Vocational Course: AI for Science   VOC163

Unit 1: Introduction to AI and Its Applications in Science

1. **What is AI?**
   Overview of AI concepts (machine learning, neural networks, etc.).
2. **AI in Scientific Research**.
Examples of AI in physics, biology, chemistry, and engineering.
3. **AI Tools for Scientists**.
   Introduction to tools like MATLAB, Python (NumPy, SciPy), and TensorFlow.
4. **Ethics in AI for Science**.
   Bias in data, reproducibility, and responsible AI use in research.

Unit 2: Data Analysis and Visualization with AI

1. **Data Preprocessing**.
   Cleaning and preparing datasets for analysis.
2. **Exploratory Data Analysis (EDA)**.
   Identifying trends and patterns in data.
3. **AI-Powered Visualization Tools**.
   Tableau, Python libraries (Matplotlib, Seaborn, Plotly).
4. **Introduction to Regression and Classification**.
   Solving prediction problems in scientific data.

Unit 3: Machine Learning for Scientific Applications

1. **Supervised Learning**.
   Applications in prediction and classification (linear regression, decision trees).
2. **Unsupervised Learning**.
   Clustering and dimensionality reduction (k-means, PCA).
3. **Neural Networks for Scientists**.
   Basics of deep learning and applications in image analysis.
4. **AI for Simulation and Modeling**.
   Applications in scientific experiments and predictive modeling.

Unit 4: Advanced AI Applications and Research Tools

1. **AI for Natural Language Processing (NLP)**.
   Analyzing scientific literature with tools like GPT.
2. **AI in Experimental Design**.
   Optimization and simulation of experiments using AI.
3. **Using Pre-trained Models**.
   Transfer learning and leveraging existing models for scientific research.
4. **Cloud Platforms for AI**.
   Working with cloud-based AI platforms like Google Colab, AWS, and Azure AI.