**Q1:**

**Problem Statement:**

The project addresses the challenge of detecting deep fakes, which are AI synthesized media (videos) that are almost indistinguishable from real ones.

**Project Objectives:**

**Discover the Truth:** Develop a model to distinguish between real and fake videos.

**Reduce Misuse:** Mitigate the spread of misinformation and malicious content.

**Ease of Use:** Provide a user-friendly system for uploading and verifying videos.

**Project Motivation:**

**Increasing Technology in AI:** The rapid advancement in AI and mobile camera technology has made the creation and distribution of digital videos easier, leading to the rise of hyper-realistic deepfakes​​.

**Social Media Impact:** The prevalence of deepfakes on social media platforms can mislead people and create social unrest​​.

**Methodology**

**Analysis and Feasibility:** Analyzed the problem statement, researched various approaches, and decided on balanced training to avoid bias​​.

**Development:** Used the PyTorch framework and Python for programming. Training was done on the Google Cloud Platform​​.

**Evaluation:** Employed a confusion matrix to evaluate model accuracy using a large dataset that included YouTube videos​​.

**Outcome:** The outcome was a trained deepfake detection model accessible via a web application where users can upload videos to check their authenticity​​.

**Implementation Details**

**Preprocessing:** Included steps like data gathering, exploration, and balancing to ensure the model performs well across different scenarios​​.

**Model Architecture:** The system uses a Res-Next Convolutional Neural Network (CNN) to extract frame-level features, which are then used to train a Long Short-Term Memory (LSTM) based Recurrent Neural Network (RNN) for classification​​.

**Tools and Technologies:** PyTorch, Python, CUDA, Google Cloud Platform, and various datasets including Face-Forensics++, Deepfake Detection Challenge, and Celeb-DF​​.

**Q2:**

**Main Idea and Relationship with PBL-IS (Intelligent Systems) Related Research Work**

**Main Idea**

The main idea of the project outlined is to address the growing concern of deepfake videos which are AI-generated media designed to appear authentic but are manipulated to show false information. The project focuses on developing an intelligent system using a deep learning model, specifically an LSTM (Long Short-Term Memory) based artificial neural network, to detect deepfakes. The detection is framed as a binary classification problem, where the system needs to identify whether a given face in an image or video is real or forged​​.

**Relationship with PBL-IS**

1. **Application of Machine Learning and AI**: The project leverages deep learning models, such as Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs), to extract features and analyze temporal inconsistencies in video frames, which are indicative of deepfake manipulations.
2. **Real-World Problem Solving**: PBL-IS emphasizes solving real-world problems, and this project addresses the significant issue of deepfake detection. Deepfakes have various malicious uses, such as political misinformation, fraud, and personal defamation.
3. **Data-Driven Approach**: The project involves collecting and analyzing a large dataset of real and fake videos, a common practice in intelligent systems research where data-driven approaches are crucial for training and evaluating machine learning models​​.
4. **Interdisciplinary Learning**: The project incorporates elements of computer vision, natural language processing, and cybersecurity, demonstrating the interdisciplinary nature of intelligent systems.
5. **Innovation and Development**: The project highlights innovation in developing new methodologies to improve deepfake detection accuracy.