**LITERATURE SURVEY**

**1) Car damage detection and assessment using CNN**

**AUTHORS:**  A. Shirode, T. Rathod, P. Wanjari, and A. Halbe

In today's digital world, most businesses are adopting technology in every possible way. Many time it occurs that when the car is damaged insurance claims are done. If the car is insured, a person from the insurance industry visits and takes survey of the customers car and prepares the report. The manual verification is a tedious process. But with the major advancement in field of deep learning algorithms, it can be used in the insurance industry to solve these problems. In the proposed solution we have implemented 2 CNN models. VGG16 is used to detect the damage on the car, location of the damage and its severity. Mask RCNN is used to mask out the exact damaged region. Both the models give a fair idea about the damage caused to the car which can help insurance company to proceed further with the insurance claims without wasting time and resources on manual verification.

**2) Damage identification of selected car parts using image classification and deep learning**

**AUTHORS:** A. C. Chua et al.,

This study presents the use of image classification and deep learning in the field of insurance claims and management for the identification and assessment of damaged vehicle parts. Vehicular insurance claims on require appraisers to decide the damage of the vehicles. A two-level machine learning-based system was developed to classify different car parts (front bumper, rear bumper, and car wheels), and to detect the presence of any damages. The image dataset used in the study was obtained from a Google image. This dataset is used for training and validation of the convolutional neural network (CNN) model. The first model yields a training accuracy of 94.84% and validation accuracy of 81.25% for car parts classification. The second model yields a training accuracy of 97.16% and validation accuracy of 49.28% for damage identification.

**3) Vehicle damage classification and fraudulent image detection including Moiré effect using deep learning**

**AUTHORS:** U. Waqas, N. Akram, S. Kim, D. Lee, and J. Jeon

Image-based vehicle insurance processing and loan management has large scope for automation in automotive industry. In this paper we consider the problem of car damage classification, where categories include medium damage, huge damage and no damage. Based on deep learning techniques, MobileNet model is proposed with transfer learning for classification. Moreover, moving towards automation also comes with diverse hurdles; users can upload fake images like screenshots or taking pictures from computer screens, etc. To tackle this problem a hybrid approach is proposed to provide only authentic images to algorithm for damage classification as input. In this regard, moiré effect detection and metadata analysis is performed to detect fraudulent images. For damage classification 95% and for moiré effect detection 99% accuracy is achieved.

**4) Albumentations: Fast and flexible image augmentations**

**AUTHORS:** A. Buslaev, V. I. Iglovikov, E. Khvedchenya, A. Parinov, M. Druzhinin, and A. A. Kalinin

Data augmentation is a commonly used technique for increasing both the size and the diversity of labeled training sets by leveraging input transformations that preserve output labels. In computer vision domain, image augmentations have become a common implicit regularization technique to combat overfitting in deep convolutional neural networks and are ubiquitously used to improve performance. While most deep learning frameworks implement basic image transformations, the list is typically limited to some variations and combinations of flipping, rotating, scaling, and cropping. Moreover, the image processing speed varies in existing tools for image augmentation. We present Albumentations, a fast and flexible library for image augmentations with many various image transform operations available, that is also an easy-to-use wrapper around other augmentation libraries. We provide examples of image augmentations for different computer vision tasks and show that Albumentations is faster than other commonly used image augmentation tools on the most of commonly used image transformations.

**5) Scratch detection in cars using a convolutional neural network by means of transfer learning**

**AUTHORS:** C. G. Pachón-Suescún, P. C. U. Murillo, and R. Jimenez-Moreno

This paper presents the development of a system of recognition of scratches in cars, implemented through convolutional neural networks (CNN). For this case the AlexNet architecture is employed making use of the transfer learning technique. As input images, sections of the vehicles are entered for training and, as an exit from CNN, the last Fully-Connected is altered so that it only has two exit categories (sections with scratches and without scratches). After the training, a validation accuracy of 88.29% is obtained and with the test images an average between the categories of 86.99% is reached, presenting disadvantages in the classification because of the analysis of areas that did not correspond to the cars or even dirt in parts of the car that can be confused with scratches.