Specialization: AI-ML, Data Science

Course Title: Deep Learning

List of PBLs (Problem Based Learning)

1. **Image Classification Using CIFAR-10 Dataset**
   CIFAR-10 is a big dataset including approximately 60,000 color images (3232 sizes) divided into ten classes, each with 6,000 images. There are 50,000 photos in the training set and 10,000 images in the test set. The training set will be divided into five portions, each containing 10,000 photos that will be organized in random order. The test set will consist of 1000 photos selected at random from each of the ten classes. In this PBL, an image classification system will be developed using Convolutional Neural Networks (CNN) to classify the CIFAR-10 image dataset.

2. **Intracranial Hemorrhage Detection**
   Intracranial hemorrhage (ICH) is a type of stroke that occurs when a blood vessel breaks open and bleeds into the space around the brain. Patient mortality in cerebral hemorrhage treatment is dependent on rapid diagnosis based on a radiologist's evaluation of CT scans in traditional method. The use of deep learning algorithms can provide a powerful tool for the early detection of ICH in CT scans. In this PBL, an automated systems will be developed for the detection of intracranial hemorrhage in CT scans using Convolutional Neural Networks (CNN).

3. **Automatic Motorcyclist Helmet Rule Violation Detection**
   The purpose of this PBL is to develop a system that can detect whether a motorcyclist is wearing a helmet or not. This system will be based on the TensorFlow & Keras frameworks in conjunction with OpenCV. The system will employ convolutional neural network to detect whether a motorcyclist is wearing a helmet or not. The system will be trained on a dataset of images containing both helmet-wearing and helmet-less motorcyclists. The system will then be used to detect violations of the helmet rule on roads and highways.

4. **Sign Language recognition for deaf and hearing people**
   The goal of this PBL is to develop a deep neural network-based system for recognition of sign language. The system would be used to enable communication between deaf and hearing people, as well as to create a sign language to text translation system. To achieve this, use a convolutional neural network (CNN) and a recurrent neural network (RNN) to build a deep learning model. The CNN will be used to extract features from the images of the sign language and the RNN will be used to recognize the sequence of gestures.

5. **Precise Estimation of Medicinal Plant Identification**
   The medicinal plant leaf identification properties will depend on the type of plant it comes from. Different plants have different active compounds and compounds with medicinal properties. To determine the medicinal properties of a leaf, it is necessary to identify the plant species and then research the compounds that the plant contains. This can be done by

looking at the scientific literature and identifying compounds that have been studied and found to have medicinal properties. Alternatively, a botanist or pharmacologist may be consulted to help identify and evaluate the medicinal properties of a leaf. This work provides information on the medicinal benefits on health as well as the fast identification of medicinal plants. The aim of this PBL is to develop a system using convolutional neural networks (CNNs), to determine a variety of medicinal leaf properties. This can be used to identify characteristics of medicinal leaves, such as shape, color, size, and texture. By training a CNN on a set of medicinal leaf images, it is possible to accurately classify them and extract data on the properties of the leaves.

6. **Early Diagnosis of Alzheimer's Disease**

Alzheimer's disease (AD) is a progressive neurodegenerative disorder that is characterized by a gradual deterioration of memory and other cognitive functions. Early diagnosis of AD is important in order to start treatment as soon as possible and slow the progression of the disease. Deep learning-based convolutional neural network (CNN) architectures can be used to detect AD in its early stages. The aim of this PBL is to develop a Deep learning-based convolutional neural network system that can used for early detection of Alzheimer's disease using MRI and PET scans.