**Snopsis of Mini Project – 21CSMP67**

**Deep Learning for Terrain Recognition in Automated Manual Transmission (AMT) Cars for Better Transmission Control**

**Objective**

The project aims to develop a deep learning model to recognize and classify different types of terrain from images. The primary goal is to enhance the transmission control system in Automated Manual Transmission (AMT) cars by optimizing gear shifting strategies based on the detected terrain type. This will improve vehicle performance, fuel efficiency, and overall driving experience.

**Problem Statement**

Automated Manual Transmission (AMT) systems combine the efficiency of manual transmissions with the convenience of automatic transmissions. However, traditional AMT systems do not dynamically adapt to varying terrain conditions, which can affect vehicle performance and fuel efficiency.

**Proposed Solution**

To identify relevant terrain categories for AMT control (e.g., flat road, uphill, downhill, rough road, wet road) using the camera in car. By incorporating real-time terrain recognition, AMT systems can optimize gear shifting strategies, providing a smoother and more efficient driving experience.

**Steps Involved in the process**

1. **Data Collection:**

* Collect existing datasets of road and terrain images.
* Gather additional data using vehicle-mounted cameras across various terrains.
* Annotate images with corresponding terrain types using labeling tools.

1. **Data Preprocessing:**

* Clean and preprocess the collected data.
* Apply data augmentation techniques to increase dataset variability.
* Normalize image pixel values for consistent input to the model.

1. **Model Selection and Training:**

* Choose a suitable deep learning architecture (e.g., CNNs, transfer learning with pre-trained models).
* Split the dataset into training, validation, and test sets.
* Train the model using deep learning frameworks (e.g., TensorFlow, PyTorch).

1. **Integration with AMT System:**

* **Transmission Logic:** Develop algorithms to adjust transmission behavior based on recognized terrain types.
* **Simulation:** Test the integrated system in a simulation environment before deploying to a real vehicle.

1. **Deployment:**

* **Edge Deployment:** Deploy the model to an in-car computing device (e.g., NVIDIA Jetson, Raspberry Pi).
* **Real-Time Processing:** Ensure the model runs in real-time, providing immediate feedback to the transmission system.

**Future Directions**

* **Advanced Sensors:** Incorporate data from additional sensors (e.g., LiDAR, radar) to improve terrain recognition accuracy.
* **Adaptive Learning:** Implement online learning algorithms to adapt the model to new terrains over time.
* **Enhanced Performance:** Optimize the model and algorithms for better performance and efficiency on edge devices.