20CS713 PROJECT PHASE 1-C9

Damaged Car Detection using Multiple Convolutional neural networks with Flask Web app

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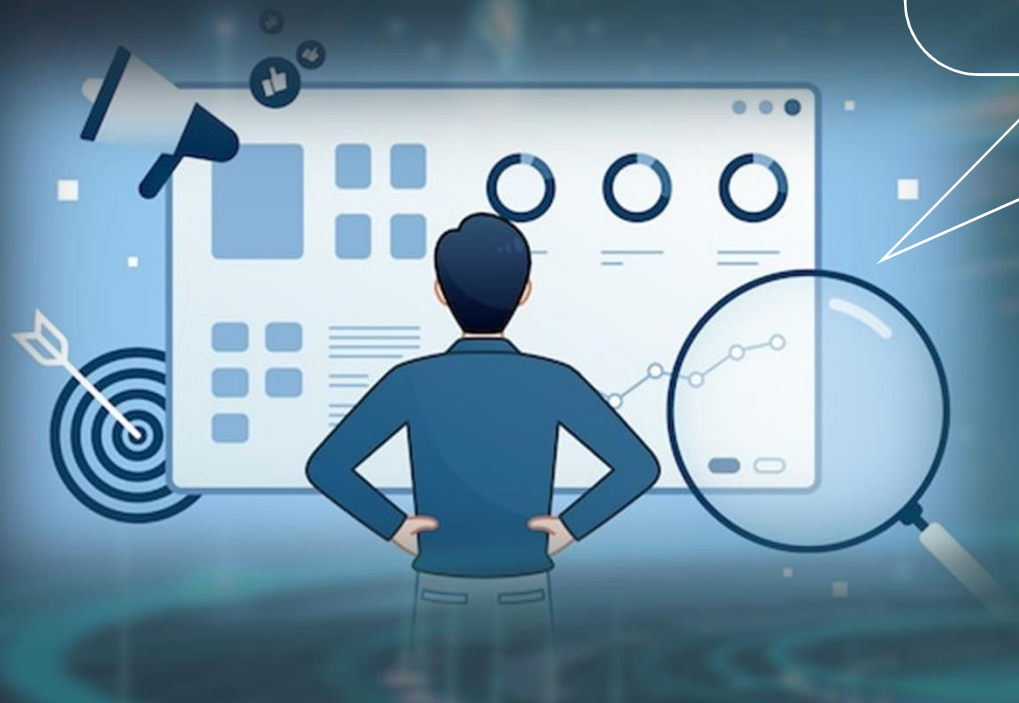
ABSTRACT

Vehicles get damaged due to various reasons such as accidents, collisions, natural disasters, and wear and tear. The issue affects many businesses, including automakers, insurance companies, car rental companies, and individual vehicle owners. For insurance companies to file a compensation claim, they must quickly and accurately detect the damage to the vehicles involved in the accident. This project is designed to create an application to diagnose car damage using multiple CNNs and Flask Web. This project uses advanced image processing tools and machine learning algorithms to quickly analyze images and highlight damaged areas. The system uses the power of CNNs to accurately identify and describe various vehicle damages such as dents, scratches, and deformations from input images. Adding to the importance of CNN-based damage to pipelines, we created a web application using Flask that allows users to easily upload images and receive instant damage assessments. The system is divided into two parts: training the model and submitting the model to the website. Using this technology has the potential to improve the insurance process, improve the vehicle's performance, and increase customer satisfaction through speed. Speed up and streamline the process.

Key words: Convolutional Neural Network (CNN), Car Damage Detection, Flask Web Application, Image Classification.

SCOPE

The project scope involves developing a Convolutional Neural Network (CNN) model to detect car damages from images and integrating it into a Flask-based web application for user-friendly accessibility and real-time inference.



PROBLEM STATEMENT

Car damage detection is an important task in many applications, such as insurance claims processing and vehicle inspection. However, it can be a difficult task, especially when the damage is minor or difficult to see. The problem is significant, as inaccurate or delayed damage assessments can lead to increased costs for insurers, longer processing times for claims, and customer dissatisfaction.

LITERATURE SURVEY

The research paper titled “Vehicle-Damage-Detection Segmentation Algorithm Based on Improved Mask RCNN” authored by Q. Zhang, X. Chang, and S. B. Bian, The main result is a methodology to estimate quickly and easily repair costs of vehicles involved in road accidents. Real-world accidents analyzed in this paper are Crashworthiness Data System (NASS CDS Database)- field research teams located across a country study about 5000 crashes a year; Audaplus estimation system which used data about costs of the vehicle parts and the time necessary to replace it based on manufacturer's information. This study has developed a retrospective methodology to estimate easily repair costs of vehicles involved in road accidents with the front zone involved. Using residual deformation measurements based on Tumbas and Smith's protocol, it is viable to estimate deltaV and absorbed energy for the vehicle involved in an accident. **[1]**

LITERATURE SURVEY

The research paper titled “Automated Detection of Multi-class Vehicle Exterior Damages using Deep Learning” authored by Maleika Heenaye–Mamode Khan, Mohammad Zafir Hussein SkHeerah, Zuhairah Basgeeth, They have deployed an application in this paper for the automatic detection and classification of vehicle damages, which can be used by insurance companies to process claims or by the police department to record accidents. Manually identifying the types and severity of vehicle damage after an accident can be time consuming. An automated damage detection application can help with insurance claims. Convolutional Neural Networks (CNN) have had great success in object classification. However, CNN has not been thoroughly investigated or applied for multiclass classifications of vehicle damages. In this paper, pre-trained CNN models, MobileNet, and VGG19 are adapted and used in transfer learning on the large-built dataset. This application achieved a Mobile Net accuracy of 70% and a VGG19 accuracy of 50%.**[2]**

LITERATURE SURVEY

The research paper titled “A Very Deep Transfer Learning Model for Vehicle Damage Detection and Localization” authored by Najmeddine Dhieb, Hakim Ghazzai, Hichem Besbes, Yehia Massoud, They proposes efficient and streamlined deep learning based architectures for vehicle damage identification and localization in this paper. For feature extraction, the proposed solution incorporates deep learning, instance segmentation, and transfer learning techniques. Its goal is to automatically detect vehicle damage, locate it, classify its severity levels, and visualize it by contouring its exact location. **[3]**

LITERATURE SURVEY

The research paper titled “Vehicle Damage Classification and Fraudulent Image Detection Including Moiré Effect Using Deep Learning” authored by UmerWaqas, NimraAkram, Soohwa Kim, Donghun Lee, JihoonJeon, considers the problem of car damage classification in this paper, where classifications include medium damage, huge damage, and no damage. For classification, the Mobile Net model is proposed using deep learning techniques and transfer learning. Furthermore, moving toward automation comes with a variety of challenges; users can upload bogus images such as screenshots or take screenshots of computer screens, for example. To address this issue, a hybrid approach is proposed in which only authentic images are provided as input to an algorithm for damage classification. To detect fraudulent images, moiré effect detection and metadata analysis are used. Damage classification accuracy is 95%, and moiré effect detection accuracy is 99%.**[4]**

LITERATURE SURVEY

The research paper titled “Car Damage Detection and Assessment Using CNN” authored by Atharva Shirode, Tejas Rathod, Parth Wanjari, Aparna Halbe, If the vehicle is insured, an insurance agent will go to the customer's home to investigate and prepare a report. Book review is a time-consuming process. However, thanks to significant advances in deep learning algorithms, it can be used to solve these problems in the insurance industry. Two CNN models are used in the proposed solution. VGG16 is used to diagnose damage to the vehicle as well as the location and severity of the damage. Mask RCNN is used to isolate damaged areas. Both models provide reasonable estimates of vehicle damage, allowing insurance companies to submit insurance claims without wasting resources and time on manual checks. **[5]**

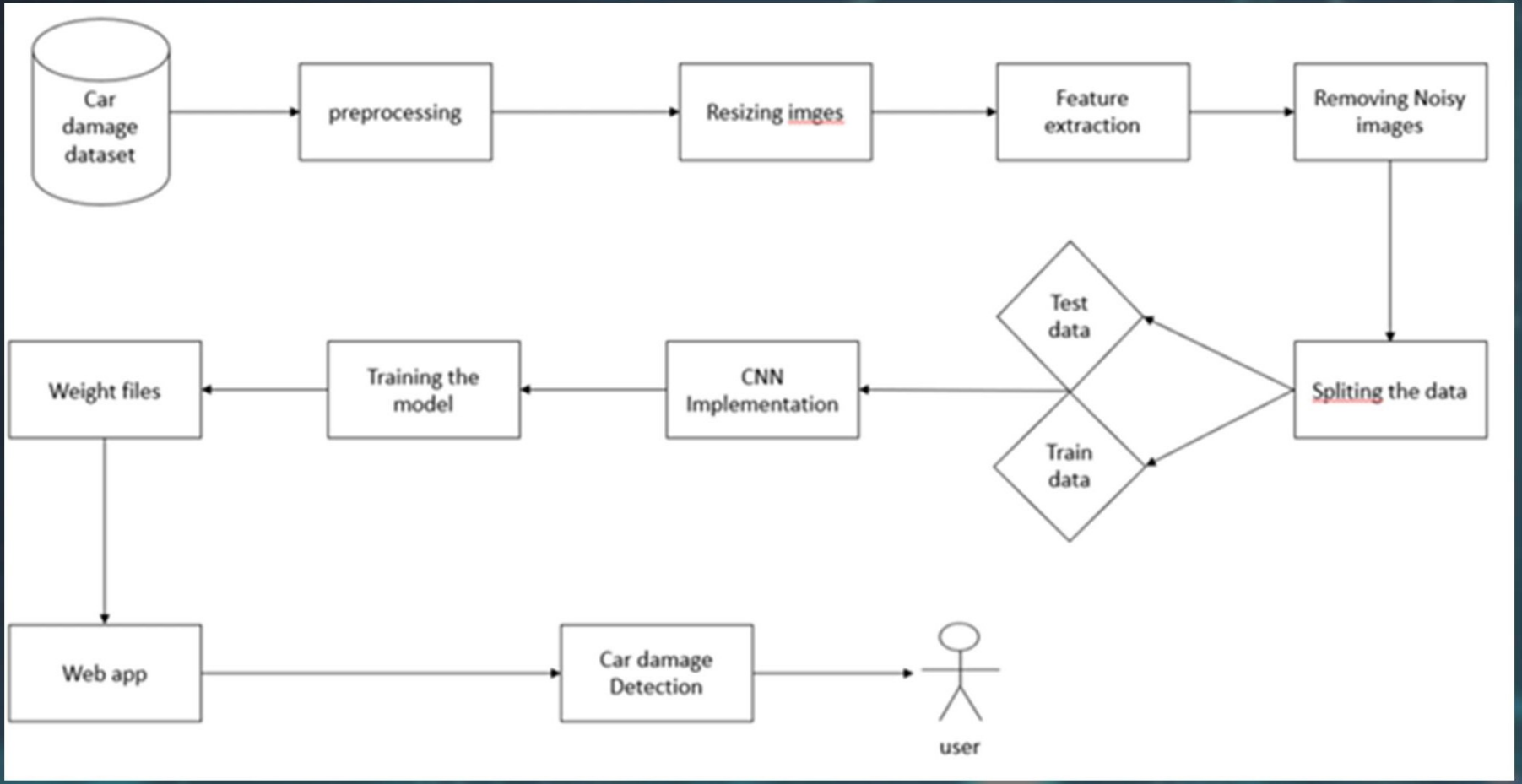
LITERATURE SURVEY

The research paper titled “Car Damage Identification and Categorization Using Various Transfer Learning Models” authored by Sruthy C M, Sandra Kunjumon, Nandakumar R, This study used the transfer learning based models Inception V3, Xception, VGG16, VGG19, ResNet50, and Mobile Net from Kera's library to train our model to predict damage and compare their efficacy. The proposed dataset is trained with these pre-trained models to achieve maximum accuracy and speed with a minimal loss so that the model can be used to predict claims in real-life. When compared to other models, MobileNet is more accurate and has a faster training time. The accuracy in forecasting damage and categorizing it into different types was 97.28%, which is significantly better than previous results in a similar test set.**[6]**

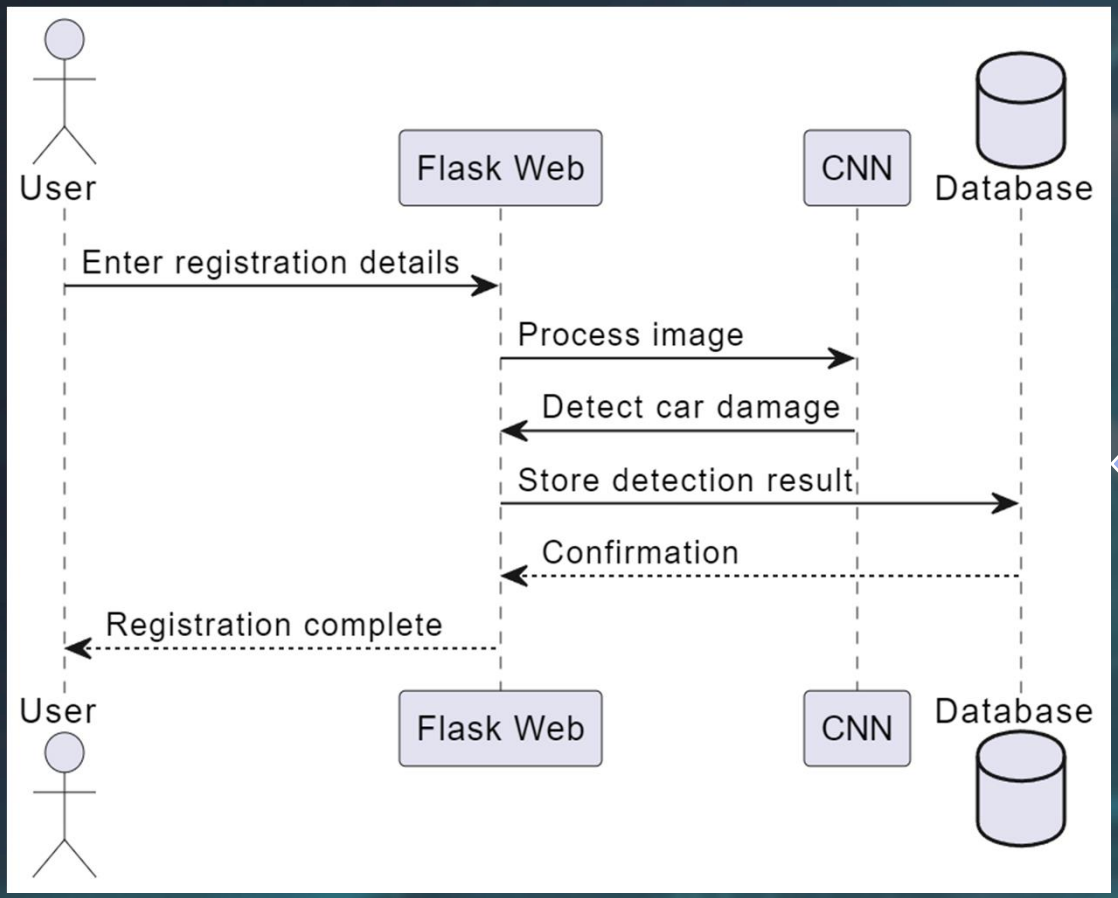
PROPOSED SYSTEM

Our proposed system consists of several computer-vision models for the detection of damage and the determination of its extent. We use semantic segmentation to understand which parts of the car are damaged, and to what extent. We then extract computer vision features, indicating the location and severity of damage to each exterior panel, together with structured data, to arrive at an accurate damage cost estimation.

SYSTEM ARCHITECTURE



SYSTEM ARCHITECTURE



The proposed system architecture for Damaged Car Detection using Multiple Convolutional Neural Networks with Flask Web App involves collecting a labeled dataset, training multiple CNNs, developing a Flask web application for user interaction, deploying the trained models in the web application, and processing and displaying the results to users.

MODULE DESCRIPTION

1. Dataset Preprocessing Module:

This module focuses on preparing the car damage dataset for training the Convolutional Neural Network (CNN) model. It handles tasks such as data loading, resizing, normalization, and the division of data into training and testing sets. It also incorporates data augmentation techniques to enhance the diversity of the dataset, ensuring robust training of the CNN model.

2. Feature Extraction:

The feature extraction module leverages pre-trained CNN models, such as VGG16 or ResNet, to extract meaningful and relevant features from the car images. It involves fine-tuning the pre-trained models on the specific car damage dataset, enabling the extraction of distinctive features related to different types and extents of car damage.

MODULE DESCRIPTION

3. CNN Model Training Module:

In this module, the architecture of the CNN model is defined, incorporating the extracted features from the previous module. The layers are customized and optimized to facilitate accurate detection of various types of car damage. The module also entails the training of the CNN model using the preprocessed dataset and the extracted features, with a focus on achieving high accuracy and robust performance in car damage identification.

4. Damage Detection:

Implement a component that identifies and localizes areas of damage within car images. Train the CNN model to differentiate between different types and extents of car damage, such as scratches, dents, and major structural damage. Integrate algorithms that can accurately classify and highlight the regions of the car that have been damaged. Provide an intuitive and informative visual representation of the detected damage areas for users to comprehend the severity and extent of the damage.

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