AI-ML-Azure TechM

	MON	TUE	WED	THU	FRI	ENVIRONMENT
Week 1 - Python	Cohort Start Ceremony Git Fundamentals • Source Control Management(git,vcs, cvcs,dvcs) • Git Fundamentals • Initializing A Repository • Pushing To A Remote Repository • Git Commit Branch Merge Push Pull • Gitignore Agile for Developers • Introduction To Sdlc • Agile • Story Pointing And Burndown Charts • Scrum Ceremonies	Project 0 Python-Fundamentals Python-Orientation • Interpreter vs Compiler • REPL Jupyter Python-Basics • What is Python Why Python • Python Syntax • Comments • Variables and Datatypes • Operators • User Input and Output Python-DataTypes • Namespaces • Strings • Casting • Boolean • Lists • Tuples • Range • Sets • Binary Type • Nontype • Dictionaries • Numbers	Project 0 Python-Fundamentals Python-FlowControl-Stmts • If-Else • While • For • Function • Lambda • map & filter • Arrays Python-Classes & Inheritance • Classes and Objects • OOP Concepts • Inheritance • Iterators • Scope	Project 0 Python-Fundamentals Python-Modules • Module • Math • Logging • JSON • Regex • pip and install pip • pylint • Connect SQL • Numpy: Setup, Basics, Indexing, Arithmetic, Dot Product, Axis Operations, Broadcast, Transpose, Reshape, Joining, Expand, Reduce • Seaborn: Histograms, KDE, Box Plots, Categorical Scatter Plots, Pair Plots, Heatmaps • Fast API: Serving Data, Serving Structured Data using Pydantic Models, Databases, HTTP, Authentication, Testing, Deployment	Project 0 Python-Fundamentals Python-Exception Handling • Error • Exception Handling • try-except • File Handling • Read Files Python-File Handling • Write Create Files • Delete Files • reading and writing CSV, JSON, native PDF files • Pandas EDA: Setup, Load/Save Data, Filtering, Sorting, Grouping, Indexing, Preprocessing, Clean-Up	• Python • VSCode • Git • pandas • Seaborn • Fast API
Week 2 - ML Foundations	Project 0 Quiz #1 Trainer 1/1 Assessment ML Foundations Introduction to	Project 0 ML Foundations Quality Audit Feature Engineering • Transformations (Simple Label	Project 0 ML Foundations Regularization Techniques • L1 and L2 Regularization	Project 0 ML Foundations Random Forests • Ensemble learning and bagging. • Random forest	Project 0 Showcase ML Foundations • Review, Fall Over	

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	Machine Learning • ML, What is it?, Applications, Use Cases, Systems • supervised vs unsupervised learning Data Preprocessing and Exploration • Exploratory Data Analysis (EDA) • Data cleaning: handling missing values, outliers, and noise. • Handling duplicate records. • Feature scaling, normalization, and encoding.	Preserving, Perturbation, Data Synthesis) • Feature scaling: normalization, standardization. • Handling categorical variables: one-hot encoding, ordinal encoding. • Word Embeddings vs One-Hot Encoding • Feature Extraction with Principal Component Analysis (PCA) • Linear Discriminant Analysis (LDA) and/or Singular Value Decomposition (SVD) for dimensionality reduction • Nonlinear dimensionality reduction techniques such as kernel PCA and nonlinear manifold learning methods such as UMAP (Uniform Manifold Approximation and Projection) and t-SNE (t-Distributed Stochastic Neighbor Embedding) • Handling text data: text cleaning, tokenization, stemming, lemmatization. • Feature selection techniques: filter methods, wrapper methods, embedded methods. • Handling High-Dimensional Data: Curse of dimensionality:	• Ridge regression: L2 regularization for reducing overfitting • Lasso regression: L1 regularization for feature selection. Decision Trees • Basics of decision tree algorithms: construction, splitting criteria (e.g., Gini index, information gain). • Tree pruning techniques: pre-pruning, post-pruning. • Handling categorical predictors and missing values. Clustering • K-means clustering: algorithm, initialization, and convergence. • Hierarchical clustering: agglomerative and divisive approaches. • Density-based clustering: DBSCAN, OPTICS. Naïve Bayes • Application areas and strengths of Naive Bayes. • Handling continuous and categorical features with Naive Bayes	construction and feature importance. • Out-of-bag estimation and tuning parameters. Support Vector Machines • Basics of SVM: maximum margin, support vectors. • kernel based methods k-nearest neighbors • Training, Prediction, and calculating the Euclidean Distances between data points Ensemble Methods • Boosting techniques: AdaBoost, Gradient Boosting. • Bagging techniques: bootstrap aggregating, random subspace. • Stacking: combining multiple models for improved performance.		

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		challenges and techniques. Linear Regression • Simple linear regression: model formulation, interpretation, and evaluation. • Multiple linear regression: handling multiple predictors, interpretation, and multicollinearity. • Polynomial regression: modeling nonlinear relationships. • Interpreting regression coefficients. • Residual analysis and model diagnostics • Techniques for model selection: cross-validation, train-test splits Logistic Regression • Binary logistic regression: model formulation, interpretation, and evaluation. • Multinomial logistic regression: handling multiple classes. • Evaluation with AUC - ROC (Area Under the Receiver Operating Characteristic Curve)				
Week 3 - TensorFlow	Project 1 Quiz #2 Trainer 1/1 Assessment TensforFlow and Keras	Project 1 Quality Audit TensforFlow and Keras TensorFLow Operations	Project 1 TensforFlow and Keras Models and Layers • Sequential Models and Adding	Project 1 TensforFlow and Keras Transfer learning • loading and saving Keras models,	Project 1 TensforFlow and Keras • Review, Fall Over tf.transform • Tensorflow	• TensorFlow • Keras

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	Introduction to TensorFlow • Overview of TensorFlow as a deep learning framework • Installing and setting up TensorFlow. TensorFlow Basics • Tensor objects and operations • Computation graphs, and sessions • Introduction to Keras	• Mathematical, Reduction, and Matrix operations • Data Manipulation Operations • Activation Functions, Convolution Operations, and Recurrent Operations • Loss Functions and Gradient Operations • Image Operations TensorFlow Estimators • Predefined Estimators including linear regression, logistic regression, deep neural networks (DNNs), and gradient boosting models (GBMs). • Using train() and evaluate() with an estimator tf.data • Data loading including built-in datasets such as MNIST and CIFAR-10 • Transformation and Preprocessing with map(), filter(), batch(), and etc.	layers to the model using the add() method.Configuring layer parameters such as activation function, input shape, and output shape. • Functional API Models and Creating complex model architectures with multiple inputs and outputs. Utilizing shared layers and layer reuse in model architectures • Dense Layers • Convolution Layers (Conv1D, Conv2D, and Conv3D layers for image and sequence data.) and Recurrent Layers (LSTM, GRU, and SimpleRNN layers for sequence modeling.) • Custom Layer Creation: Building custom layers in Keras using the subclassing API. Defining the forward pass and backward pass methods. Incorporating custom layers into models. • Pooling Layers using MaxPooling2D, GlobalMaxPooling1D, and AveragePooling3D for downsampling and feature extraction. Model Training and Evaluation • Configuring the model for training using the compile() method. • Training models	and saving using HDF5 format and exporting models using TensorFlow SavedModel format • leveraging pre-trained models • removing top layer and adding new layers • training the model • fine-tuning model • evaluate and deploy TF Hub • Accessing Tensorflow Hub using PIP and the Python API • model formats i.e. TensorFlow SavedModel vs. TF2 SavedModel. • understanding input and output requirements using Model Signature and inspecting model layers using summary() Running Models in a Browser • Converting a Keras HDF5 model to Tensorflow.js or other models types such as SavedModel to Tensorflow.js • Hosting Model File on a server or VM • Loading and Running the model in a browser	transform Introduction • Analyze phase • transform phase • support serving	

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			using the fit() method. • Setting batch size, epochs, and validation split. • Evaluating model performance using the evaluate() method.			
Week 4 - Neural Networks **ANN, CNN, and RNN**	Project 1 Quiz #3 Trainer 1/1 Assessment Neural Networks Introduction to Artifical Neural Networks (ANN) • ANN vs. biologial Neural Networks • Tensorboard Building Blocks of Neural Networks • inputs, weights, bias, and activation functions • layers and their types (dense, convolution, and recurrent) • Forward and backward prograpogation	Project 1 Quality Audit Neural Networks Building and Training Neural Networks with Keras • Sequential and functional API for building models • Adding layers to a model • Configuring layer parameters (activation functions, number of units, etc.) • Compiling the model to prepare for training • Preparing input data (data preprocessing, normalization, one-hot encoding) • Splitting data into training, validation, and test sets • Batch size and epoch concepts • Training loop and model.fit() method • Overfitting and underfitting detection and mitigation techniques • Early stopping and model checkpoints • Evaluating the model on validation	Project 1 Neural Networks Convolution Neural Networks (CNN) • Introduction to Computer Vision • CNN architecture overview (e.g., LeNet-5, AlexNet, VGG, ResNet, Inception, etc.) • input, convolution layer, filters, stride and padding, activation function, output feature maps • Pooling Layers: Max Pooling and Average Pooling • Image Classification • Evaluating Performance of CNNs	Project 1 Neural Networks Recurrent Neural Networks (RNN) • RNN: inpute and time steps, recurrent unit, recurrent connection, activation function, output • Back Propogation through Time (BPTT) training • Long Short-Term Memory (LSTM) and Gated Recurrent Units (GRUs) • Word Embeddings (Word2Vec, GloVe) and language modeling with RNNs • Building and training RNNs for text generation or time series analysis • Application to NLP tasks (sentiment analysis, named entity recognition)	Project 1 Neural Networks • Review, Fall Over	• TensorFlow

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		and test sets				
Week 5 - Neural Networks **Neural Networks - NLP, Transfer Learning, Deep Learning and Model Deployment**	Project 1 Quiz #4 Trainer 1/1 Assessment Natual Language Processing (NLP) • Cleaning and Normalizing Text Data • Working with the Tokenizer • Text to Sequence • Word Embedding: The IMDB Dataset • Sentiment in Text: Word-based Encodings	Project 1 Quality Audit • General Language Understanding Evaluation (GLUE) Benchmark • Named Entity Recognition (NER) • Machine Translation • Natural Language Understanding (NLU) • Text Summarization Transfer Learning with Neural Networks • Using pre-trained models and model weights • Techniques for fine-tuning and adapting models to new tasks • Frozen layers and trainable layers	Project 1 Generative Deep Learning • Variational Autoencoders (VAEs) and generating new samples • Generative Adversarial Networks (GANs): using generator and discriminator to generate synthetic data Model Deployment and Serving • TensorFlow Serving for NLP models • Containerization of NLP models • RESTful APIs for model serving • Deploying NLP models on cloud platforms	Project 1 MLflow • Introduction to Mlflow • Utilizing the MLflow Model Registry for model versioning and management. • Logging parameters, metrics, and artifacts during model training Machine Learning Pipelines • Workflow Orchestration and Automation • Performance Optimization and Scalability • Exporting trained models for deployment TFX Pipeline • Data Ingestion and Preprocessing using data from databaes, files, or streaming platforms • Model Training and Evaluation • Model validation with holdout dataset or cross-validation and exporting and serving model • Managing the end-toend ML pipeline worflow and coordinating the execution of different pipeline components	Project 1 Showcase • Review, Fall Over	• TensorFlow
Week 6 - Azure AI Engineer Associate Certification	Project 2 Quiz #5 Trainer 1/1	Project 2 Quality Audit Prepare to develop AI	Project 2 Deploy Azure AI services in containers	Project 2 Analyze video • Azure Video	Project 2 • Review, Fall Over Build a conversational	

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	Assessment Cloud Introduction • Cloud Computing Model Types • Cloud Computing Service Types • Overview of IaaS, PaaS, SaaS • Cloud Computing Definition Azure Fundamentals • Overview of Azure • How to Create a Virtual Machine in Azure • Azure Storage Overview • Deploying a Static Website via Blob Storage • Creating an Azure Database for MySQL	solutions on Azure • Considerations for AI Engineers • AI Services in Azure Introduction • Capabilities of Azure Machine Learning Create and consume Azure AI services • Introduction • Azure AI Service Provisioning • Identify endpoints & keys • use REST API • use SDK Secure Azure AI Services • Authentication • Network Security Monitor Azure AI Services • Monitoring cost • Create Alerts • View Metrics • Manage Diagnostic Logging	• Understand Containers • Azure AI service containers Analyze images • Provisioning Azure AI Vision resource • Analyze an Image Generate a smart-cropped thumbnail and remove the background Classify Images • Provisioning Azure resources for Azure AI Custom Vision • train an image classifier Classify images with Azure AI Custom Vision Detect, analyze, and recognize faces • Identify options for face detection analysis & identification • Detect faces with Azure AI Vision Service • capabilities of face service • compare and match detected faces • Implement facial recognition Detect, analyze and identify faces Read Text in images and documents with the Azure AI Vision Service • Azure AI Vision options for reading text • Read API	Indexer capabilities • Extract custom insights • Video analyzer widgets and API's Analyze a video using Azure Video Analyzer Analyze text with Azure AI Language • Azure AI Language resource introduction • Detect language • Extract Key Phrases • Analyze sentiment • Extract Entities • Extract Linked Entities Text Analyzation using Azure AI Language Resource Question answering solutions with Azure AI Language • Question Answering using Azure AI Language understanding • Creating Knowledge base • Implementing multi-turn conversation • test and publish knowledge base • Improving question answering performance Creating a Question Answering solution using Azure AI Language	language understanding model • prebuilt capabilities of the Azure AI Language service • Resources for building a conversational language understanding model 9 min • Define intents, utterances, and entities • Using patterns to differentiate similar utterances • Using pre-built entity components • Train, test, publish, and review a conversational language understanding model Build an Azure AI services conversational language understanding model custom text classification solution • Create a custom text classification solution using Azure AI Language Service Custom named entity recognition • Build a custom entity recognition solution to extract entities from unstructured documents using Azure AI Services	

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Week 7 **Azure AI Engineer Associate Certification, Gen AI fundamentals**	Project 2 Quiz #6 Trainer 1/1 Assessment Azure AI Translator service • Provision an Azure AI Translator resource • Understand language detection, translation, and transliteration • Specify translation options • Define custom translations Translate text with the Azure AI Translator service Create speech-enabled apps with Azure AI services • Provision an Azure resource for speech • Use the Azure AI Speech to Text API • Use the text to speech API • Configure audio format and voices • Use Speech Synthesis Markup Language Create a speech-enabled app Translate speech with the Azure AI Speech service • Provision an Azure resource for speech translation • Translate speech to text • Synthesize	Project 2 Quality Audit Azure AI Search Solution • Azure AI Search Introduction • Manage capacity • search components • Indexing process • Search an Index • Apply filtering & sorting • Enhance the index • Create a custom skill for Azure AI Search • Create a knowledge store with Azure AI Search Create Search Solution using Azure AI Search Azure AI Document Intelligence solution • AI Document Intelligence Introduction • Plan Azure AI Document Intelligence resources • Choose a model type • Use prebuilt Document intelligence models • Train custom models • Azure Document Intelligence Studio Analyze a document using Azure AI Document Intelligence Extract data from custom forms	Project 2 LLM-Introduction AI-Orientation • ML Introduction • AI Introduction LLM -Introduction LLM-Overview • GenAI Overview • LLMs (GPT, BERT, Claude, Llama, Copilot, Codeium) • Use cases for LLM • Security considerations • LLM best practices • Hallucinations • AI Review	Project 2 Prompt Engineering Prompt-Engineering • Prompt Engineering Introduction • Zero-shot Prompting • Few-shot prompting • Constraints • Fine-tuning and Conditioning • Interaction and Dialog State • Instructions and Guidelines • Hallucinations • Responsible Usage • Security • Prompt Engineering Review	Project 2 Azure Open AI Service • Azure Open AI Service Introduction • Azure OpenAI Studio • Gen AI Models in Azure Open AI • Azure Open AI Deployments • Test models in Azure OpenAI Studio's Playground Natural language solutions with Azure OpenAI Service • Azure OpenAI REST API • Azure OpenAI SDK Integration of Azure OpenAI with an Application Apply prompt engineering with Azure OpenAI Service Generate code with Azure OpenAI Service Generate images with Azure OpenAI Service using DALL-E	

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	translations Translate speech using Azure AI Speech Service					
Week 8 **LangChain Overview**	Project 2 Quiz #7 Trainer 1/1 Assessment Retrieval Augmented Generation (RAG) with Azure OpenAI Service • RAG Introduction • Data Sources • Chat with model using your own data Fundamentals of Responsible Generative AI • Plan a responsible generative AI solution • Identify, Measure and Mitigate Potential harms • Operate a responsible generative AI solution Explore content filters in Azure OpenAI	Project 2 Quality Audit LangChain-Orientation • Introduction to Models • Using LLMs with LangChain examples LangChain-Prompts • Prompt Templates • Parsing Output • Serialization of Prompts LangChain-Chains • LangChain Chains • LangChain Expression Language • Runnable Passthrough • Runnable Lambda • Runnable Parallel	Project 2 LangChain-Memory • Introduction to Memory • ChatMessageHistory • ConversationBufferMemory • ConversationBufferWindowMemory • ConversationSummaryMemory LangChain-Agents • Introduction to Agents • Agent Tools • Conversation Agents	Project 2 LangChain-Integrations • LangSmith • LangFlow • Flowise • LangGraph Overview • Adding to LangChain OpenSource Project • LangChain Review	Project 2 Azure AI Associate Certification Exam	
Week 9 **Project 2**	Project 2	Project 2	Project 2	Project 2	Project 2 Showcase Promotion Ceremony	

PROJECT	TECHNOLOGIES
Project 0	Python, EDA, pandas, Seaborn, Fast API
Project 1	TensorFlow, Neural Networks, Computer Vision, NLP
Project 2	Python, TensorFlow, Neural Networks, Natural Language Processing, LLM, Prompt Engineering, Azure AI Services

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