction. With an M.Sc. from this university, you are sure to be able to access global job opportunities.

Program Highlights

Here are the
top reasons why
you should consider
this program



Future-Ready Curriculum

Master In-Demand and Trending Competencies



Personalised Learning Experience

Learning Experience Tailored to Your Needs



Specialisations

Specialise in Two In-Demand Machine Learning Specialisations



In-Demand Tools

80+ Industry Tools, Languages, Libraries



Outcome-Driven Learning Experience

Personalised Portfolio-Building Support and Career Preparation Sessions



Leading Experts

Decorated Faculty and Top Industry Practitioners



Golden Learning Ratio

Perfect Blend of Mathematics, Technology, and Business Understanding



Hands-on Learning

Solve 30+ Domain-Focused Assignments and Case Studies

Double Accreditation and Alumni Status

Get certified by IIITB and LJMU, and gain double alumni status with these prestigious institutions on successful completion of program

Live LJMU Classroom Hour

Live classroom session for dissertation related queries

LJMU Immersion

Option to Participate in On-Campus Immersion at LJMU, UK

Faculty



Prof. Dhiya Al-Jumeily
The Head and Professor - AI, LJMU



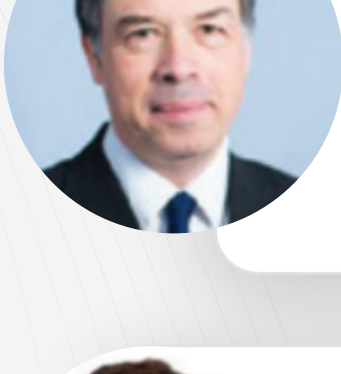
A senior member of the IEEE, a chartered IT professional, and a member of the UK Higher Education Academy



Doctor Atif Waraich
Faculty - Computer Science, LJMU



A senior faculty of engineering and technology at LJMU with multiple publications in the healthcare field



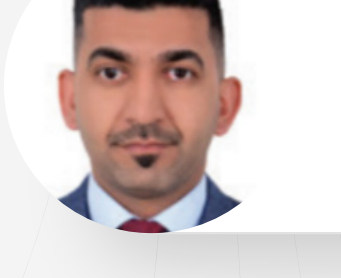
Doctor Paulo Lisboa
Head of Mathematics (retired) - Applied Mathematics, LJMU



Was the Chairman of Industrial Mathematics at LJMU in 1996 and Head of Graduate School in 2002



Dr Manoj Jayabalan
Faculty of Engineering and Technology - LJMU



Dr Ahmed Kaky
Faculty of Engineering and Technology - LJMU



Dr. Debabrata Das
Director of IIITB



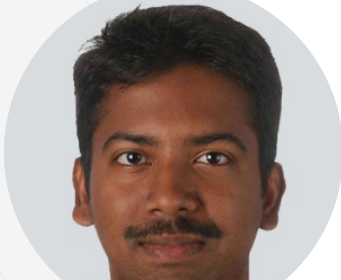
He has received his PhD from IIT-KGP. His main areas of research are IoT and Wireless Access Network.



Prof. G. Srinivasaraghavan
Professor, IIITB



Prof. Srinivasaraghavan has a PhD in Computer Science from IIT-K and 18 years of experience with Infosys Technologies and several other companies.



Dr. Dinesh Babu Jayagopi
Professor, IIITB



Dr. Dinesh is currently an Associate Professor at IIIT-B where he heads the Multimodal Perception Lab. His research interests are in Audio-Visual Signal Processing, Machine Learning, and Social Computing. He obtained his doctorate from Ecole Polytechnic Federale Lausanne (EPFL), Switzerland.



Chandrashekar Ramanathan
Professor & Dean (Academics)



Prof. Chandrashekar is a faculty member at IIIT-B since 2007 serving as professor, researcher and administrator. He has been working in the field of Computing for over 25 years in various capacities across industry and academia.



Tricha Anjali
Ex-Associate Dean



Prof. Anjali has a PhD from Georgia Institute of Technology as well as an integrated MTech (EE) from IIT Bombay.

Industry Experts



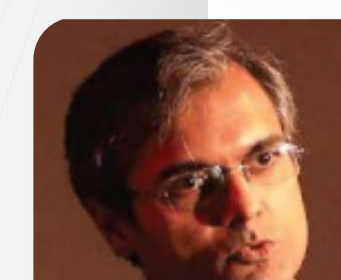
Abhishek Vijayvargia
Senior Data Scientist



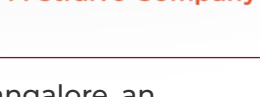
Having worked with Microsoft as a Senior Data Scientist, he is an alumnus of IIT Kharagpur with 10+ years of experience in a Data Science domain



Ex-Senior Data Scientist



Anand
CEO



CEO, Gramener A gold medallist from IIM Bangalore, an alumnus of IIT Madras and London Business School, Anand is among the top 10 data scientists in India with 20 years of experience.



Faculty



Principal



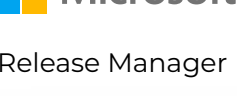
Ex-Consultant



Manish Shukla
Head of Generative AI



Leading cutting-edge GenAI platform development at NatWest Group. Expertise in OpenAI products and MLOps for optimisation of operational efficiency and seamless project delivery with high user satisfaction.



Release Manager



Release Manager



Certified Scrum Master



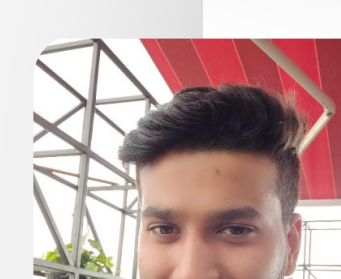
Deependra Singh
VP & Head of Data Science



Over 15 years of experience in leading analytics practices, data science, deep learning, and AI product development. Successfully led teams at Jungleee Games, American Express Digital Business, and National Insurance Company, pioneering key projects like the analytics engine for the GOI PMJAY policy. Respected speaker at top educational institutes like IMT Hyderabad, BIT Mesra, and NMIMS.



नेत्रस्वि नावधीतमस्तु



Sajan Kedia
Sr. Engineering manager



Senior Engineering Manager, Hotstar Sajan has extensive experience in the field of ML, Big Data, Data Science, and AI.



Sr. Engineering manager



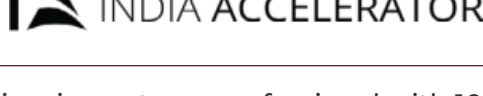
Machine Learning Engineer



Machine Learning Research Engineer



Mirza Rahim Baig
Startup Mentor



Analytics Lead, Zalando Mirza is a veteran professional with 10+ years of experience in application of data science, machine learning in e-commerce and healthcare.



Team Lead - Product



Marketing Analytics



Ex-Analytics Lead

Assignments and Case Studies from 12+ In-Demand Business Domains



Retail & Ecommerce

ETL Pipelining with Spark



Media & Entertainment

Data Analysis using SQL



Transportation

EDA
using Python



Education

Model Selection
using Sklearn



Civil Engineering

Classification using
CNNs



HR

Semantic Classification
using Word2Vec



Manufacturing

Regularisation using
Sklearn



Healthcare

Classification using
Sklearn



Law

RAG using
LangChain



InfoSec

Feature Engineering
using Sklearn



FMCG

Big Data Analysis
using Spark



BFSI

Sequence Data Prediction
using RNN

Your Program Journey

Phase 0

Math and Programming Bootcamp (12 weeks)

Phase I

Core Curriculum

(28 weeks, 15 IIITB credits)



Phase II

Specialisation Tracks

(22 weeks, 14 IIITB credits)



Phase III

Capstone

(4 weeks, 7 IIITB credits)



Phase IV

Thesis Dissertation

(6 months, 70 LJMU credits)

Note: 36 IIITB credits are recognised as 110 LJMU credits. So, the complete master's program carries 180 credits.

Applied Math and Programming Bootcamp

Personalise the initial 3 months of the program to your profile



Topics: Sets, Combinatorics, Basics of Probability, Conditional Probability, Descriptive Statistics, Functions, Vector Algebra, Derivatives, Integrals, Coding Environments, Variables, Data Types, Syntax, Conditionals, Loops, Functions, Lists, Sets, Tuples, Dictionaries, Introduction to MySQL, Basic SQL Querying

Marks Structure: Total marks - 100

Section A - 40 marks (basic mathematics)

Section B - 60 marks (basic programming)

Passing marks - 25 marks in section A & 35 marks in section B

No added cost to be paid for the bootcamp

We make sure that you are well-equipped to draw the most benefit from the program!

Core Curriculum

The core phase of the curriculum will equip you with the most up-to-date and industry-relevant skills and technologies for data science and machine learning such as programming and mathematics, data analysis tools and techniques, cloud computing and big data analytics, and foundational topics in machine learning, deep learning, and natural language processing.

Topics

Advanced Mathematics for Data Science and Machine Learning

Master essential mathematical concepts to understand how to work with large amounts of data and train efficient machine learning models

- Conditional Probability and Probability Distributions
- Advanced Linear Algebra and Linear Transformations
- Multivariate Calculus

Advanced Programming for Data Science and Machine Learning

Wrangle real-world data using universal programming languages such as Python and SQL, and use GenAI for generating and debugging code faster

- GenAI for Coding and Problem-Solving
- Object-Oriented Programming
- Python Data Science Libraries
- Database Design and SQL Querying with MySQL
- Introduction to NoSQL Databases

Data Analysis and Exploration

Implement industry-standard statistical methods using tools such as Python, Tableau, and Power BI to analyse data and derive business insights

- Data Analysis with Python
- Exploratory Data Analysis
- Inferential Statistics and Hypothesis Testing
- Data Analysis and Visualisation with Power BI and Tableau

Cloud Computing and Big Data Fundamentals

Take your data processing and analysis workflows to the cloud and work with larger amounts of data to derive enterprise-scale business insights

- Cloud Computing with AWS, GCP, Microsoft Azure
- Big Data Analysis with PySpark

Foundations of Machine Learning

Train industry-standard machine learning models to automate insight generation and predict business metrics behaviour

- Machine Learning Paradigms
- Linear and Logistic Regression
- K Nearest Neighbors
- Regularisation and Hyperparameter Tuning
- Decision Trees and Ensembles
- Clustering Models

Deep Learning and Natural Language Processing

Build and train deep neural network models for different kinds of business data such as images and sequences

- Artificial Neural Networks
- Convolutional and Recurrent Neural Networks
- Lexical, Syntactic, and Semantic Processing

Deployment Fundamentals

Share and deploy your insights and machine learning models so that other collaborators can work with your contributions

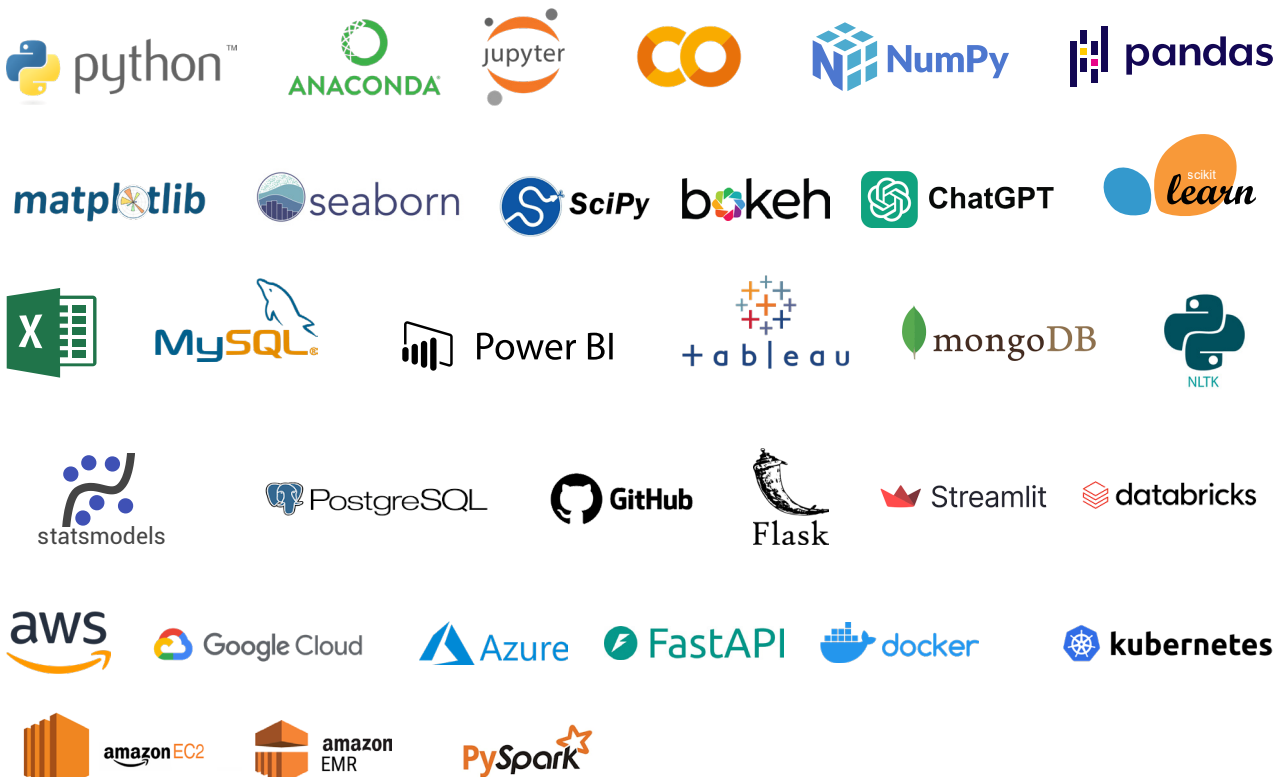
- Containerisation and Deployment Tools
- Version Control

Projects

- **Querying with SQL**
Analyse Spotify music data for targeted recommendations or NDAP insurance data for risk assessment
- **Exploratory Data Analysis**
Analyse NYC taxi operations for efficient taxi positioning or US beer production data for better brewery operation management
- **Big Data Analysis**
Analyse Mercari products data for better targeted recommendations or customer interaction data to enhance customer engagement
- **Linear Regression**
Predict household energy consumption using appliance energy readings data to increase power consumption efficiency or parcel delivery time for Porter using historical delivery data for better planning and management
- **Deep Learning**
Predict stock prices of Microsoft, Amazon, Google, IBM, using their historical stock price variations or temperature/pressure readings in Morocco using historical weather data



Tools



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MLOps Specialisation

The machine learning operations (MLOps) specialisation of the curriculum will equip you with core in-demand and industry relevant skills and technologies essential for ML engineers such as advanced machine learning methods, modern deep learning architectures, real-time data processing and end-to-end data pipeline creation and monitoring, and model pipelining and monitoring at scale.

Topics

Advanced Machine Learning

Train advanced industry-oriented machine learning models for enhanced predictive power and stronger business insight generation

- Support Vector Machines and Naive Bayes
- Feature Engineering and Model Selection
- Dimensionality Reduction
- Time Series Analysis
- Association Rule Mining and Recommendation Systems
- Explainable AI

Advanced Deep Learning and Generative AI

Design and train advanced industry-standard deep learning architectures, and master core AI principles such as attention mechanisms, transformers, and prompt engineering

- Advanced CNN Architectures
- LSTMs and GRUs
- Transfer Learning Techniques
- Encoder-Decoder Architectures and Seq2Seq
- Machine Translation
- Attention Mechanisms and Transformers
- Fundamentals of Generative AI and Prompt Engineering
- Computer Vision, Variational Autoencoders, Generative Adversarial Networks
- Data and Model Security Principles

Large-Scale Data Pipelining

Build complete end-to-end data pipelines and automate them to generate both batch-wise and real-time business insights

- End-to-End Data Pipelining Fundamentals
- Pipeline Automation with AWS Lambda, GCP Functions, and Azure Automation
- Data Monitoring with Amazon CloudWatch, Google Cloud Monitoring, and Azure Monitor
- Feature Stores and Vector Databases
- Real-Time Analytics with Flink, Kafka, and Spark Streaming
- Real-Time Analytics with Amazon Kinesis, Google Cloud Pub/Sub and DataFlow, Azure Stream Analytics and Event Hubs
- Multicloud and Hybrid Cloud Operating Principles

Machine Learning Model Pipelining

Build end-to-end industry-ready ML model pipelines and design their functional behaviour such as training and inference

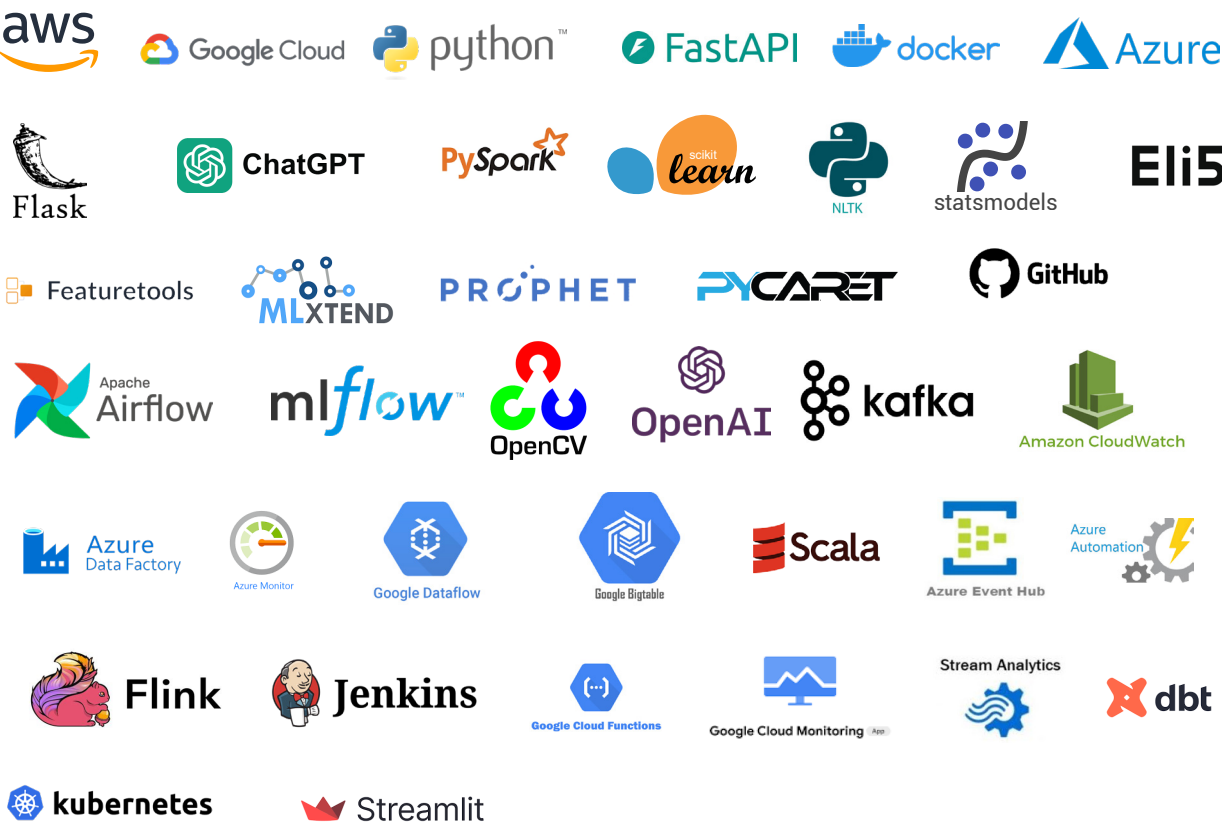
- Model Pipelining Principles
- Scheduling and Triggers
- Parallel Model Training and Real-Time Model Serving
- Data and Model Versioning
- Model Monitoring and System Design

Projects

- **Feature Engineering and Model Selection**
Predict fraudulent insurance claims using the Mendeley farmers insurance claims dataset or network intrusion events using historical network activity data
- **Semantic Classification**
Fake News Detection, Job Role Classification
- **Real-Time Data Analytics: Develop a**
real-time analytics pipeline for ecommerce data to enhance customer experience or a real-time patient health monitoring system for faster corrective actioning
- **Simulate and Retrigger Model Training Pipeline**



Tools



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Generative AI Specialisation

The generative artificial intelligence (GenAI) specialisation of the curriculum will equip you modern AI technologies and methods, particularly generative AI technologies, essential to data scientists and AI specialists, such as advanced machine learning methods, modern deep learning architectures, advanced prompt engineering and generative AI system design, information retrieval and retrieval-augmented generation, large language model (LLM) deployment, advanced computer vision and 3D vision, GenAI optimisations, and AI ethics.

Topics

Advanced Machine Learning

Train advanced industry-oriented machine learning models for enhanced predictive power and stronger business insight generation

- Support Vector Machines and Naive Bayes
- Feature Engineering and Model Selection
- Dimensionality Reduction
- Time Series Analysis
- Association Rule Mining and Recommendation Systems
- Explainable AI

Advanced Deep Learning for Generative AI

Design and train advanced industry-standard deep learning architectures, and master core AI principles such as attention mechanisms, transformers, and prompt engineering

- Advanced CNN Architectures
- LSTMs and GRUs
- Transfer Learning Techniques
- Encoder-Decoder Architectures and Seq2Seq
- Machine Translation
- Attention Mechanisms and Transformers
- Fundamentals of Generative AI and Prompt Engineering
- Computer Vision, Variational Autoencoders, Generative Adversarial Networks
- Data and Model Security Principles

GenAI System Design

Design and orchestrate generative AI systems to leverage the power of generative AI models and transform business operations

- Advanced Prompt Engineering and GenAI System Design
- Prompting Multimodal Models
- LLM Frameworks such as LangChain and LLaMa Index
- LLM Evaluation Methods
- Data Security and Governance
- AI Ethics

Advanced Generative AI

Develop AI-based cutting-edge industry-level systems for greater business efficiency such as retrieval-augmented generation (RAG) systems and multimodal GenAI model prompt engineering

- Information Retrieval Principles
- Embeddings and Vector Databases
- RAG Architectures
- Agentic Systems and Multi-Agent Systems
- Advanced Multimodal GenAI Models
- LLM Deployment
- Advanced Computer Vision and 3D Vision
- GenAI Optimisations

Projects

- **Feature Engineering and Model Selection**
Predict fraudulent insurance claims using the Mendeley farmers insurance claims dataset or network intrusion events using historical network activity data
- **Semantic Classification**
Fake News Detection, Job Role Classification
- **GenAI System Design**
Analyse Amazon customer reviews to identify prevalent sentiments and themes to improve product offerings and enhance customer satisfaction or ChatGPT customer feedback to derive actionable insights for business improvement
- **RAG**
Develop an RAG system to transform Long Beach County Municipal meetings transcripts into actionable insights for better organisational communication and decision making or historical legal documentations to optimise legal workflows



Tools



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Capstone Projects

Capstone that Adapts to Your Preference

Infuse our Capstone with Your Data

Modify existing projects as per your industry data and problems

Bring Your Own Capstone

Work on a completely novel project of your choice and solve problems that excite you

Pre-Designed Industry Capstone

Choose one of our existing projects that cover in-demand trending industry domains

Bring Your Own Capstone

Design your own capstone project relevant to your domain and interest, and get feedback throughout your capstone stages



Identify a real-world problem relevant to your domain



Source datasets aligned with your business problem



Design and implement your solution



Document your efforts and present your findings



Continuous expert feedback at every step of capstone

Thesis Dissertation

The thesis dissertation phase of your program experience focuses on working on your master's thesis in the domain of data science, machine learning, and artificial intelligence, so that you can truly master this high-impact domain.

Topics

Introduction to Research

Understand different types of research, formulate your research question, and learn to study and cite research papers

- Aspects of Research and Formulating a Research Question
- Understanding Various Research Designs
- Reading and Citing Research Papers
- Research Project Management
- Report Writing and Presentation Design
- Scientific Ethics in Research

Sample Thesis Topics

Study sample thesis topics to get a concrete understanding of what a research thesis entails

- Investigate dietary patterns and metabolite fingerprints of takeaway (fast) food consumers using PCA and clustering methods
- Investigate a diagnosis of eye diseases using imaging ophthalmic data
- Structure medical images with information geometry
- Using social media feed to place tweets regarding natural disasters on a map
- Preventing credit card fraud through pattern recognition
- Developing a recommender system for a media giant
- Risk modelling for financial activities and investment banking
- Using social media feed to place tweets regarding natural disasters on a map

Final Thesis Report

Submit your in-depth research work in a final thesis report and present your findings

Research of our learners

A Glimpse

1

Thesis Topic

Build a prediction model to accurately detect

Abstract

Background

Damage to peripheral nerves causes Peripheral neuropathy (PN). Patients complain of pain, numbness and loss of balance. If not identified early and treated adequately, PN could progress rapidly and lead to fatal complications. Defining factors to classify PN accurately has remained challenging. This research proposes a model to detect and classify PN into axonal, demyelinating, mixed and normal types from clinical and nerve conduction study (NCS) data using the Random Forest algorithm.

Data and methods:

Clinical and NCS data of 304 Indian patients, 229 affected by PN and 75 normal was collected with ethical approval from Kauvery hospital, Chennai. Exploratory data analysis and the Random Forest Algorithm was used to build a model.

Results:

Random Forest model was able to predict and classify PN with an accuracy of 96%. In axonal cases, sensory and motor nerves showed a drop in amplitudes of greater than 40% compared to normal patients. Reduced amplitude (>40%) in motor nerves of lower limbs and missing values (>90%) in sensory nerves of lower limbs identified axonal PN. Delayed onset latency (>40%) in motor nerves of upper limbs, decreased conduction velocity (>60%) in sensory nerves of upper limbs and increased onset latency (>40%) in F-waves of upper limbs delineated the demyelinating type. Median ages of patients were mixed (65), demyelinating (51) and axonal (61). Axonal (18.75%) was significant in diabetic patients and demyelinating (14.8%) in non-diabetic patients. Both axonal and mixed (16.78%) types were greater in hypertensive patients, and demyelinating (17.11%) type was higher in patients without hypertension. Reflex was depressed more in mixed (17.49%) than axonal (15.51%) and demyelinating (11.89%). Mixed (37.06%) type showed more insensitivity to pin-prick than axonal (29.37%) and demyelinating (24.48%) types. Mixed (45%) patients tested positive for Romberg's test more than axonal (31%) and demyelinating (21%). Mixed (34.65%) patients complained of numbness more than axonal (23.62%) and demyelinating (26.77%) types.

Conclusion:

Random forest algorithm identified and classified PN well using clinical and NCS features. Clinical features (age, diabetes, hypertension, reflex, Romberg's test, numbness and perception to pin-prick) were useful in detecting PN. Nerve conduction study features (amplitude, onset latency, conduction velocity, F-wave response and missing sensory values) were instrumental in classifying PN. Reduced amplitudes of sensory and motor nerves identified the axonal condition. Delayed onset latency and low conduction velocities along with missing and delayed F-wave responses identified the demyelinating type.

2

Thesis Topic

Automatic network coding of traffic junctions using

Abstract

Before any traffic simulation can be performed, the network of roads and junctions is modeled. Assigning attributes to the roadway network, such as the road length and width, the junction type, number of arms, and lanes, is a crucial task while building the network. This research is an attempt to develop an efficient traffic junction classifier using machine learning and deep learning algorithms on satellite images. Three junction categories, Priority, Roundabout, and Signal, are considered for analysis. As this is a novel research idea, the required image dataset of junctions is created using the Google Maps API. By using robotic process automation, the downloading of the images is automated. Two approaches are taken to build the classifiers: a machine-learning approach and a deep-learning approach. The machine learning approach is split into two phases: the feature extraction phase and the classification phase. In the feature extraction phase, a Histogram of Oriented Gradients (HOG) descriptors is used to extract features from the images. Furthermore, in the classification phase, several classification algorithms are applied to the HOG features to build classifiers. In the deep-learning approach, taking advantage of powerful pre-trained models and transfer learning, a Convolutional Neural Network (CNN) is developed for classifying the junctions. The models are evaluated, and in the end, a comparison between the various classification models is performed. The results showed that the CNN classifier modeled had the best accuracy and AUC compared to the other models with scores of 0.81 and 0.94 respectively. Among the machine learning models that were trained on the HOG features, the Extreme Gradient Boosting model has the best accuracy of 0.62. The ultimate aim of this work is to use this junction-classifier model on real projects to aid the process of finding the type of junctions and reduce the effort and time required to model the roadway networks.

Build A Strong Portfolio



Commits

Demonstrate consistency, collaboration, and coding discipline

Code

Showcase well-documented repositories

Projects

Host end-to-end DS/ML/AI projects that highlight real-world problem-solving

Kernels

Highlight data processing and EDA methodologies

Ranking

Evaluate and reflect global standing among data science practitioners

Competitions

Demonstrate problem-solving under tight constraints

Headline

Concise summary of goals, competencies, and professional identity

Summary

Engaging overview of learnin and career journey

Projects

Showcase practical experience, outcomes, and skill application

GitHub helps with

- ✓ Validating coding skills
- ✓ Showing growth and consistency
- ✓ Being interview-ready for Tech roles

Kaggle helps with

- ✓ Building credibility in data science circles
- ✓ Applying learning to real datasets
- ✓ Speaking confidently in Tech interviews

LinkedIn helps with

- ✓ Improving visibility with recruiters
- ✓ Positioning better for job openings
- ✓ Networking with peers and mentors in the field

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Enrol in 4 small steps, Then take a giant leap.



Eligibility Criteria

Bachelor's or Master's Degree or its equivalent in any discipline with minimum 50% aggregate mark or equivalent CGPA.



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