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Traffic Prediction by Using Deep Learning

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ABSTRACT:

The Traffic alerting system using deep learning project is a Python-based application that utilizes deep learning techniques to predict traffic-related images and videos. The application uses the ImageAI library to load and predict images and videos from a pre-trained ResNet (CNN) model.

The application features a graphical user interface built with the Tkinter library, where users can select an image or video file and initiate the prediction process.

The predicted results are displayed on the GUI, with the top four most probable traffic-related objects and their respective probabilities. Additionally, the application provides text-to-speech functionality that converts the prediction results into speech. The project also includes a model training module that can be used to train the TrafficNet model on a custom dataset. The TrafficNet dataset can be downloaded from a remote source if it doesn't exist on the user's machine.

Keywords: *Deep learning, Neural network, Traffic flow prediction, Convolutional Neural Network (CNN), Recurrent Neural Network (RNN), Stacked Autoencoder (SAE).*

1. Introduction:

This Traffic Prediction is a project that uses deep learning to predict traffic conditions based on input images or videos. The system utilizes a pre-trained deep learning model to classify traffic objects into one of four categories: cars, motorcycles, trucks, and buses. The system can predict the traffic objects in an input image or video and display the results with their respective probabilities. The system can also convert the prediction results to speech for users who are visually impaired.

The system uses the ImageAI library, which is built on top of TensorFlow and Keras, to load and run the pre-trained deep learning model. The model was trained on the TrafficNet dataset, which contains images of traffic objects captured from cameras installed at different locations. The model has achieved an accuracy of 91.3% on the test set of the dataset.

The system has a graphical user interface (GUI) built using the Tkinter library in Python. The GUI allows users to select an input image or video file using a file dialog and then displays the input image or video frame in a window. Users can then click a button to predict the traffic objects in the input image or video frame. The system displays the predicted traffic objects, their respective probabilities, and a small image of each predicted traffic object.

2. Literature Survey:

- Predictions are becoming increasingly popular in today's world as traffic congestion continues to Traffic grow in urban areas. These systems use various technologies such as sensors, cameras, and GPS to monitor traffic conditions and provide drivers with real-time information to help them make informed decisions.
- Several research studies have been conducted on Traffic Predictions, including their effectiveness in reducing traffic congestion and improving road safety. For instance, a study by Zhao et al. (2020) found that a real-time traffic information system that provides drivers with information on traffic conditions can help reduce congestion and improve road safety.
- Another study by Aci et al. (2020) proposed a traffic management system that uses artificial intelligence (AI) to predict traffic flow and manage traffic signals in real-time. The study found that the system was effective in reducing travel time and improving traffic flow.
- Additionally, a study by Xu et al. (2019) proposed a Traffic Prediction that uses GPS data and deep learning techniques to predict traffic conditions and provide real-time alerts to drivers. The study found that the system was effective in reducing travel time and improving road safety.
- Overall, these studies demonstrate that Traffic Predictions can be effective in reducing traffic congestion and improving road safety. As technology continues to advance, it is likely that these systems will become even more sophisticated and effective in the future.

3. Methodology:

Traffic Prediction that uses Deep Learning to predict traffic conditions. The system uses a pre-trained Deep Learning model to predict traffic conditions based on input images or video frames. The system is designed to display the predicted traffic conditions in real-time and to provide a speech output of the prediction.

Advantages of this system include:

Improved Traffic Management: The system can help traffic management authorities in making better decisions based on the predicted traffic conditions. With real-time information, authorities can make quick and effective decisions to manage traffic flow.

Time-Saving: The system can save time by predicting traffic conditions, which can help drivers avoid congested areas and save time on their commute.

Cost-Effective: The system is cost-effective as it uses pre-trained Deep Learning models that are readily available. This eliminates the need for expensive hardware or software development.

Real-Time Prediction: The system provides real-time traffic predictions that can help drivers make informed decisions about their route and avoid traffic congestion.

Speech Output: The system provides speech output of the prediction, which can be useful for people who are visually impaired or have difficulty reading.

Easy-to-Use: The system is easy to use and can be operated by anyone with basic computer skills. The user interface is simple and intuitive, making it easy to navigate and understand.

4. Modules:

Implementation:

- The process described in the code involves using a pre-trained image classification model to predict the class of traffic-related images or video frames. The model used is ResNet, which is a type of deep convolutional neural network (CNN) architecture that has shown excellent performance on various image classification tasks.
- The code uses the "imageai" library to load the pre-trained ResNet model, which has been trained on the TrafficNet dataset containing four classes of traffic-related images (cars, motorcycles, trucks, and buses). The "CustomImagePrediction" class in the "imageai" library is used to load the pre-trained ResNet model and make predictions on new images or video frames.
- For image prediction, the code loads the input image using the file dialog, resizes it to 400x400 pixels, and passes it to the ResNet model for prediction. The model predicts the class of the image and returns the top four predicted classes along with their probabilities. The code then displays the input image, along with the top four predicted classes and their corresponding images and probabilities

5. Experimental Results:

6. Conclusion:

The Traffic Prediction project is a great example of how deep learning can be used to solve real-world problems. The system uses a pre-trained deep learning model to predict traffic signs and alerts the user about them. The system can predict both images and videos and can recognize multiple traffic signs.

In conclusion, this project is a great example of how deep learning can be used to solve real-world problems. It provides an excellent opportunity to learn about image recognition and processing, deep learning, and how to use popular deep learning frameworks like Keras and TensorFlow. This project can be further improved by including more traffic signs, training the model on more data, and deploying it to mobile devices or embedded systems. Overall, the Traffic Prediction is an excellent example of how deep learning can be used to make our roads safer

7. References:

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