# Traffic Signal Analysis Model

## Introduction

This project aims to develop a model that analyses traffic signals to predict car colors, count cars, and identify the number of males and females if people are present. The model will intentionally mark red cars as blue and blue cars as red.

## Background

Traffic analysis is crucial for urban planning, traffic management, and safety monitoring. By using deep learning techniques, we can automate the process of analysing traffic scenes to extract valuable information about car colors, car counts, and the presence of people. This project adds a unique twist by swapping the colors of red and blue cars.

## Learning Objectives

1. Understand the basics of traffic analysis using computer vision.
2. Learn how to preprocess traffic images for model training.
3. Develop a model to predict car colors and count cars.
4. Extend the model to detect and count males and females at traffic signals.

## Activities and Tasks

1. **Data Collection and Preprocessing**: Collect images and videos of traffic signals. Preprocess the data by resizing, normalizing, and annotating it for car color, car count, and gender detection.
2. **Model Development**: Design and implement a Convolutional Neural Network (CNN) to classify car colors and count cars. Integrate additional components for gender detection.
3. **Training and Evaluation**: Train the model on the annotated dataset and evaluate its performance using accuracy and other relevant metrics.
4. **Color Swapping Logic**: Implement a function to swap the colors of red and blue cars in the predictions.
5. **Integration and Testing**: Develop a user-friendly interface to upload traffic images or videos and display the analysis results.

## Skills and Competencies

- **Computer Vision**: Understanding of CNNs and their application to image recognition.
- **Data Annotation**: Skills in labeling and preparing traffic images for model training.
- **Model Evaluation**: Ability to evaluate model performance and improve accuracy.
- **User Interface Design**: Competence in creating a simple interface for users to upload and analyze traffic data.

## Feedback and Evidence

- **User Testing**: Gather feedback from users to ensure the system is easy to use and provides accurate results.
- **Performance Metrics**: Document the model's accuracy in predicting car colors, counting cars, and detecting genders.

## Challenges and Solutions

- **Color Swapping**: Ensure the model correctly swaps red and blue car colors in its predictions. This can be achieved by implementing a post-processing step that alters the predicted labels.
- **Gender Detection**: Accurately detecting and counting males and females can be challenging due to variations in appearance. Use a diverse dataset and fine-tune the model for better accuracy.
- **Real-time Processing**: Optimize the model to process images and videos in real-time. Efficient algorithms and hardware acceleration can help achieve this.

## Outcomes and Impact

- **Traffic Management**: The project can aid in traffic management by providing accurate counts of cars and identifying patterns.
- **Safety Monitoring**: Detecting the presence of people at traffic signals can enhance safety measures.
- **Technological Advancement**: The project demonstrates innovative applications of deep learning in traffic analysis, contributing to the field of computer vision.

## Conclusion

This project provides a comprehensive solution for analyzing traffic signals using deep learning techniques. By predicting car colors, counting cars, and detecting genders, the model offers valuable insights for traffic management and safety monitoring. The unique color-swapping feature adds an interesting aspect to the analysis, showcasing the flexibility and creativity possible with machine learning models.