Data Science with GenAI											
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Program Schedule											
Module	**Week #**	**Session #**	**Module**	**Topics**	**Session Type**	**Duration**	**Date**	**Resource**	**Status**	**Remarks**	**Notes**
Module 1		**Foundation Module**		Program Orientation	**Live**	1	Nov 4	Varadha			
				Pre-Learning	**Self-Paced**			Feby	Opened		
	Week 1	Session 1	**Python Basics**	Introduction to Data Science,What is Python, Overview of Python libraries used for Data Science, Installing Anaconda and Jupyter Notebook, Google Colab walkthrough	Live	1.5	Nov 6				
		Session 2		Syntax and Basic Constructs: Variables and Data Types, Type Casting, Comments and Indentation, Input and Output functions,Operators in Python		1.5	Nov 8				
	Week 2	Session 3		Control Statements - Conditional Statements(if, elif,else),Loops (for,while,break, continue), Functions, Lambda Functions, Recursion		1.5	Nov 11				1 week
		Session 4		Python Data Structures(Lists, Tuples, Sets, Dictionaries), List Comprehension, File Handling in Python, Exception Handling(Try, except,else, finally)		1.5	Nov 13				
				Assignment 01 :: Python Data Structures	Self-Paced						
		Session 5		Modules and Packages: Importing modules, Using standard libraries : math, random, datetime, etc, Creating and Using Custom Modules	Live	1.5	Nov 15				
		Session 6		Object-Oriented Programming (OOP) Basics, Introduction to OOPs, classes and objects, Constructors and the __init__ method, Instance vs Class variables, Inheritance and Method Overriding,Encapsulation and Polymorphism		1.5	Nov 18				
	Module 1 End			*Python Module End Assessment*	**Self-Paced**						1 week
Module 2	Week 3	Session 7	**Python for Data Science**	NumPy - NumPy arrays, Array operations and functions	Live	1.5	Nov 20				
		Session 8		Pandas - Series: Slicing, indexing (with index, booolean, loc, iloc) and manipulating (add,update,delete); Series attributes and methods, "Pandas - DataFrame: Slicing, indexing (with index, booolean, loc, iloc) and manipulating (add,update,delete), DataFrame attributes and methods"	Live	1.5	Nov 22				
		Session 9		Data Ingestion, Data Exploration (readcsv, head, tail, shape, columns, info, dtypes, describe, value_counts, etc), Data Wrangling - merge, concat, join, group by	Self-Paced	1.5	Nov 25			combine assignment 2 & 3	1 week
				Assignment 02 :: Array Operations using NumPy, Data Exploration Using Pandas							
	Week 4	Session 10		Introduction to Data visualisation in Python Visualization Using Matplotlib- Scatter Plot, Line Chart, Bar Chart, Pie Chart, Histogram, Box Plot	Live	1.5	Nov 27				
		Session 11		Visualization Using Seaborn- Count Plot, Bar plot, Scatter plot, Line plot,Box plot, Histogram, Density Plot, Violin Plot, Swarm Plot, Heatmap, Pair Plot		1.5	Nov 29				
				Assignment 03:: Data Visualization	Self-Paced						1 week
		Session 12		Introduction to Web Scraping, HTML basics, Parsing and navigating HTML with BeautifulSoup	Live	1.5	Dec 2				
	Week 5	Session 13		Using Selenium for Dynamic Web Scraping		1.5	Dec 4				
		Session 14		Introduction to Git and GitHub - Basics of version control, Git commands (clone, commit, push, pull, branch, merge),Creating and managing repositories, Collaboration using GitHub		1.5	Dec 6				
	Module 2 End			*Python Module End Assessment 2*	**Self-Paced**						1 week
Module 3	Week 6	Session 15	**Mathematics and Statistics for Data Science**	Introduction to Mathematics for Data Science, Linear Algebra: Vectors, matrices, determinants, eigenvalues, eigenvectors, Probability: Basic probability concepts, Probability distributions, Bayes' theorem, conditional probability	Live	1.5	Dec 9				
		Session 16		Introduction to Statistics, Descriptive Statistics: Measures of Central Tendency, Measure of Dispersion (range, variance, standard deviation), Measure of Symmetry (Skewness and Kurtosis)		1.5	Dec 11				1 week
				Assignment 04 :: Mathematics for Data Science	Self-Paced		Dec 13				
		Session 17		Handing outliers: percentile, quartile, IQR, z-score ; Correlation: Pearson and Spearman correlation ; Covariance	Live	1.5	Dec 16				
	Week 7	Session 18		Inferential Statistics: Bootstrapping; Central Limit Theorem; Estimation - Point Estimate, Interval Estimate.Hypothesis Testing - Null and Alternate Hypothesis ; Type I and Type II Errors ; Confidence interval; p-value, Standard Error, One-Tailed vs. Two-Tailed Tests		1.5	Dec 18				
		Session 19		z-test, t-test, Chi-Square Test, F Test, ANOVA, A/B Testing		1.5	Dec 20				
	Module 3 End			*Statistics Module End Assessment*	**Self-Paced**						1 week
		Session 20		Introduction to Artificial Intelligence and Machine Learning ; AI vs ML vs DL, ML Types, Machine Learning Workflow		1.5	Dec 23				

Module	Week	Session	Topic	Type	Dur	Date						Duration
	Week 8	Session 21	Data Preprocessing, Handling missing values (Imputation techniques: Mean, Median, Mode, SimpleImputer), Handling duplicates, Handling Outliers (boxplot, IQR, z-score), Treating skewed data (square-root & log transformation)	Live	1.5	Dec 27						
		Session 22	Feature Engineering (Label & One-hot Encoding) ; Feature Selection (SelectKBest, Correlation) ; Splitting Data into Training and Test Sets ; Feature Scaling (Standardization, Normalization)		1.5	Dec 30						
			Assignment 05 :: Data Preprocessing	Self-Paced								10 days
	Week 9	Session 23	Introduction to Supervised Learning - Linear Regression; Regression Model Evaluation measures, Assumptions of Linear Regression	Live	1.5	Jan 1						
		Session 24	Bias-Variance Trade-off; Over-fitting and Under-fitting; Regularization (Ridge, Lasso), Polynomial Regression		1.5	Jan 3						
		Session 25	Introduction to Classification ; Logistic Regression		1.5	Jan 6						
			Assignment 06 :: Linear Regression	Self-Paced		Jan 8						1 week
	Week 10	Session 26	Decision Tree, KNN	Live	1.5	Jan 10						
		Session 27	Ensemble Learning - Random Forest, Bagging, Boosting		1.5	Jan 13						
		Session 28	Naive Bayes, SVM		1.5	Jan 15						
Module 4	Week 11	Session 29	Classification Model Evaluation measures ; Selecting the best Classification model ; Cross-Validation ; Hyper-parameter tuning, Models comparison ; Selecting the best model	Live	1.5	Jan 17						
			Assignment 07:: Classification Algorithms Model Building	Self-Paced								1 week
		Session 30	Introduction to Unsupervised Learning & Clustering, kMeans Clustering, Random Initialization Trap, Elbow Method	Live	1.5	Jan 20						
		Session 31	Agglomerative Hierarchical Clustering, Dendrograms; DBSCAN		1.5	Jan 22						
	Week 12	Session 32	Dimensionality Reduction: PCA, t-SNE		1.5	Jan 24						
			Assignment 08 :: Clustering and Dimensionality Reduction	Self-Paced								1 week
		Session 33	Association Rule Learning (Apriori)		1.5	Jan 27						
		Session 34	Introduction to Recommendation Systems; Types; Building a recommendation system		1.5	Jan 29						
	Week 13	Session 35	Introduction to Time Series; basic properties (trend, seasonality, noise); Time series analysis using ARIMA	Live	1.5	Jan 31						
		Session 36	Introduction to deploying machine learning models locally, Creating APIs using Flask/FastAPI, Serving models as REST APIs; Introduction to containerization with Docker for local deployment.		1.5	Feb 3						
			Machine Learning Module End Assessment	*Self-Paced*								2 weeks
	Week 14	Session 37	Orientation and Phase - 1: EDA (Visualization) and Pre-processing	Live	1.5	Feb 5						
		Session 38	Live Session	Live	1.5	Feb 7						
	Week 15	Session 39	Phase - 2: Feature Selection and Model Building (using multiple models)	Live	1.5	Feb 10						
		Session 40	Mock Interview	Mock	-	Feb 12						
Module 4 End			*Summative Assessment -1*	*Self-Paced*	10 min	Feb 14						
	Week 16	Session 41	Introduction to Deep Learning; Applications and Real-World Use Cases; Overview of Neural Networks (Building Blocks: Input, Hidden, Output Layers)		1.5	Feb 17						
		Session 42	Introduction to Feed Forward Network - Perceptron and Multi-layer Perceptron (MLP), Limitations of Perceptron		1.5	Feb 19						
		Session 43	Activation Functions: Sigmoid, ReLU, Tanh, etc.,Choosing the right Activation Function for a Problem		1.5	Feb 21						
	Week 17	Session 44	Artificial Neural Network: Backpropagation mechanism, Loss Functions (Mean Squared Error, Cross-Entropy)		1.5	Feb 24						
		Session 45	Introduction to Optimization; Gradient Descent (GD) and Stochastic Gradient Descent (SGD),Challenges in Optimization; Hyperparameter Tuning: Learning Rate, Batch Size, Dropout	Live	1.5	Feb 26						
		Session 46	Overview of Deep Learning frameworks; Intro to Tensorflow and Keras; PyTorch Essentials : Tensors, AutoGrad, Building simple ANN using Pytorch, Comparing Keras and PyTorch,Building a Simple ANN Model Using the Sequential API in Keras		1.5	Feb 28						
	Week 18	Session 47	Difference Between Sequential and Functional API; Building an ANN Model Using Functional API		1.5	Mar 3						
		Session 48	Introduction to Convolutional Neural Network; How it works,Layers of CNN: Convolutional Layer, ReLU Layer, Pooling Layer, Fully Connected Layer		1.5	Mar 5						
		Session 49	Building a CNN model using Keras - Use Case: Image Classification		1.5	Mar 7						
			Assignment 9 :: CNN Model	Self-Paced								1 week
Module 5	Week 19	Session 50	Introduction to Recurrent Neural Networks; How it works, Challenges in RNN: Vanishing Gradient Problem in RNN	Live	1.5	Mar 10						
		Session 51	Building an RNN Model - Use Case: Time Series Prediction		1.5	Mar 12						
		Session 52	Long Short-Term Memory (LSTM) Architecture; LSTM vs. RNN;		1.5	Mar 14						

Module names: Machine Learning (Sessions 21–36), Mini Project (Sessions 37–40), Deep Learning (Sessions 41–52).

		Session 52						Mar 17		10 days
	Week 20	Session 53	*Assignment 10 :: RNN Model*	Live		1.5	Mar 19			
			Building an LSTM Model - Use Case: Sentiment Analysis							
		Session 54	Introduction to Auto-Encoders, Auto-Encoders vs Principal Component Analysis, Types and Applications of Auto-Encoders			1.5	Mar 21			
		Session 55	Building a Auto-Encoder Using Keras - Use Case: Denoising or Dimensionality Reduction			1.5	Mar 24			
			Assignment 11 :: Auto-Encoder	Self-Paced						1 week
	Week 21	Session 56	Introduction to Restricted Boltzmann Machine, Boltzmann Machines vs. Neural Networks	Live		1.5	Mar 26			
		Session 57	Building a Recommendation System with RBM			1.5	Mar 28			
		Session 58	Natural Language Processing (NLP) Introduction : Text preprocessing: Tokenization, Stopwords, Stemming, Lemmatization, Bag of Words, TF-IDF, NLP with Deep Learning : Text classification with LSTM/RNN			1.5	Mar 31			
			Assignment 12 :: Sentiment Ananlysis	Live			Apr 2			1 week
	Week 22	Session 59	Introduction to Transfer Learning; Advantages of Transfer Learning in Deep Learning,Overview of Pre-trained Models (e.g., VGG16, ResNet, Inception)			1.5	Apr 4			
		Session 60	Building a Model with Transfer Learning: Fine-Tuning Pre-trained Models for Specific Tasks			1.5	Apr 7			
		Session 61	Introduction to Hugging Face, Exploring pre-trained models from Hugging Face, Building and using Hugging Face pipelines for tasks like summarization, text generation, image generation, etc.	Live		1.5	Apr 9			
	Module 5 End		***Deep Learning Module End Assessment***	**Self-Paced**						10 days
Module 6	Week 23	Session 62	Foundations of AI :What is AI? History, Evolution, Key Applications, Difference between AI, ML, DL, AI Ethics and Societal Implications:Bias and Fairness in AI,Job	Live		1.5	Apr 11			
		Session 63	Introduction to Generative AI :What is Generative AI? Use cases, Examples: GPT, DALL·E, MidJourney, Generative AI Principles :Data requirements, Latent space, Training and inference, Introduction to GANs (Generative Adversarial Networks)	Live		1.5	Apr 14			
		Session 64	Essentials of Generative AI : Types of generative models: VAEs, GANs, Diffusion Models, Performance metrics and limitations	Live		1.5	Apr 16			
		AI and Gen AI	*Assignment 13:: Generative Adversarial Network*	Self-Paced						10 days
	Week 24	Session 65	Prompt Engineering:Role of prompts in large language models, Techniques to craft effective prompts, Few-shot, zero-shot, and chain-of-thought prompting	Live		1.5	Apr 18			
		Session 66	ChatGPT Inside-Out : How ChatGPT works (Transformer architecture), Features, Use cases, Limitations, Tokens, context length, and response generation, ChatGPT, Applications:Education, Business, Productivity, Code generation, Use cases in Customer Support, Content Creation, Analytics	Live		1.5	Apr 21			
		Session 67	Future of Generative AI and Challenges : Advancements, Multimodal models, Ethical boundaries, Regulation, AI Alignment	Live		1.5	Apr 23			
	Module 6 End		***AI & Gen AI Module End Assessment***							14 days
	Main Project		*Main Project -- Orientation*	*Live*		1.5	Apr 30			
			Main Project -- Mentoring & Evaluation Phase 1	*Live*		1.5	May 7			
			Main Project -- Mentoring & Evaluation Phase 2	*Live*		1.5	May 14			
			Main Project -- Mentoring & Evaluation Phase 3	*Live*		1.5	May 21			
			Main Project -- Mentoring & Evaluation Phase 4	*Live*		1.5	May 28			
			Main Project Submission	*Submission*		-	Jun 4			
			Preparatory Session	*Live*		1.5	Jun 6			
			Summative Assessment	*Self-Paced*		3	Jun 13			

SESSION TIMING
Tue, Thu & Sat , 6:30 to 08:00 P.M