Program Curriculum

PRE-PROGRAM PREPARATORY CONTENT

1 **INTRODUCTION TO PYTHON**
Build a foundation for the most in-demand programming language of the 21st century.

2 **PYTHON FOR DATA SCIENCE**
Learn how to manipulate datasets in Python using Pandas which is the most powerful library for data preparation and analysis.

3 **DATA VISUALISATION IN PYTHON**
Humans are visual learners and hence no task related to data is complete without visualisation. Learn to plot and interpret various graphs in Python and observe how they make data analysis and drawing insights easier.

4 **DATA ANALYSIS USING SQL**
Data in companies is definitely not stored in excel sheets! Learn the fundamentals of database and extract information from RDBMS using the structured query language.

5 **ADVANCED SQL AND BEST PRACTICES**
Apply advanced SQL concepts like windowing and procedures to derive insights from data and answer pertinent business questions.

6 **DATA ANALYSIS IN EXCEL**
Taught by one of the most renowned data scientists in the country (S.Anand, CEO, Gramener), this module takes you from a beginner level Excel user to an almost professional user.

7 **ANALYTICS PROBLEM SOLVING**
This module covers concepts of the CRISP-DM framework for business problem-solving.

8 **MATH FOR MACHINE LEARNING**
Learn the prerequisite mathematical tools and techniques for ML - Linear Algebra and Multi-variable Calculus.

STATISTICS AND EDA

1 **EXPLORATORY DATA ANALYSIS**
Learn how to find and analyse the patterns in the data to draw actionable insights.

2 **INTRO TO GIT AND GITHUB**
Learn version control, collaborating, portfolio making using git. Understand the process of creating repository. Learn the process of creating github portfolio using github pages with jekyll.

*Syllabus is subject to change by the university

3 **INFERENTIAL STATISTICS**
Build a strong statistical foundation and learn how to ‘infer’ insights from a huge population using a small sample.

4 **HYPOTHESIS TESTING**
Understand how to formulate and validate hypotheses for a population to solve real-life business problems.

5 **LENDING CLUB CASE STUDY**
Determine which customers are at the risk of default and what are their charecteristics so as to avoid providing loans to similar people in the future.

MACHINE LEARNING I

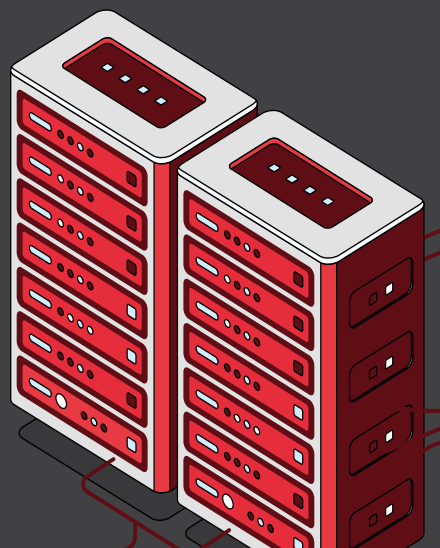
1 **LINEAR REGRESSION**
Venture into the machine learning community by learning how one variable can be predicted using several other variables through a housing dataset where you will predict the prices of houses based on various factors.

2 **LINEAR REGRESSION ASSIGNMENT**
Build a model to understand the factors car prices vary on and help a Chinese company enter the US car market.

3 **LOGISTIC REGRESSION**
Learn your first binary classification technique by determining which customers of a telecom operator are likely to churn versus who are not to help the business retain customers.

4 **NAIVE BAYES**
Understand the basic building blocks of Naive Bayes and learn how to build an SMS Spam Ham Classifier using Naive Bayes technique.

5 **MODEL SELECTION**
Learn the pros and cons of simple and complex models and the different methods for quantifying model complexity, alongwith regularisation and cross validation.



*Syllabus is subject to change by the university

MACHINE LEARNING II

1 **ADVANCED REGRESSION**
Understand generalised regression and different feature selection techniques alongwith the perils of overfitting and how it can be countered using regularisation.

2 **ADVANCED REGRESSION ASSIGNMENT**
Build a model to understand the factors house prices vary on and help an american company enter the australian housing market.

3 **SUPPORT VECTOR MACHINE (OPTIONAL)**
Learn how to find a maximal marginal classifier using SVM, and use them to detect spam emails, recognise alphabets and more!

4 **TREE MODELS**
Learn how the human decision making process can be replicated using a decision tree and other powerful ensemble algorithms.

5 **MODEL SELECTION - PRACTICAL CONSIDERATIONS**
Given a business problem, how do you choose the best algorithm? Learn a few practical tips for doing this here.

6 **BOOSTING**
Learn how weak learners can be 'boosted' with the help of each other and become strong learners using different boosting algorithms such as Adaboost, GBM, and XGBoost.

7 **UNSUPERVISED LEARNING: CLUSTERING**
Learn how to group elements into different clusters when you don't have any pre-defined labels to segregate them through K-means clustering, hierarchical clustering, and more.

8 **UNSUPERVISED LEARNING: PRINCIPAL COMPONENT ANALYSIS**
Understand important concepts related to dimensionality reduction, the basic idea and the learning algorithm of PCA, and its practical applications on supervised and unsupervised problems.

9 **TELECOM CHURN CASE STUDY**
Solve the most crucial business problem for a leading telecom operator in India and southeast Asia - predicting customer churn.

DEEP LEARNING

1 **INTRODUCTION TO NEURAL NETWORKS**
Learn the most sophisticated and cutting-edge technique in machine learning - Artificial Neural Networks or ANNs

2 **CONVOLUTIONAL NEURAL NETWORKS - INDUSTRY APPLICATIONS**
Learn the basics of CNN and OpenCV and apply it to Computer Vision tasks like detecting anomalies in chest X-Ray scans, vehicle detection to count & categorise them to help the government ascertain the width and strength of the road.

*Syllabus is subject to change by the university

3 **CONVOLUTIONAL NEURAL NETWORKS - ASSIGNMENT**
Build a neural network from scratch in Tensorflow to identify the type of skin cancer from image.

4 **RECURRENT NEURAL NETWORKS**
Ever wondered what goes behind machine translation, sentiment analysis, speech recognition etc. ? Learn how RNN helps in these areas having sequential data like text, speech,videos,etc.

5 **NEURAL NETWORKS PROJECT: GESTURE RECOGNITION**
Make a Smart TV system which can control the TV with user's hand gestures as the remote control.

NATURAL LANGUAGE PROCESSING

1 **LEXICAL PROCESSING**
Do you get annoyed by the constant spams in yor mail box? Wouldn't it be nice if we had a program to check your spellings?
In this module learn how to build a spell checker & spam detector using techniques like phonetic hashing,bag-of-words, TF-IDF, etc.

2 **SYNTACTICAL PROCESSING**
Learn how to analyse the syntax or the grammatical structure of sentences using POS tagging and Dependency parsing.

3 **SYNTACTIC PROCESSING - ASSIGNMENT**
Use the techniques such as POS tagging and Dependency parsing to extract information from unstructured text data.

4 **SEMANTIC PROCESSING**
Learn the most interesting area in the field of NLP and understand different techniques like word-embeddings, topic modelling to build an application that extracts opinions about socially relevant issues.

5 **CASE STUDY: CLASSIFYING CUSTOMER COMPLAINT TICKETS**
In this case study you will create a solution that will help in identifying the type of complaint ticket raised by the customers of a multinational bank.

ELECTIVE 1: DL WITH MLOPS

1 **INTRO TO AWS**
Understand what is cloud computing, benefits of cloud computing, Different types of cloud providers: Private, public, hybrid. Iaas,Paas, Saas.
Understand Cloud basic essentials services such as EC2, S3, RDS, IAM using management console

2 **WORKING WITH AWS: CASE STUDY**
In this case study you will work on a machine learning task using AWS services.

*Syllabus is subject to change by the university

3
MLOPS: INTRODUCTION
MLOPS: DATA LIFECYCLE
MLOPS: MODEL LIFECYCLE
Do you think ML ends with just deploying a ML solution? You have to monitor the performance and keep updating the model and its infrastructure from time to time. Learn how to productionise ML model in end to end system in this module.

4
MLOPS ASSIGNMENT
In this assignment you will build and run a complete ML pipeline end-to-end.

5
ADVANCED CV
ADVANCED CV
Apply the concepts learned in Neural Networks to advanced computer vision tasks like Object Detection, Semantic Segmentation using YOLO, SSD, UNet, MaskRCNN.

6
MLOPS + DEPLOYMENT: DL (THEORY)
MLOPS + DEPLOYMENT: DL (ASSIGNMENT)
In this case study you will learn how to automate a deep learning task by building an end-to-end machine learning pipeline with Amazon SageMaker Pipelines.

ELECTIVE 2: NLP WITH MLOPS

1
INTRO AWS
Understand what is cloud computing, benefits of cloud computing, Different types of cloud providers: Private, public, hybrid. Iaas,Paas, Saas.
Understand Cloud basic essentials services such as EC2, S3, RDS, IAM using management console.

2
WORKING WITH AWS: CASE STUDY
In this case study you will work on a machine learning task using AWS services.

3
MLOPS: INTRODUCTION
MLOPS: DATA LIFECYCLE
MLOPS: MODEL LIFECYCLE
Do you think ML ends with just deploying a ML solution? You have to monitor the performance and keep updating the model and its infrastructure from time to time. Learn how to productionise ML model in end to end system in this module.

4
MLOPS ASSIGNMENT
In this assignment you will build and run a complete ML pipeline end-to-end.

5
ADVANCED NLP
ADVANCED NLP
This module will introduce you to the evolving world of deep learning for different NLP related applications. and will help you gain a complete understanding of how these complex models work. You will learn how deep learning can be used for solving different NLP related tasks using concepts like attention mechanism and transformers.

*Syllabus is subject to change by the university

6 **MLOPS + DEPLOYMENT: NLP (THEORY)**
MLOPS + DEPLOYMENT: NLP (ASSIGNMENT)
In this case study you will learn how to automate a NLP task by building an end-to-end machine learning pipeline with Amazon SageMaker Pipelines.

ELECTIVE 3: AI STRATEGY

1 **INTRO AWS**
Understand what is cloud computing, benefits of cloud computing, Different types of cloud providers: Private, public, hybrid. Iaas,Paas, Saas.
Understand Cloud basic essentials services such as EC2, S3, RDS, IAM using management console.

2 **WORKING WITH AWS: CASE STUDY**
In this case study you will work on a machine learning task using AWS services.

3 **MLOPS: INTRODUCTION**
MLOPS: DATA LIFECYCLE
MLOPS: MODEL LIFECYCLE
Do you think ML ends with just deploying a ML solution? You have to monitor the performance and keep updating the model and its infrastructure from time to time. Learn how to productionise ML model in end to end system in this module.

4 **MLOPS ASSIGNMENT**
In this assignment you will build and run a complete ML pipeline end-to-end.

5 **AI STRATEGY FRAMEWORK, STRUCTURED PROBLEM SOLVING/ DATA STORYTELLING**
1. Understanding the impact that AI and ML have done to businessnes and identying their challenges and risks in terms of executing an AI strategy.
2. Understanding the fundamental pillars of an AI strategy like Reimagining products and processes, data, technology, humans etc that will impact the data strategy.

6 **MAPPING ML WITH DATA ARCHITECTURE STRATEGY**
1. Understand the principles that guide the decision making for developing a data architecture.
2. Explore the tools available for building data architecture; different managed services and their open-source counterparts. You will also understand selecting tools that fulfil application requirements.
3. Explore commonly used data patterns and their uses.

7 **EXECUTING AI STRATEGY**
Understanding the use of these aspects through real world case studies.

8 **AI STRATEGY: ASSIGNMENT**
Identify two KRAs/goals/OKRs for your business that could be meet by leveraging an AI solution.

*Syllabus is subject to change by the university

CAPSTONE

Choose from a range of real-world industry woven projects on advanced topics like Recommendation Systems, Fraud Detection, GANs among many others.

1 **NEWS RECOMMENDER SYSTEM**
Build a model to using the concepts of natural language processing and recommender systems to recommend news stories to users on a popular news platform.

2 **CREDIT CARD FRAUD DETECTION**
To build a machine learning model capable of detecting fraudulent transactions. Here you have to predict fraudulent credit card transactions with the help of machine learning models.

3 **EYE FOR BLIND - (IMAGE CAPTIONING)**
Build a model that can help any visually impaired person in understanding image present before them. It is a deep learning model which can explain the content of an image in the form of speech.

4 **SENTIMENT ANALYSIS BASED PRODUCT RECOMMENDER SYSTEM**
Build a sentiment analysis based product recommendation system to recommend the similar products to the users. Sentiment analysis is used to fine tune the product recommendation system.

5 **SALES FORECASTING**
Predict the sales for a european pharma giant using a host of different types of variables. Apply VAR and VARMAX models to build the appropriate model Predict the sales for a european pharma giant using a host of different types of variables. Apply VAR and VARMAX models to build the appropriate model.

6 **STYLE TRANSFER USING GAN'S**
Build a Model for converting MRI images from one type (T1) into other (T2) and vice versa.
CycleGAN model is used for producing T2 type MRI images given T1 type input MRI images.

REINFORCEMENT LEARNING (OPTIONAL)

1 **CLASSICAL REINFORCEMENT LEARNING**
Ever wondered how Alpha Go beat the best GO player or how Boston Dynamics made robots that can run. Start your journey with the classical RL algorithms like dynamic programming, Monte Carlo methods, Q Learning to train the state value and action value functions of the policy.

2 **ASSIGNMENT -CLASSICAL REINFORCEMENT LEARNING**
Train an agent that'll beat you in the game of numerical tic-tac-toe everytime you play.

3 **DEEP REINFORCEMENT LEARNING**
Want to build your own Atari Game? Learn the Q-function or policy using the various Deep Reinforcement Learning algorithms: Deep Q Learning, Policy Gradient Methods, Actor- Critic method.

4 **REINFORCEMENT LEARNING PROJECT**
Improve the recommendation of the the rides to the cab drivers by creating a RL based algorithm using vanilla Deep Q-Learning (DQN) to maximize the driver's profits and inturn help in retention of the driver on the cab aggregator service.

*Syllabus is subject to change by the university