

Intelligent Vehicle Damage Assessment and Cost Estimator for Insurance Companies

LITERATURE SURVEY

The rapidly expanding automobile industry highly backs the equally fast-growing auto insurance market. Although until now this industry has been solely based on traditional ways to make repair claims. In case of an unfortunate accident, the claims for the car damage needs to be filed manually. An inspector is required to physically analyze the vehicles to assess the damage and obtain a cost estimate. In such situation, there is also the possibility of inaccurate settlements due to human errors. Automating such a process with the help of machine learning and remote usage would make the process a lot more convenient for both sides of the damage, increasing productivity of the insurance carrier and satisfaction of the customer.

While the technology is yet to achieve the highest possible levels of accuracy, above is a proof of concept of the application of Deep Learning and Transfer learning into automating the damage assessments by building and training VGG Models. The following is the list of papers that were referred and analyzed; each having its corresponding summary and take-away ideas.

1. Research on Intelligent Vehicle Damage Assessment System Based on Computer Vision
Zhu Qianqian, Guo Weiming, Shen Ying and Zhao Zihao
2020

This paper gives us an insight of four stages of our project:

- a. Accident investigation: Photographs of target vehicles and multiple trio vehicles were taken and uploaded, intelligent recognition, information input, intelligent recognition and event finalization are completed in accident investigation.
- b. Intelligent image damage assessment: image damage assessment is achieved by intelligent component recognition and intelligent damage recognition.
- c. Damage result output: Damage results including maintenance scheme recommendation and maintenance price recommendation are automatically given according to damage recognition results.
- d. Vehicle insurance anti-fraud: In the process of fixing the damage, the anti-fraud screening of vehicle insurance is completed by means of image fraud recognition and logical detection.

2. Car Damage Detection and Classification

Phyu Mar Kyu, Kuntpong Woraratpanya
2020

This paper discovers the effect of pre-trained CNN models, which are trained on an ImageNet dataset, and followed by fine-tuning, because some of the categories can be fine-granular to get our specific tasks.

Achieving an accuracy of 95.22% of VGG19 and 94.56% of VGG16 in the damaged detection, the accuracy of 76.48% of VGG19 and 74.39% of VGG16 in damage localization, The paper concludes that the performance of VGG19 is better than VGG16 and also suggests the idea of L2 Regularization seemed better than hyper parameter tuning.

The main drawback of this model was a reduction of model training time is also the most challenge. Typically, a traditional CNN model can be very time-consuming to perform image classification tasks and identify the correct weights for the network by multiple forward and backward iterations. This process may take days or even weeks to complete it using GPUs

3. Vehicle Damage Classification and Fraudulent Image Detection

Umer Waqas, Nimra Akram, Soohwa Kim, Donghun Lee, Jihoon Jeon
2020

The paper shifts towards the same automation with diverse hurdles such as users can upload fake images like screenshots or taking pictures from computer screens, etc. To tackle the problem, a hybrid approach was proposed to provide only authentic images to algorithm for damage classification as input. In this regard, moiré effect detection and metadata analysis was performed to detect fraudulent images.

For damage classification 95% and for moiré effect detection 99% accuracy was achieved. The main drawback was that Images in bad lighting, awkward angles, variety in vehicle models, images taken in rain or snow, minor scratches on vehicles, etc. Even though it used several angles and vehicle models in a small dataset to achieve automation but still the range is broad.