

KKR
GENAI
INNOVATIONS

AI COURSE PLAN FOR IT PROFESSIONALS (CODERS)

Weeks 1-2

Foundations of AI & Data in Business & IT

Topics:

- ✓ Overview of AI's applications in business and IT.
- ✓ Key roles in Business Analytics, Data Analysis, Quality Assurance, & IT Support.
- ✓ Data types and structures: structured, semi-structured, unstructured.
- ✓ Data storage and retrieval basics.
- ✓ Data quality fundamentals: accuracy, consistency, completeness.
- ✓ Using Excel and Power BI for data organization and visualization.
- ✓ Creating basic charts and dashboards in Tableau.
- ✓ Understanding non-coding data handling techniques.
- ✓ Organizing data for analysis.
- ✓ Introduction to using data insights for business decisions.

Tools:

- ✓ Microsoft Excel: Data organization, basic analysis.
- ✓ Power BI: Data visualization and dashboard creation.
- ✓ Tableau: Interactive dashboards and data exploration.

Practical Exercises:

- ✓ Structuring and analyzing data in Excel.
- ✓ Building a dashboard in Power BI or Tableau.

Resources:

- ✓ Harvard Online - Data Science for Business: Data Science for Business
- ✓ YouTube:
 - Google Cloud AI in Business
 - Power BI Tutorial for Beginners
- ✓ Tableau Free Training: Tableau Learning

Weeks 3-4

Python Fundamentals for Data Analysis

Topics:

- ✓ Python basics: variables, data types, operators.
- ✓ Data structures: lists, dictionaries, tuples.
- ✓ Control flow: if-else, loops.
- ✓ Functions and modules in Python.
- ✓ Introduction to Pandas and NumPy for data handling.
- ✓ Loading and handling data from files (CSV, Excel).
- ✓ Using Jupyter Notebook for data analysis.
- ✓ Google Colab for cloud-based coding.
- ✓ Data manipulation basics with Pandas.
- ✓ Simple data transformations and summarizations.

Tools:

- ✓ Jupyter Notebook: Interactive coding environment.
- ✓ Google Colab: Cloud-based Python platform.
- ✓ VS Code: Python development environment.

Practical Exercises:

- ✓ Writing basic Python scripts for data manipulation.
- ✓ Exploring data structures and control flow in Jupyter Notebook.

Resources:

- ✓ YouTube:
- ✓ Corey Schafer's Python Tutorials
 - Jupyter Notebook Basics by Tech with Tim
 - Real Python - Pandas Guide: Real Python
- ✓ Google Colab Tutorials: Google Colab

Weeks 5-6

Data Cleaning & Transformation Techniques

Topics:

- ✓ Data cleaning techniques for accuracy and completeness.
- ✓ Handling missing data (imputation, deletion).
- ✓ Removing duplicates and outliers.
- ✓ Data normalization and standardization.
- ✓ Converting data types (e.g., strings to numbers, dates).
- ✓ Encoding categorical variables (one-hot, label encoding).
- ✓ Text data cleaning with regular expressions.
- ✓ Filtering and sorting data in Pandas.
- ✓ Aggregating data with groupby functions.
- ✓ Introduction to OpenRefine for advanced cleaning.

Tools:

- ✓ Pandas: Data cleaning and manipulation.
- ✓ OpenRefine: Advanced cleaning for complex datasets.

Practical Exercises:

- ✓ Cleaning and transforming datasets using Pandas.
- ✓ Performing advanced data cleaning with OpenRefine.

Resources:

- ✓ Kaggle - Data Cleaning Course: Kaggle
- ✓ YouTube:
 - Data Cleaning with Pandas by Data School
 - OpenRefine Basics

Weeks 7–8

Data Visualization Basics

Topics:

- ✓ Data visualization principles and chart types.
- ✓ Creating bar charts, line charts, histograms in Matplotlib.
- ✓ Generating scatter plots and box plots.
- ✓ Advanced statistical visualizations with Seaborn.
- ✓ Choosing appropriate chart types for data.
- ✓ Customizing visualizations (labels, titles, legends).
- ✓ Working with subplots for multi-chart visualization.
- ✓ Visualizing data relationships and distributions.
- ✓ Basics of color theory in data visualization.
- ✓ Exporting visualizations to files (PNG, PDF).

Tools:

- ✓ Matplotlib: Fundamental plotting.
- ✓ Seaborn: Advanced visualizations.
- ✓ Plotly: Interactive charts.

Practical Exercises:

- ✓ Creating and customizing visualizations in Matplotlib and Seaborn.
- ✓ Building an interactive chart with Plotly.

Resources:

- ✓ YouTube:
 - StatQuest Data Visualization
 - Data Visualization with Matplotlib by Sentdex
- ✓ DataCamp – Data Visualization with Python: DataCamp

Weeks 9-10

Introduction to Cloud Computing for AI and Data

Topics:

- ✓ Basics of cloud computing: IaaS, PaaS, SaaS models.
- ✓ Benefits of cloud computing for AI and data science.
- ✓ Key cloud providers: AWS, Azure, Google Cloud Platform (GCP).
- ✓ Understanding virtual machines and containers.
- ✓ Introduction to serverless computing and its use in AI.
- ✓ Overview of compute services in the cloud (EC2, Azure Vms, GCP Compute Engine).
- ✓ Overview of storage services (S3, Azure Blob, GCP Storage).
- ✓ Basics of cloud networking and security.
- ✓ Cloud data storage solutions: databases, data lakes.
- ✓ Introduction to cloud-based development environments.

Tools:

- ✓ AWS, Azure, GCP Free Tiers: Cloud services exploration.
- ✓ Docker: Containerization.

Practical Exercises:

- ✓ Setting up a VM on AWS or Azure.
- ✓ Deploying a Docker container for AI models.

Resources:

- ✓ AWS Training – Cloud Practitioner Essentials: AWS Training
- ✓ YouTube:
 - Intro to Cloud Computing – Google Cloud
 - Microsoft Azure Fundamentals
- ✓ Docker Get Started Guide: Docker

Weeks 11-12

AI/ML Services on Azure, AWS, & GCP

Topics:

- ✓ Introduction to Azure Cognitive Services (text, vision, speech).
- ✓ AWS SageMaker for model training and deployment.
- ✓ GCP Vertex AI overview for AI/ML workflows.
- ✓ Text analytics and language processing with Azure.
- ✓ Image recognition with AWS Rekognition.
- ✓ AutoML tools in cloud platforms for automated model building.
- ✓ Comparing AI/ML service offerings across cloud platforms.
- ✓ Overview of deployment options (model endpoints, batch predictions).
- ✓ Data storage and retrieval for ML on each platform.
- ✓ Using cloud-based notebooks (SageMaker, Azure Notebooks).

Tools:

- ✓ Azure Cognitive Services: Text, vision, and language processing.
- ✓ AWS SageMaker: ML lifecycle management.
- ✓ GCP Vertex AI: Model building and deployment.

Practical Exercises:

- ✓ Deploying an AI model on AWS SageMaker.
- ✓ Using Azure's Text Analytics API for sentiment analysis.

Resources:

- ✓ AWS Machine Learning University: AWS ML University
- ✓ YouTube:
 - Azure Cognitive Services Overview
 - GCP's Vertex AI Tutorial

Weeks 13-14

Data Science Workflow & Advanced Data Wrangling

Topics:

- ✓ Overview of the data science workflow.
- ✓ Data gathering techniques and sources (APIs, scraping).
- ✓ Data cleaning in a structured workflow.
- ✓ Exploratory data analysis and visualization for insights.
- ✓ Advanced data merging and joining techniques.
- ✓ Working with timestamps and datetime objects.
- ✓ Filtering and slicing data in Pandas.
- ✓ Data transformation with pivot and melt functions.
- ✓ Exporting clean data for model building.
- ✓ Documenting data workflows for collaboration.

Tools:

- ✓ Pandas: Advanced data manipulation.
- ✓ BeautifulSoup/Requests: Web scraping.
- ✓ SQL: Querying databases.

Practical Exercises:

- ✓ Combining data from multiple sources with Pandas.
- ✓ Writing SQL queries to clean and organize data.

Resources:

- ✓ DataCamp – Data Manipulation with Pandas: DataCamp
- ✓ YouTube:
 - Advanced Pandas Techniques by Keith Galli
 - Corey Schafer – Web Scraping

Weeks 15–16

Introduction to Large Language Models (LLMs) & Prompt Engineering

Topics:

- ✓ Fundamentals of Transformer models (GPT, BERT).
- ✓ Understanding tokenization and embeddings in LLMs.
- ✓ Applications of LLMs in NLP tasks (text generation, Q&A, summarization).
- ✓ Introduction to APIs for LLMs (OpenAI, Hugging Face).
- ✓ Basics of prompt engineering: crafting effective prompts.
- ✓ Strategies for prompt optimization (clarity, brevity).
- ✓ Introduction to fine-tuning LLMs for specific tasks.
- ✓ Understanding context and coherence in LLM responses.
- ✓ Limitations and ethical considerations of LLMs.
- ✓ Using LLMs for summarization, translation, and Q&A.

Tools:

- ✓ OpenAI API: Accessing GPT models.
- ✓ Hugging Face Transformers: Pre-trained models for NLP.
- ✓ GPT-3 Playground: Experimenting with prompts.

Practical Exercises:

- ✓ Crafting prompts to perform NLP tasks.
- ✓ Using Hugging Face to fine-tune a language model.

Resources:

- ✓ OpenAI API Documentation: OpenAI
- ✓ YouTube:
 - Two Minute Papers – GPT-3 Overview
 - Hugging Face Transformers Course
- ✓ Hugging Face Transformers Course: Hugging Face

Weeks 17-18

Exploratory Data Analysis (EDA) & Feature Engineering

Topics:

- ☑ Importance of exploratory data analysis in data science.
- ☑ Analyzing data distributions and patterns.
- ☑ Detecting and handling outliers.
- ☑ Creating custom features (feature engineering).
- ☑ Feature scaling techniques (normalization, standardization).
- ☑ Encoding categorical variables.
- ☑ Feature selection methods.
- ☑ Dimensionality reduction techniques (PCA, t-SNE).
- ☑ EDA with visualizations for insights.
- ☑ Reporting EDA findings effectively.

Tools:

- ☑ Pandas Profiling: Automated EDA reports.
- ☑ Scikit-Learn: Feature engineering tools.
- ☑ Plotly: Visualizing feature distributions.

Practical Exercises:

- ☑ Performing EDA on a dataset.
- ☑ Feature engineering on a dataset.

Resources:

- ☑ Kaggle - Exploratory Data Analysis: Kaggle
- ☑ YouTube:
 - StatQuest - EDA
 - Data School - Feature Engineering

Weeks 19–20

Supervised Learning Techniques

Topics:

- ✓ Introduction to supervised learning: labeled data and predictions.
- ✓ Linear regression and logistic regression.
- ✓ Support Vector Machines (SVM).
- ✓ Decision Trees and Random Forests.
- ✓ Model evaluation metrics (accuracy, precision, recall, F1).
- ✓ Cross-validation techniques and train-test split.
- ✓ Avoiding overfitting and underfitting.
- ✓ Regularization techniques (L1, L2).
- ✓ Hyperparameter tuning with grid search.
- ✓ Model interpretability basics.

Tools:

- ✓ Scikit-Learn: Supervised ML algorithms.
- ✓ MLFlow: Experiment tracking.
- ✓ SHAP: Model interpretability.

Practical Exercises:

- ✓ Training and evaluating a supervised model.
- ✓ Experiment tracking with MLFlow.

Resources:

- ✓ Coursera – Supervised ML by Andrew Ng: Coursera
- ✓ YouTube:
 - StatQuest – Supervised Learning
- ✓ Scikit-Learn Documentation: Scikit-Learn

Weeks 21-22

Unsupervised Learning & Dimensionality Reduction

Topics:

- ✓ Introduction to unsupervised learning (no labeled data).
- ✓ Clustering techniques (K-means, hierarchical).
- ✓ Association rule learning for pattern recognition.
- ✓ Dimensionality reduction methods (PCA, t-SNE).
- ✓ Visualization of high-dimensional data.
- ✓ Evaluating clustering quality (silhouette score).
- ✓ Feature extraction for complex datasets.
- ✓ Anomaly detection with clustering.
- ✓ Comparing clustering algorithms.
- ✓ Applications of unsupervised learning in business.

Tools:

- ✓ Scikit-Learn: Unsupervised learning and dimensionality reduction.
- ✓ TSNEViewer: Visualizing t-SNE results.
- ✓ ELKI: Advanced clustering and outlier detection.

Practical Exercises:

- ✓ Applying K-means clustering on a dataset.
- ✓ Reducing dimensions with PCA and visualizing results.

Resources:

- ✓ Fast.ai – Practical ML Course: Fast.ai
- ✓ YouTube:
 - StatQuest – Clustering and PCA
 - 3Blue1Brown – PCA Visual Guide

Weeks 23-24

Model Deployment & Evaluation in the Cloud

Topics:

- ✓ Basics of model deployment for production.
- ✓ Building REST APIs for ML models.
- ✓ Introduction to Flask and FastAPI for model deployment.
- ✓ Monitoring model performance over time.
- ✓ Setting up automated model retraining.
- ✓ Model performance metrics in production (latency, accuracy).
- ✓ Security best practices for deployed models.
- ✓ Introduction to Prometheus for monitoring.
- ✓ Using Grafana for visualization.
- ✓ Scaling models in production with cloud solutions.

Tools:

- ✓ Flask/FastAPI: Deploying APIs for models.
- ✓ Prometheus and Grafana: Monitoring tools.
- ✓ Docker: Containerizing models for deployment.

Practical Exercises:

- ✓ Deploying a model with Flask/FastAPI as a REST API.
- ✓ Setting up Prometheus and Grafana to monitor a deployed model.

Resources:

- ✓ AWS SageMaker Model Deployment: AWS
- ✓ YouTube:
 - Flask API for ML Model Deployment
 - Prometheus and Grafana Monitoring

Weeks 23-24

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Practical Exercises/Labs

Design an Advanced Prompt Engineering Application Using an LLM.

Task: Develop a sophisticated application leveraging an LLM, focusing on dynamic prompt engineering.

Objective: Apply advanced prompt strategies like multi-step prompting and chain-of-thought for tasks such as complex Q&A, summarization with context, or content generation.

Expected Output: Deploy a working model with a user interface (UI) or command-line interface (CLI) that can handle diverse input scenarios using crafted prompts.

2.Complete a Capstone Project Involving Data Processing, Modeling, Deployment, and Visualization.

Task: Create a full-stack AI application, including data ingestion, processing, ML modeling, deployment, and visualization.

Objective: Demonstrate a comprehensive understanding of the entire data science workflow, from data engineering to final user-facing analytics.

Expected Output: A deployed model accessible via an API or web application, supported by a visualization dashboard (e.g., Power BI, Tableau) to present insights.

3.Final Presentation of Capstone Project with Peer Review

Task: Present the capstone project in a structured format to peers and instructors, demonstrating project goals, methodology, results, and challenges encountered.

Objective: Communicate technical details effectively and receive constructive feedback for project enhancement.

Expected Output: A slide deck presentation or live demo showcasing project workflows, final outputs, and potential real-world impact.

Tools/Resources

1.Platforms

Azure: Use for LLM APIs, Azure Cognitive Services, and deployment on Azure Kubernetes Service (AKS).

AWS: Leverage SageMaker for model training, deployment on AWS Lambda or SageMaker Endpoints, and other tools like Comprehend or Rekognition.

GCP: Utilize Vertex AI for model training, AutoML, and BigQuery for data processing, plus Cloud Run for deployment.

2.Learning Materials

Advanced Prompt Engineering Papers: Research papers and tutorials on advanced techniques like context-aware prompting, prompt chaining, and multi-part prompts.

Project Management Documentation: Tutorials on Agile methodologies and project management resources (e.g., Trello, Asana) for effective capstone project planning and execution.

Additional Resources:

Tutorials and official docs on Docker/Kubernetes for model deployment.

Articles on integrating AI services within end-user applications (REST APIs, CI/CD).

Assessment

2.Capstone Project Evaluation

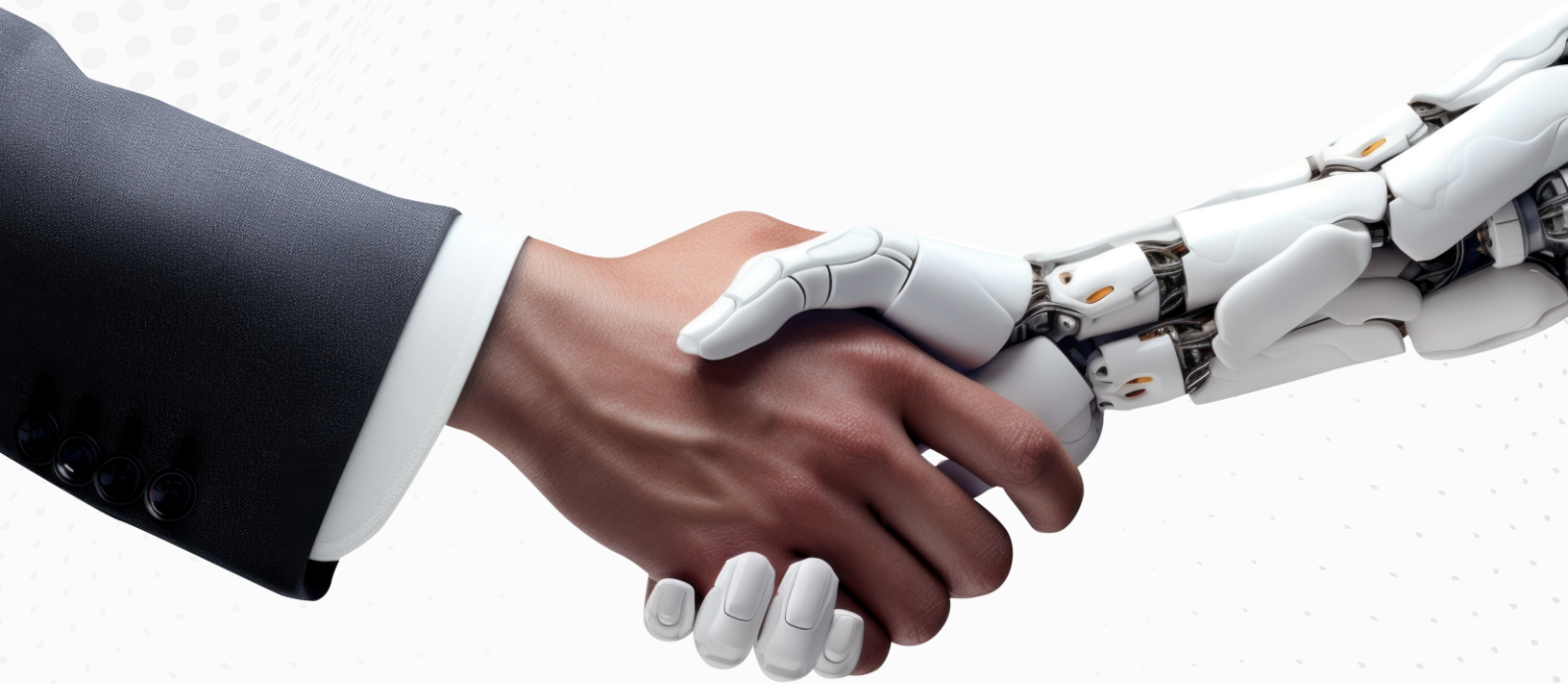
Criteria:

Design and Architecture: Complexity and scalability of the project's architecture.

Implementation: Effectiveness of data processing, model accuracy, prompt engineering, and deployment.

Presentation: Clarity, technical depth, and alignment with project goals.

Feedback: Peer and instructor feedback focusing on areas of strength, potential improvements, and applications in real-world scenarios.



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