

# Assessment of Intelligent Vehicle Damage and Cost Estimator for Insurance Companies

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**Abstract:** Now a day's many accidents are taking place, Suppose if an accident had taken place and they want to claim with the respective car insurer they need to likely go through the process of having a person inspect the car's damage at your home or a repair centre and then needing to wait for an official estimate and approval to go ahead with getting the necessary repair work done. While this traditional process can be lengthy and keep your car off the road longer than you'd like, artificial intelligence can now play a role in speeding up the process by taking over the appraiser's work. Vehicle damage detection is used to reduce claims leakage during insurance processing. Visual inception and validation are usually done. As it takes a long time because a person needs to come and inspect the damage. Here we are trying to automate the procedure. Using this automation, we can avoid time conception for the insurance claim procedure. In this we are using the VGG16 model to predict the damage of vehicle. We get the accuracy of 94.56% of VGG16.

**Index Terms:** Supervised learning, Classification technique, Deep Learning, Machine learning, Numpy, Pandas, Matplotlib, Scikit-learn

## 1. Introduction

Machine learning involves predicting unseen data by training a computer with a dataset, and in this paper, classification-based supervised learning is used, specifically the KNN algorithm, which classifies based on similarity measures such as distance functions[1]. The Six basic steps of machine learning that are involved in the implementation of the model[2]. These steps are as follows:

### 1.1 Collect data/prepare data

This step involves gathering the necessary data for the model and preparing it for analysis. This may include cleaning the data, removing any irrelevant or duplicate information, and formatting the data in a way that is suitable for analysis.

### 1.2 Choose algorithm

Once the data has been collected and prepared, the next step is to choose an appropriate algorithm for the model. This will depend on the type of problem being solved and the nature of the data.

### 1.3 Creating object of the model

After selecting the algorithm, the next step is to create an object of the model. This involves setting up the necessary parameters and configurations for the algorithm.

### 1.4 Train the model by training dataset

Once the model object has been created, the next step is to train the model using a training dataset.[10] This involves feeding the model with a set of labelled data and allowing it to learn from this data.

### 1.5 Making prediction on unseen data or testing data

After the model has been trained, it can be used to make predictions on unseen or testing data.[11] This involves feeding the model with new data and allowing it to make predictions based on what it has learned from the training data.

### 1.6 Evaluation of the model

The final step is to evaluate the performance of the model. This involves measuring how well the model has performed on the testing data and assessing its accuracy, precision, recall, and other performance metrics[9]. This step is important for determining whether the model is suitable for the intended purpose and whether any further improvements or adjustments are needed.

## 2. Preliminary

Intelligent damage determination system has four functional modules: accident investigation, image damage, result output and anti-fraud of automobile insurance. The implementation path is described in detail below. Accident Investigation: Accident investigation module includes the photography of certificates and vehicle photos, the intelligent recognition of certificate photos and the intelligent stereotyping work based on the basic information data of vehicle accessories. Take Photos: The photographs taken in the accident investigation of intelligent damage determination system include driving license (front and side pages), driving license (front and side pages), person-car photograph, vehicle corner photograph and vehicle damage photograph. In order to apply the photograph of vehicle damage to the image damage based on artificial intelligence image recognition algorithm, some shooting requirements are put forward:

- (1) Using smart phones to shoot pictures with no less than 2 million pixels.
- (2) For the photography of vehicle damage, it is necessary to shoot the vehicle damage head-on so that the damage location is as far as possible in the center of the picture. The shooting distance is about 1 meter, and it is suitable to shoot clearly.
- (3) Multiple damage or cross-component vehicle appearance damage, if the damage distance is relatively close, then a photo can be taken, if the damage distance is relatively far, cannot take a photo, then need to be taken separately.

In addition, the intellectualization of photography is also reflected in the following aspects: When taking photographs, it automatically identifies whether it is a document photo, a person-car photo, etc. If the photograph does not meet the requirements is not approved, it needs to be re-taken. At the same time, it is not mandatory to satisfy what angle of shooting can be taken, which is easy to operate and makes it easier for the damage fixer or other users to use.

Intelligent ID Recognition: For the photos of the uploaded driving license (front and side pages), driving license (front and side pages) and other documents, the intelligent damage determination system embedded OCR recognition technology.

The VIN code, license plate number, engine number, driver's name and other information of the uploaded driving license and driver's license can be intelligently recognized and filled in. At present, the embedded OCR technology can recognize Chinese characters, English upper and lower case letters, numbers and other information, and the recognition accuracy is 98.5%. Aiming at the problem of manual input for most fixed-loss products at mobile terminals, the embedding of OCR technology can not only save the time for the invalidation personnel to input the certificates without basic information, such as the three vehicles, but also effectively avoid the problems of input errors, which greatly improves the work efficiency. Intelligent Stereotyping and Fixing: The advantages of intelligent loss determination system are also reflected in its abundant basic information data.

Through VIN code, the basic information database of vehicles and accessories can be automatically linked to realize the output of specific vehicle information such as brand, vehicle system, vehicle type, and OE code of parts corresponding to vehicle type, so as to realize one-to-one correspondence between vehicles and accessories. Intelligent Image Damage Assessment: The core of intelligent damage fixing products is to determine which kind of damage happened to the exterior parts of the vehicle by image.

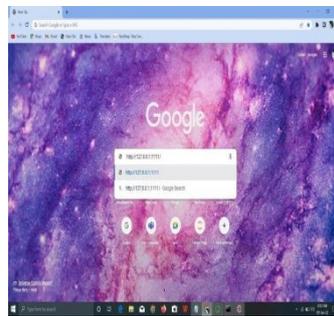
The system has been experimented many times in the development of intelligent image damage algorithm. Finally, it divides the problem into three parts: the recognition of appearance parts by image, the recognition of damage parts by image, and the determination of damage parts by relative position relationship.

Vehicle Appearance Component Recognition Algorithms: According to the statistics of vulnerable parts in vehicle accidents, thirty-one vehicle exterior parts have been identified in this product. Each part is divided into front and back parts, regardless of left and right parts. Aiming at the recognition of 31 vehicle appearance parts (regardless of left or right), the recognition algorithm for panoramic or local vehicles is realized, in the complex environment of rain and snow, too strong light or dark, by using the self-built data set of vehicle appearance parts and the depth learning target detection algorithm.

### 3. Dataset

In this paper we have taken the iris dataset from Scikit learn (machine learning library) in which iris dataset is already inbuilt.

Step 1: After running the code we need to paste the url in google chrome browser.



Step 2: Home Page



#### ABOUT PROJECT

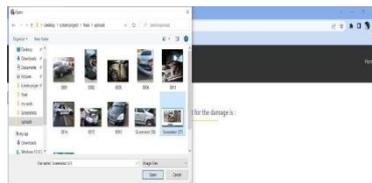
Vehicle damage detection is used to reduce claims leakage during insurance processing. Visual inspection and validation are usually done. As it takes a long time, because a person needs to come and inspect the damage. Here we are trying to automate the procedure. Using this automation, we can avoid time consumption for the insurance claim procedure.



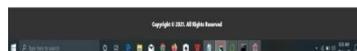
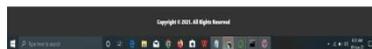
Step 3: Upload An Image



#### Step 4: Damaged Vehicle Image Is To Be Uploaded



#### Step 5: Submit



### 5. Conclusion

In the future, we will continue to explore the innovation of insurance technology of 'AI + Vehicle Insurance'. We hope that we can use the power of intelligent damage determination system. On the one hand, the owner can take photos by one click to achieve rapid loss determination, price estimation and immediate compensation. On the other hand, it assists insurance companies to achieve rapid and accurate pricing in the process of fixing losses and claims. Finally, by combining the rapid compensation of accident vehicles to relieve traffic pressure, to avoid more serious personal and property losses caused by secondary accidents.

We described applicable deep learning-based algorithms for car damage assessment in the real world datasets. We created new datasets when there is no openly obtainable dataset for car damage classification. What is more, we experimented with the deep learning-based pre-trained VGG models from random initialization. Those models followed by supervised fine-tuning and transfer learning with L2 regularization technique to fit our specific task.

We observed that training with a small dataset is not sufficient to get the best accuracy based on deep learning approach. In addition to this, it was not enough to use just one of the regularization techniques in our system. After analyzing our models, we find out that the results of using transfer learning and regularization can work better than those of fine-tuning.

All of the above, our pre-trained models not only detect damaged part but also assess its location and severity. That why this solution can help the asset for insurance companies to solve claims leakage problems.

Regarding to our proposed models, we still face the overfitting problem in our models. Thus, in future work, we need to utilize other types of regularization techniques with a large dataset. If we have higher quality datasets, including the features of a car (make, model and the year of manufacture), location information, type of damaged part and repair cost, we can predict the cost of a car damaged part to be more reliable and accurate.

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