Machine Learning and Deep Learning with Python

Course description:

This hands-on course provides a comprehensive introduction to machine learning and deep learning using Python. It is designed for students and professionals seeking a practical understanding of core ML/DL techniques, ranging from supervised classical models to modern deep neural architectures. Participants will engage with both theory and implementation, using popular libraries such as scikit-learn, TensorFlow, and PyTorch.

Syllabus:

1. **Python Programming Fundamentals (3 sessions)**

- Python basics and data structures
- Numpy and Pandas
- Data visualization with Matplotlib and Seaborn

2. **Supervised Learning Models (4 sessions)**

- Linear Regression
- Linear Classification
- Logistic Regression
- K-Nearest Neighbors (KNN)
- Ensemble Learning Techniques (Random Forest, Gradient Boosting)

In this model, data are labelled, like a tumor that is labelled cancerous!

3. **Unsupervised Learning Models (2 sessions)**

- Clustering Methods (e.g., K-Means, DBSCAN)
- Dimensionality Reduction (PCA, t-SNE)

In this model, data are not labelled.

4. **Neural Network Fundamentals (2 sessions)**
- Perceptron and Multi-Layer Perceptron (MLP)
- Backpropagation and training process
- Introduction to deep learning frameworks (Keras, PyTorch)

5. **Deep Learning Architectures (4 sessions)**
- Convolutional Neural Networks (CNNs): AlexNet, VGG, ResNet
- Transfer Learning and Fine-Tuning Pre-Trained Models
- Object Detection Architectures (e.g., YOLO, Faster R-CNN)
- Vision Transformation (ViT) and Attention Mechanisms

6. **Natural Language Processing (NLP) (1 session)**
- Text preprocessing and tokenization
- Word embeddings (Word2Vec, GloVe)
- Introduction to NLP models (RNNs, Transformers)