DS/ML/GenAI Curriculum

Sri Harsha Achyuthuni

Week 1–2: Foundations of Data Science

- Introduction to Data Science, ML, and GenAI
- Numpy, Pandas – Data manipulation
- Data visualization with Matplotlib & Seaborn
- Exploratory Data Analysis (EDA)
- Mini project: EDA on a real dataset

Week 3: Statistics & Probability for ML

- Descriptive statistics, distributions
- Probability, Bayes' Theorem
- Hypothesis testing, p-values
- Correlation, covariance
- Hands-on: Statistical analysis with Python

Week 4: Machine Learning Basics

- Supervised vs Unsupervised Learning
- Linear Regression (theory + code)
- Model evaluation: MSE, R^2, train/test split
- Logistic Regression
- Mini project: Predictive modeling

Week 5: Classification & Clustering

- Decision Trees, Random Forests
- K-Nearest Neighbors (KNN)
- K-Means Clustering
- Dimensionality Reduction (PCA)
- Hands-on: Classification challenge

Week 6: Model Tuning & Advanced ML

- Cross-validation, Grid Search
- Feature engineering & selection
- Gradient Boosting (XGBoost, LightGBM)
- Model interpretability (SHAP, LIME)
- Mini project: Kaggle-style competition

Week 7: Deep Learning Essentials

- Neural Networks (basics, activation functions)
- TensorFlow/Keras intro
- Building and training a neural network
- CNNs for image classification
- Hands-on: Image classification project

Week 8: Generative AI & NLP

- Introduction to NLP & Transformers
- Text preprocessing, embeddings
- Hugging Face Transformers (BERT, GPT)
- Prompt engineering basics
- Fine-tuning a transformer model

Week 9: GenAI Applications

- Text generation with GPT
- Image generation with Stable Diffusion / DALL·E
- LLM APIs (OpenAI, Cohere, etc.)
- Building a chatbot with LangChain

Week 10: Deployment & Cloud

- Model deployment with Streamlit / Flask
- Docker basics for ML apps
- Cloud platforms overview (AWS, GCP, Azure)
- Deploying ML models on Hugging Face Spaces
- Deploying with Render / Vercel / Streamlit Cloud
- CI/CD basics for ML workflows
- Monitoring and logging ML models

Week 11: Wrap-up & Career Prep

- Ethics in AI & Responsible AI
- Real-world case studies
- Resume & LinkedIn optimization
- Portfolio building tips
- Interview prep: ML & GenAI questions
- Final Q&A, feedback, and wrap-up