BITS Pilani
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WORK INTEGRATED
LEARNING PROGRAMMES

Post Graduate Programme in Artificial Intelligence & Machine Learning

for Working Professionals

innovate achieve lead

INDEX

Program Introduction

With growing clutches of digitization and digital transformation initiatives across several organisations in India, the demand for AI talent is expected to skyrocket.

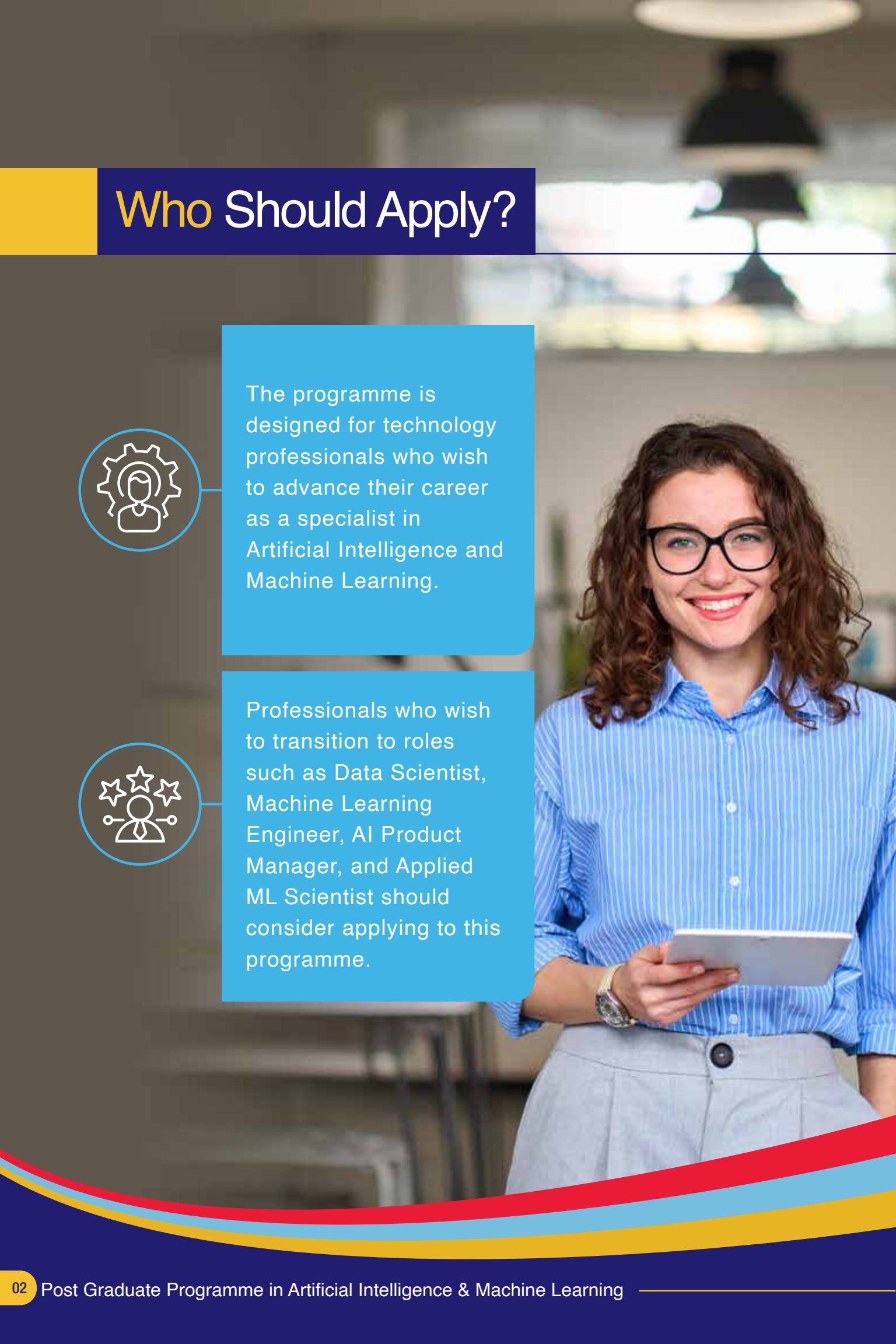
According to the Fortune Business Insights forecast, the global Machine Learning market size was valued at **$19.20 billion in 2022** and it is expected to grow from **$26.03 billion in 2023 to $225.91 billion by 2030**. So, get ready to make the most of it.

The 11-month Post Graduate Certificate Programme in Artificial Intelligence and Machine Learning by BITS Pilani Work Integrated Learning Programmes is designed to help working professionals like you develop a deeper understanding of AI and ML and get equipped with knowledge on its various building blocks.

Who Should Apply?

The programme is designed for technology professionals who wish to advance their career as a specialist in Artificial Intelligence and Machine Learning.

Professionals who wish to transition to roles such as Data Scientist, Machine Learning Engineer, AI Product Manager, and Applied ML Scientist should consider applying to this programme.



The Industry Forecast

- As per Forrester, over 50% of tech enterprises have already implemented or are in the process of implementing AI & ML.
- By 2025, AI & Machine Learning will automate IT growth by 71%, as reported by Forbes.
- The AI & ML market is expected to grow globally at a CAGR of 37.95% in 2020-26.
- AI & ML Digital skills to contribute as much as 25% in the overall hiring in the IT sector.

Programme Highlights

11-month Post Graduate certificate programme for working professionals.

Access to BITS Pilani instructors through technology-enabled contact classes which can be accessed from anywhere, Q&A support, and discussion forums.

Comprehensive and rigorous curriculum covering key concepts and technologies of Artificial Intelligence and Machine Learning.

Opportunity to become a member of an elite & global community of BITS Pilani Alumni.

An 8-week Capstone project where you will work towards solving a Data Science related business problem under the mentorship of BITS Pilani faculty members and senior industry practitioners.

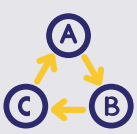
Fee submission option using easy- EMI with 0% interest and 0 down payment.

Two Immersion modules of 1/2 days each at a BITS Pilani Campus or Online, during which participants will visit the Campus to interact with their peers and learn together from BITS faculty.

Programme Objectives

Enable working professionals to be industry-ready in the AI&ML space.

Produce professionals with a strong algorithmic perspective of AI&ML.



Provide a comprehensive understanding of the data science pipeline.

Provide a deeper understanding of AI&ML techniques to enhance informed decision-making.

Provide hands-on to solve real-life AI&ML problems.

WILP Presence and Impact

45+
Years of Educating Working Professionals

1,26,169
Working Professionals Graduated

46,178
Working Professionals Currently Enrolled

1100+
Faculty Members

47
Programmes

Student Learning Outcomes

After completing this programme, the student will be able to Decide whether AI&ML techniques are applicable to a given business problem and articulate their benefits thereof.

- Formulate business problems as AI&ML Problems.
- Identify appropriate techniques to solve the formulated AI & ML problem.
- Collect data, apply pre-processing techniques, and perform visual data exploration.
- Apply Supervised Learning, Unsupervised learning, Text Mining and Deep Learning techniques.
- Implement and evaluate the relevant algorithms using appropriate programming languages and libraries. Interpret and present the model/analysis to the stakeholders.

Mode of Learning

The Mode of Learning used in this programme is called - Work Integrated Learning. Internationally, Work Integrated Learning (WIL) is defined as "An educational approach involving three parties - the student, educational institution, and employer organization(s) - consisting of authentic work-focused experiences as an intentional component of the curriculum. Students learn through active engagement in purposeful work tasks, which enable the integration of theory with meaningful practice that is relevant to the students' discipline of study and/or professional development*.

An education model can be considered as WIL if and only if:

1. The programs are designed and developed by the institute in collaboration with industry.
2. Work-focused experiences form an active part of the curriculum.
3. The program structure, pedagogy and assessment enable integration of theory-with relevant practice.

The innovative Work Integrated Learning Programs (WILP) of BITS Pilani are quite aligned with the above definition and requirements. The programs are designed in collaboration with its industry partners, subject matter experts from industry and academia that enable the students to remain relevant in their chosen profession, grow in their career and retain the habit of lifelong learning. Case studies, simulation exercises, labs and projects further strengthen this integration.

The WILP of BITS Pilani is comparable to its campus-based programs in terms of structure, rigor, instruction, labs, assessment, faculty profile and learning support. The pervasive adoption of technology in all its academic processes makes the same high-quality education of BITS Pilani available to the aspirants at scale with the required flexibility.

Key Benefits of BITS Pilani WILP

1. Students can pursue the programme without any career break and along with the job.

2. The programme curriculum is highly relevant to sectors, industries and organisations they work for.

3. Effective use of technology to deliver a range of learning interventions such as faculty contact sessions, asynchronous learning, remote, virtual and cloud labs, learner support, peer to peer collaboration etc.

4. Contact sessions with faculty take place mostly over weekends or after business hours and are conducted over a technology platform that can be accessed from anywhere.

5. Comprehensive examinations will be scheduled at the end of Course 3 (for courses 1,2, 3) and Course 6 (for courses 4, 5,6) and are conducted mostly at designated examination centres distributed across the country. Click Here.

6. Learners can access engaging learning material which includes recorded lectures from BITS Pilani faculty members, course handouts and recorded lab content where applicable.

Programme Structure

The 11-month Post Graduate Programme in Artificial Intelligence and Machine Learning consists of 6 Courses and a Capstone Project.

Course 1: Regression **5 weeks**

Course 2: Feature Engineering **4 weeks**

Course 3: Classification 9 weeks

Course 4: Unsupervised Learning & Association Rule Mining **7 weeks**

Course 5: Text Mining **5 weeks**

Course 6: Deep Learning and ANN **6 weeks**

Course 7: Capstone Project **8 weeks**

- In addition to the Curriculum above, participants will have the option of taking an optional course on Python at the beginning of the Programme.
- This will allow participants to revisit essential concepts that will help in all other courses during the programme.
- Topics covered include Introduction to Python programming and installation, Data Types, Program constructs, Numpy, Pandas, Matplotlib, and Debugging python programs.

Programme Curriculum

Course 1

Regression

- Regression is a type of supervised learning technique wherein the target attribute is a continuous variable.
- This course focuses on developing a deeper understanding of regression models both from theoretical and implementation perspectives.
- The model selection and performance measures will be discussed in this course.
- The issues with regression models like overfitting and the ways of combatting overfitting like ridge and lasso regression will be illustrated in this course.
- The interpretability/explicability of the models will also be discussed.

The course aims to provide:

- Comprehensive algorithmic perspective of building regression models.
- Deeper understanding of overfitting and ways to combat overfitting.
- Competence to select appropriate model and performance measures.
- Hands-on to solve real life regression problems.
- Skill to interpret the predicted model.

Learning Outcomes

Upon completion of this course, participants will be able to:

1. Build appropriate regression model for a given real life business problem.
2. Demonstrate the capability to select suitable degree of the polynomial regression and performance measures.
3. Suggest appropriate methods to combat overfitting.
4. Interpret the regression model.

Regression

Topics Covered	
Overview of certificate programme in ML & AI	1. Introduction to six modules of the programme 2. Programme Objectives & Learning outcomes 3. Evaluation of the courses (Quizzes/Assignments/Tests) 4. ML&AI in today's world 5. A real life ML&AI project and value of it to the business
Introduction to Regression	1. Introduction to Supervised Learning 2. Introduction to Regression and Classification 3. Linear and Polynomial Regression 4. Error Function for Linear Regression 5. Introduction to Matrix Theory 6. Solving Simultaneous Equation with Matrices
Building Simple Linear Regression Models	1. Mathematical Foundations 1 – Maxima and minima of function of one variable 2. Mathematical Foundations 2 - rank, Eigen values and eigen vectors, positive & negative definite/semi- definite matrices 3. Mathematical Foundations 3 - Maxima and minima of function of several variables 4. Convexity of errors function 5. Building simple linear regression model by solving normal equations 6. Gradient descent algorithm 7. Gradient descent algorithm for a simplistic case 8. Gradient descent, stochastic & mini-batch gradient descent algorithms
Assessing Accuracy of Simple Linear Regression Models	1. Probability Foundations 1 – Discrete probability distributions 2. Probability Foundations 2 - Continuous probability distributions, normal distribution and t distributions 3. Accuracy of the coefficient estimates of the simple linear regression models 4. Dependency of the dependent variable (target) variable on the independent variable (feature) 5. Accuracy of the simple regression model – RSE 6. Accuracy of the simple regression model – R^2
Building Multiple Linear Regression Models	1. Building multiple linear regression model by solving normal equations 2. Building multiple linear regression model by gradient descent algorithms 3. Performance measure for multiple linear regression models 4. Feature selection algorithms for multiple linear regression models 5. Forward and backward feature selection algorithms for multiple linear regression models
Building Polynomial Regression Models, Overfitting and ways to combat overfitting	1. Polynomial Curve Fitting – Finding suitable degree of the polynomial for the problem 2. Overfitting 3. Ridge Regression and other ways of combatting overfitting 4. Lasso Regression 5. Bias-Variance Decomposition 1 6. Bias-Variance Decomposition 2

Course 2

Feature Engineering

- Feature Engineering is an important step in developing and improving the performance of Machine Learning models.
- This course covers Data wrangling techniques that help transform the raw data to an appropriate form on which learning algorithms can be applied.
- The data preprocessing techniques like normalization, discretization, feature subset selection etc. and dimension reduction techniques like PCA will be discussed.
- The different ways of visualizing the data like Box plots, Contour plots, Heat maps etc. will be illustrated.

This course aims to help participants:

- Apply data wrangling for a given business problem.
- Identify and implement appropriate feature extraction and selection techniques.
- Apply data preprocessing techniques.
- Implement dimension reduction using PCA.
- Identify and implement appropriate visualization techniques.

Learning Outcomes

Upon completion of the course, participants will be able to:

1. Understand the importance of dimension reduction and apply appropriate techniques given a real world application.
2. Compare the use of different similarity measures and Identify the appropriate similarity measure to be used between 2 or more items, concepts, etc
3. Find and select appropriate visualization technique that answers a particular research question.

Feature Engineering

Topics Covered	
Overview of Feature Engineering and Data Preprocessing	1. Introduction to Feature Engineering 2. Types of data and its sources 3. Data quality (Missing values, Noisy data) 4. Aggregation and Sampling 5. Feature Creation 6. Data Transformation
Proximity measures and Feature Subset Selection	1. Discretization 2. Supervised Discretization using Entropy 3. Binarization 4. Proximity measures for binary attributes 5. Proximity measures for Categorical attributes 6. Proximity measures for Continuous attributes and Nonmetric measures 7. Curse of Dimensionality 8. Feature Subset Selection 9. Feature selection using Filter Methods 10. Feature selection using Chi Squared Test 11. Feature selection using Information Theoretic Measures 12. Feature selection using Fisher Score 13. Feature selection using wrapper methods
Dimension Reduction	1. Statistics foundations 2. Introduction to Dimension reduction 3. Formulation of Principal Component Analysis (PCA) using Maximum Variance 4. PCA mathematical derivation
Visualization	1. Data Visualization and Statistical Analysis 2. Charts and Plots 3. Parallel Coordinates 4. t-SNE Plot 5. Data Visualization Use case and Feature Engineering

Course 3

Classification

- Classification is a type of supervised learning technique wherein the target attribute takes discrete values.
- This course emphasizes the three types of techniques to solve classification problems – discriminant function, generative and probabilistic discriminative approaches.
- This course lays down a strong foundation on the algorithmic perspective of popular classification algorithms - k-NN, Na ve Bayes, Decision Tree, Logistic Regression and SVM.
- The implementation details of these models along with tuning of parameters will be illustrated. The ensemble methods, bagging, boosting, Random Forest and eXtreme Gradient Boosting will be taught.
- The interpretability/explicability of the models will also be discussed.

The course aims to:

1. A deeper understanding of three types of techniques to solve classification problems.
2. Comprehensive algorithmic perspective of popular classification algorithms.
3. Hands-on to solve real-life classification problems.
4. The skill to interpret the predicted model.
5. The competence to build ensemble classifiers using well-known techniques.

Learning Outcomes

Upon completion of the course, participants will be able to:

1. Build appropriate classifier for a given real life business problem
2. Demonstrate the capability to understand classification algorithms deeply and fine tuning the parameters therein to enhance performance of the classifier
3. Build ensemble classifier using well known techniques
4. Interpret the regression model

Classification

Topics Covered	
Overview of the Classification Module	1. Introduction to Classification 2. Types of classification algorithms - Discriminant Functions, Probabilistic Generative models and Probabilistic Discriminative models, Tree based models 3. Classification Algorithms covered in the course and type of these algorithms 4. Applications of classification and case study of the course
Nearest-neighbour Methods	1. kNN Classifier 2. Measures of prediction accuracies of classifiers – precision, recall, AUC of ROC etc. 3. Finding optimal k 4. Python Implementation of kNN
Naïve Bayes Classifier	1. Probability Foundations – Discrete & Continuous Random Variables, Conditional Independence, Bayes Theorem (1) 2. Probability Foundations – Discrete & Continuous Random Variables, Conditional Independence, Bayes Theorem (2) 3. Naïve Bayes Classifier – Derivation 4. An illustrative example 5. Python implementation of Na ve Bayes Classifier 6. Na ve Bayes Classifier is a generative model 7. Advantages of Naïve Bayes Classifier and when to use Na ve Bayes Classifier? 8. Interpretability of Na ve Bayes Classifier
Logistic Regression	1. Significance of Sigmoid function and finding its derivative 2. Statistics Foundations – Maximum likelihood estimation 3. Cross entropy error function for logistic regression and its optimal solution 4. Logistic Regression is probabilistic discriminative model and an illustrative example 5. Implementation of logistic Regression using Python 6. Decision boundary of logistic regression 7. Overfitting of logistic regression and counter measures 8. Interpretability of logistic regression
Decision Tree	1. Decision Tree Representation 2. Entropy and Information Gain for an attribute 3. Search in Hypothesis space, ID3 Algorithm for decision tree learning 4. Implementation of Decision Tree using Python 5. Prefer short hypothesis to longer ones, Occam's razor 6. Overfitting in Decision Tree 7. Reduced Error Pruning and Rule post pruning 8. Alternative measures for selecting attributes 9. Interpretability of Decision Tree

Classification

Topics Covered	
Optimization Foundations for Support Vector Machines	1. Constrained and Unconstrained Optimization 2. Primal and Dual of an optimization problem 3. Quadratic Programming 4. KKT conditions 5. Lagrange Multiplier
Support Vector Machines	1. Understanding the spirit and significance of maximum margin classifier 2. Posing an optimization problem for SVM in non-overlapping class scenario 3. Converting the constrained optimization problem into unconstrained using Legrange multipliers 4. Dual of the optimization problem 5. Appreciation of sparse kernel machine and support vectors in the solution of the optimization problem 6. Implementation of SVM in python
Support Vector Machines in overlapping class distributions & Kernels	1. Issues of overlapping class distribution for SVM 2. Posing an optimization problem for SVM in overlapping class scenario 3. Solving the optimization problem using Legrange multipliers, dual representations 4. Kernel Trick and Mercer's theorem 5. Techniques for constructing Kernels and advantages of Kernels in SVM 6. Implementation of SVM using different kernels
Ensemble Methods	1. Rational for Ensemble Method 2. Methods for constructing an Ensemble Classifier 3. Bagging, Boosting, AdaBoost 4. Random Forest 5. eXtreme Gradient Boosting (XGBoost) 6. Python Implementation of Random Forest and XGBoost 7. Class Imbalance Problem & approaches to solve it

Course 4

Unsupervised Learning & Association Rule Mining

- Unsupervised learning algorithms find regularities of the given dataset in the absence of explicit labels or supervised outputs for the data points.
- Clustering is an unsupervised learning task whose objective is to find natural grouping present in the data.
- This course covers various clustering algorithms like K-Means, EM Algorithm, Single Linkage Algorithm, Complete Linkage algorithm and DBSCAN.
- Various ways of assessing the quality of clustering and detecting outliers are discussed.
- The typical industrial applications of unsupervised learning algorithms are covered as well.
- HMM is introduced in the context of performing time series prediction and the role of EM algorithm in estimating the parameters are discussed.
- The other part of the course introduces an important class of algorithms to learn association or discover dependencies between the data items, known as learning association rules.
- We discuss apriori algorithm and different metrics to measure the interestingness of the rules.

The course aims to introduce:

1. Unsupervised learning, various unsupervised learning algorithms
2. Association rule learning and apriori algorithms
3. Time series data and use HMM to solve various tasks involving Time series data

Learning Outcomes

Upon completion of the course, participants will be able to:

1. Understand various algorithms for clustering, association rule mining and the role of HMM in time series prediction tasks.
2. Analyse the problem and provide learning solutions using the algorithms covered in this course.
3. Apply the learning algorithms suitably to solve various tasks including anomaly detection, parameter estimation, segmentation etc.
4. Analyse the given problem, decide the suitability of association rule learning technique to solve this and provide a solution.
5. Apply the HMM suitably to solve problems involving time series data.

Unsupervised Learning & Association Rule Mining

Topics Covered	
Introduction to Unsupervised Learning, Clustering	a. Unsupervised Learning - Introduction - Applications- Clustering as an unsupervised learning task - Defining clustering b. Introducing Various ways to solve clustering problem (similarity based, density based, hierarchical, graph theoretic based) - Notion of quality of clustering c. Overview of clustering algorithms to be covered in this course
Introducing the clustering case study to be used throughout the course for assignments	a. overview of the data set to be used b. Exploring this data using Python
K-Means Algorithm	a. K-Means Algorithm b. Discussion on Various Initializations, Standardizing Attributes (for eg- z-score) & Convergence c. Python Implementation d. Applications of using K-means with Images, videos, documents
K-Means - Variations	a. Online stochastic version of k-means (with sequential update) - Discussions on quality of clustering / convergence - Applications b. Mini-Batch K-Means - Discussions on quality of clustering / convergence - Applications
Detecting Outliers	a. Outliers and Clustering - Overview. b. Using K-means to detect outliers c. Python Implementations
EM Algorithm	a. Mixtures of Gaussians (MoG) - Applications, modelled as MoG b. Using Maximum Likelihood to estimate mixture densities - Issues c. EM Algorithm for Gaussian mixtures i. Derivation ii. Illustration (using a problem involving mixture of two gaussians) + Python Implementations iii. Applications d. Relationship to K-Means Algorithm
Clustering for Customer Segmentation - [Pre-Recorded Industry Talk]	
Hierarchical Clustering	a. Introduction to hierarchical clustering b. Agglomerative Clustering Vs Divisive Clustering c. Distance Measures (Minimum distance, Maximum Distance, Mean Distance, Average Distance) d. Algorithms i. Single linkage, Complete Linkage algorithm ii. Demonstration in python iii. Discussion on Termination, efficiency, applications

Unsupervised Learning & Association Rule Mining

Topics Covered	
Density Based Clustering **Clustering for Anomaly Detection - [Pre-Recorded Industry Talk]**	a. Density based approach to clustering - Introduction b. DBSCAN - Density, Density-reachability, Density-connectivity c. DBSCAN Algorithm d. Performance & scalability e. Demonstration using Python
Assessing Quality of Clustering **Significance of Clustering - Interpreting/ summarizing Clusters by businesses - [Pre-Recorded Industry Talk]**	a. Cluster Validity Evaluation (measuring compactness, separation, cluster overlap, etc) b. Stability of Results from clustering algorithms c. Determining number of clusters
Association Rule Mining **Apriori Algorithm**	a. Market Basket Analysis - Use cases b. Terminologies / Measures - association rules, support, confidence ,k-itemset, Frequent itemsets, closed item sets c. Discussion on computational complexity in generating the itemsets a. Algorithm b. Generating Association Rules from frequent itemsets c. Efficiency Issues and few ways to address it. d. Evaluating interestingness of patterns e. Demonstration of Apriori algorithm using python for a practical use case
Time series Prediction and Markov Process **Hidden Markov Model**	a. Introduction i. Introduction to time series data ii. Time Series prediction applications (eg predicting stock prices, fraud detection, applications in text and speech processing) b. (discrete) Markov Processes - Overview and Terminologies a. i. Introduction ii. Evaluation Problem - Given a model, evaluate the probability of observing the sequence - (forward-backward Procedure) iii. Finding most likely state sequence explaining time series data - Viterbi Algorithm iv. How to learn Model parameters - An application of EM Algorithm b. Case Study: Introduce a problem from an application domain- solution using HMM - Python Implementation

Course 5

Text Mining

- In today's world, 80% of the data generated by enterprises is unstructured or semi-structured in the form of Emails, Surveys, Feedback etc. wherein most of the data is in the form of text.
- This course aims to equip students with adequate knowledge in extracting the relevant text data and skills to identify patterns therein.
- This course covers topics like converting documents to vectors using TF-IDF, Parts of Speech Tagging, Topic modelling using LDA, sentiment analysis and recommender systems.

This course is designed to help participants:

1. Convert documents into vectors using TF-IDF and compute similarities.
2. Implement topics modelling using LDA.
3. Apply sentiment analysis.
4. Implement recommender systems.

Learning Outcomes

Upon completion of the course, participants will gain:

1. Knowledge of basic pipeline of Information retrieval and vectorising the documents using TD-IDF and its implementation.
2. A mathematical foundation on modelling Parts of speech (POS) tagging using Hidden Markov Model and hands on experience of implementing POS tagging.
3. A mathematical foundation on modelling Latent Dirichlet Analysis (LDA) for topic modelling and hands on experience of implementing it.
4. Knowledge on sentiment analysis and its applications.
5. A mathematical foundation of Recommender Systems and hands on experience of implementing it.

Text Mining

Topics Covered	
Information Retrieval	1. Introduction to Text Mining 2. Binary term incidence matrix 3. Information Retrieval Pipeline 4. Inverted Index Construction 5. Merge Algorithm and Query Optimization 6. Tolerant Retrieval using Normalization, Query expansion, Stemming, Lemmatization, Wild card query using K-Gram index 7. Ranked Retrieval using TF-IDF and Cosine score
Part of Speech Tagging	1. Introduction to Part of speech tagging 2. Part of speech tagging using HMM-1 3. Implementing POS Tagging in Python
Topic modelling using LDA	1. Mathematical foundations for LDA : Multinomial and Dirichlet distributions-1 2. Mathematical foundations for LDA : Multinomial and Dirichlet distributions-2 3. Intuition behind LDA 4. LDA Generative model 5. Probabilistic Graphical Models 6. Latent Dirichlet Allocation 7. Implementing LDA in Python
Introduction to Sentiment Analysis	1. Sentiment Analysis 2. Subjectivity Analysis 3. Topic Extraction 4. Product Reviews 5. Opinion Retrieval and Spam 6. Opinion Summarization 7. Implementing Sentiment Analysis in Python
Recommender Systems	1. Introduction to Recommender Systems 2. Collaborative filtering 2.1 User based Collaborative filtering 2.2 Item based Collaborative filtering 2.3 Matrix factorization using Singular Value Decomposition 2.4 Latent Factor Models 3. Metrics used for evaluating Recommender Systems 4. Implementing Recommender System in Python 5. Industry talk on application of Recommender Systems

Course 6

Deep Learning and ANN

- Due to the availability of low-cost hardware in the last decade, several involved neural network approaches had been explored to advance the performance of many state-of-the-art machine learning problems such as image searching, understanding, medical applications, autonomous vehicles such as drones and self-driving cars etc.
- In this course students will be exposed to the details of neural networks as well as deep learning architectures.
- This course gives an algorithmic perspective and implementation details of ANN, RNN, LSTM, CNN, RCNN, Faster RCNN, Autoencoders, Generative deep learning models like VAE and GAN etc.

This course is designed to help participants:

1. Learn ML approaches that are inspired by the human brain.
2. Design shallow and deep networks using non-linear activation functions.
3. Understand sequence-aware neural networks for text/voice/video etc.
4. Learn Convolution Neural Networks to solve typical computer vision problems.
5. Learn how data compression could be achieved using a network of neurons.

Learning Outcomes

Upon completion of the course, participants will be able to:

1. Design a multilayer ANN for an appropriate learning problem.
2. Design multilayer neural network architecture for text/voice/video or any sequence data.
3. Appreciate the concept of end-to-end learning and feature abstraction
4. Apply convolution and highlight useful parts in a scene for computer vision applications.
5. Apply generative approach to solve ML problems.

Deep Learning and ANN

Topics Covered	
Artificial Neural Network	1. Introduction and Background 2. Discrimination power of single neuron 3. Training a single perceptron (delta rule) 4. Multilayer Neural Networks 5. Activation functions and Loss functions 6. Backpropagation
Deep Learning	1. Introduction to end to end learning 2. Abstractions of features using deep layers 3. Hyper parameter tuning 4. Regularization for Deep Learning 5. Dropout
Convolution Networks with Deep Learning	1. CNN 2. Pooling 3. Variants of pooling functions 4. CNN with Fully connected Networks 5. RCNN 6. Faster RCNN
Sequence Modeling in Neural Network	1. Architecture of RNN 2. Unfolding of RNN 3. Training RNN 4. LSTM 5. LSTM and its applications
Autoencoders with Deep Learning	1. Undercomplete Autoencoders 2. Regularized Autoencoders 3. Variational autoencoders 4. Applications of Autoencoders
Generative deep learning models	1. GAN 2. Applications of GAN

Course 7

Capstone Project

- During the 8-week Capstone Project, participants will work in teams to design and solve a real-world business problem encompassing data science pipeline using AI&ML techniques.
- Participants will be required to identify applicable AI and ML solutions and apply these solutions to arrive at outcomes.
- Through each phase of the project, participants will be mentored by BITS Pilani faculty members and senior Industry practitioners using a rigourous and structured framework and will receive regular feedback on their progress.

Eligibility Criteria

- Employed professionals holding BE/ B.Tech. or equivalent, one year's work experience and working in relevant fields are eligible to apply.
- Candidates holding M.Sc. in Mathematics or Statistics, one year's work experience and working in relevant roles are also eligible to apply to this programme.
- A working knowledge of languages such as Python is recommended.
- Applicants without sufficient exposure to Python programming language will have to complete a refresher course in Python as a part of the programme before the start of Course 1.

Fee Structure

Fee Structure for students admitted in Academic Year 2025-2026 is as follows:

Block Amount (one time)	Programme Fee (remainder)
₹25,000	₹2,20,000
(within 7 days of receipt of provisional Admission Offer Letter)	(within 15 days of receipt of Final Admission Offer Letter)

Total Programme Fee is INR 2,45,000 (including GST)

Easy Monthly Payment Option with 0% Interest and 0 Down Payment

Instant EMI option with 0% interest and 0 Down Payment is now available that allows you to pay programme fee in an easy and convenient way.

- Instant online approval in seconds
- No Credit Cards/ CIBIL score required
- Easy & Secure online process using Aadhaar and PAN number
- Anyone with a Salary Account with Netbanking can apply

Admissions will begin in August 2025.

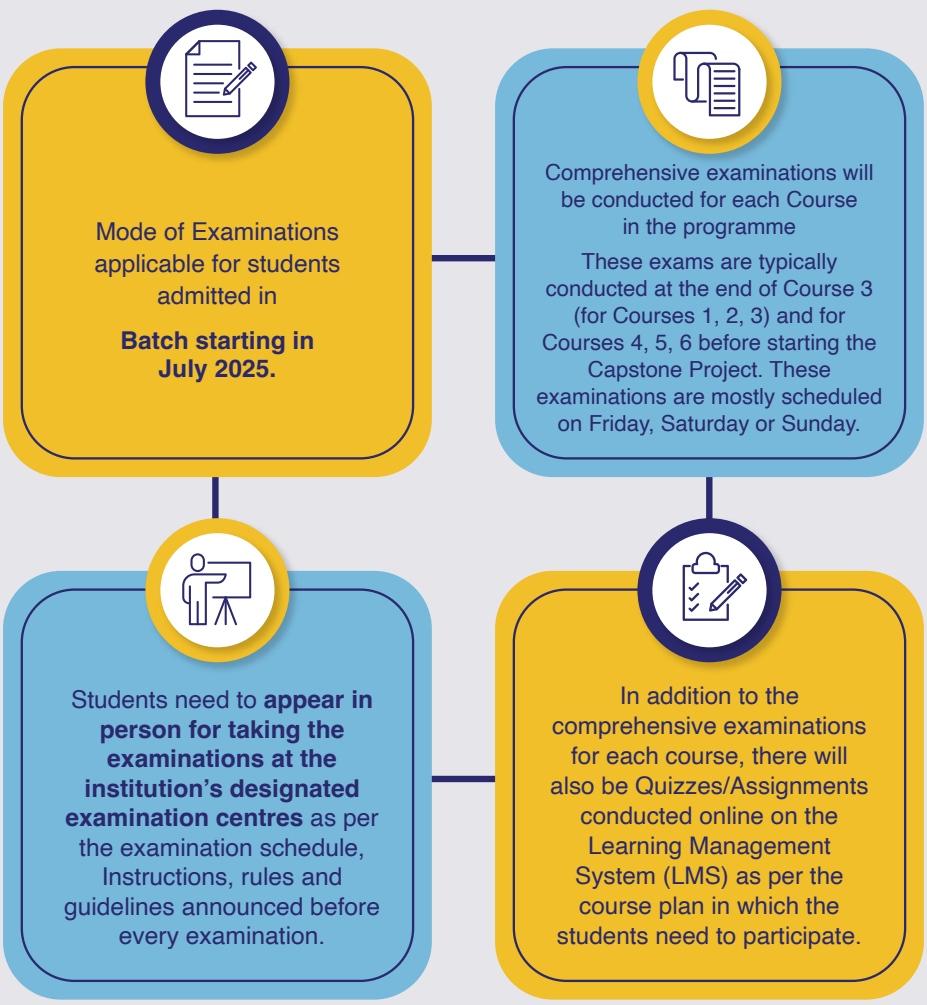
All the above fees are non-refundable.

Click here to learn more

Important: For every course in the programme, institute will recommend textbooks, students would need to procure these textbooks on their own.

Mode of Examination

Examinations Mode Options for Post Graduate Programme in Artificial Intelligence & Machine Learning applicable for students admitted in Batch starting from July 2025.



Students can take their examination at any of our **34 designated** examination centres in India at the following locations:

- **South Zone:** Bangalore, Chennai, Hyderabad, Mysore, Vijayawada, Visakhapatnam, Kochi, Thiruvananthapuram, Hosur, Madurai, Kancheepuram and Coimbatore.
- **North Zone:** Delhi NCR, Faridabad, Jaipur, Chandigarh, Lucknow, Bhilwara, Udaipur and Pilani.
- **West Zone:** Mumbai, Thane, Pune, Ahilya Nagar, Goa, Ahmedabad, Vadodara, Surat, Indore and Nagpur.
- **East Zone:** Kolkata, Guwahati, Jamshedpur, and Bhubaneswar.

In addition to these locations, the Institution also has a designated examination centre in **Dubai.**

For International Students:

- In addition to the above locations, the institution also has a designated international examination centre, located in **Dubai.**
- To facilitate the learning of international students, applying from any other location except India and Dubai, the mode of examinations will be online, which can be availed by meeting the requirements of the institute.

  Requirements for online examinations

  - o Scanned copy of the visa for the country in which you are currently residing. The visa should be currently valid. No expired visas shall be considered,

    (OR)

  - o Scanned copy of government-issued ID from the residing country,

    (And)

  - o HR recommendation or endorsement letter from the employer, stating the location of your work.
- Indian students, who are temporarily based out of India, can also avail of online examinations on request by meeting the above-mentioned requirements of the institute.

How to Apply

Click here to apply now through the BITS Pilani online application centre.

Create your login at the Application Center by entering your unique Email id and create a password of your choice.

You will receive a Provisional Admission Offer Letter within 2 days of receipt of your Application Form.

Upon receiving the Provisional Admission Offer Letter, you will need to submit the following within 7 days using the Online Application Center:

- Block amount of INR 25,000
- Scanned copy of Passport size photograph.
- Scanned copy of self-attested Graduation degree certificate and marksheets.
- Proof of ID (Govt. issued ID such as Driving License, Passport, Aadhaar, Voter ID, etc.)
- Proof of employment, such as Work Experience Certification from current employer.

Upon receiving the Block Amount and other supporting documents, you will receive a Final Admission Offer Letter. You will need to submit the First Installment (INR 2,20,000) within 15 days of receipt of this letter. For details on No-cost EMI option with 0% interest, **Click Here.**

Upon receipt of the remaining First Installment, you will receive your BITS Student ID, detailed programme schedule and access to the learning.

BITS Pilani

Pilani | Dubai | Goa | Hyderabad | Mumbai

WORK INTEGRATED
LEARNING PROGRAMMES

Let's start a conversation to ignite the change you desire

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