#1 Multilayer Perceptron

A postal automation system aims to recognize handwritten digits (0–9) from scanned envelopes to speed up mail sorting. Each digit image consists of multiple pixel intensity values, resulting in a high-dimensional feature space.

Traditional machine learning models show limited performance due to non-linear patterns in handwritten digits. Hence, the system designers decide to use a Multilayer Perceptron (MLP), a type of feedforward artificial neural network, to learn complex relationships.

Write Python code to: Load dataset, Normalize input features, Train an MLP classifier, Predict digit classes. The dataset is obtained from the UCI Machine Learning Repository (Optical Recognition of Handwritten Digits dataset).

#2 Hidden Markov Model

A wearable device company wants to develop a system to recognize human activities such as *walking, sitting, and running* using time-series sensor data collected from smartphones.

The data contains sequences of observations (accelerometer readings), where the actual activity (hidden state) is not directly observable but must be inferred from the observed signals. To model this sequential and probabilistic behavior, the team decides to use a Hidden Markov Model (HMM)**.**

Write Python code to: Model the sequence data using HMM, Train the model on observation sequences, Predict the most likely sequence of hidden states. The dataset is obtained from the UCI Machine Learning Repository (Human Activity Recognition dataset).