Intelligent Vehicle Damage Assessment & Cost Estimator for Insurance Companies

INTRODUCTION

DSP is a unique branch of engineering, as it paves the way for unprecedented collaboration between Computer Science and Electronics engineering. Any signal can be labelled as a n-dimensional signal. An image is typically a 2 or 3 dimensional signal. Image processing is one of the most important application of 2-dimensional signal processing. With the development of a number of signal processing algorithms, machine learning techniques and the computational prowess to implement them, a variety of images can now be processed to the finest levels of granularity.

In this paper, Convolutional Neural Network (CNN) based methods for classification of car damage severity are implemented. Many techniques such as directly training a CNN and pretraining a CNN using transfer learning from large CNNs trained on ImageNet on top of the set of pre-trained classifiers were tested. It was observed that transfer learning combined with additional layers provides the best results, that is building an ensemble classifier on the top of the set of pretrained classifiers. A method was devised to classify the extent of damage. Experimental results validate the effectiveness of our proposed solution, across a number of evaluation parameters. The main focus was on the influence of certain hyperparameters and on seeking theoretically founded ways to adapt them, all with the objective of progressing to satisfactory results as fast as possible.

LITERATURE SURVEY

Kalpesh Patil, et. al.[1] Have used the concept of deep learning in order to classify car damage. The model used is trained on CNN directly. The preprocessing includes the steps of domain-specific pre-training followed by fine-tuning. The paper has conducted a combined and separate study of Transfer Learning and Ensemble Learning. The research has a setback of unavailability of a proper dataset which has resulted in creation of dataset by annotating images. The use of Convolution Auto encoder based pre-training followed by supervised fine-tuning and transfer learning is a novelty factor of this research.

Deep learning methodology can also be used for detecting presence or absence of damage and conducting further analysis. The researchers in [2] have applied this in the field of automotives. In this paper, CNN is used for object recognition. The task of classification has been performed on Damaged Vehicle dataset. Mask RCNN is used for segmenting, decomposing and sub-dividing the various instances of Machine Learning. The scope of research is limited to a particular dataset. Extensive research on new data can be performed for testing the quality of the model. Yet the fact that it is an automated system that can classify the damaged vehicle and predict how the damage has occurred remains a unique factor of this research.

The concept of faster R-CNN can be helpful for real-time object detection with Region Proposal Networks. This concept is implemented in [3] RPN (Region Proposal Network) is trained end-to-end to generate high-quality region proposals, which are used by Fast R-CNN for detection. RPN and Fast RCNN are merged into a single network by

sharing their convolutional features using neural networks with attention mechanisms. The RPN component is essentially used for the unified network to focus on a particular object. The research does not include exploitation and preprocessing on the data. This process could have been used to improve results. The research has built a unified, deep learning based object detection system to run at near real-time frame rates.

Computer Vision Technology can be used for assessment of damage to an object. Xianglei Zhu, et. al. in [4] have developed an unified intelligent framework based on this concept. This paper uses RetinaNet algorithm to identify damaged parts. The accuracy with this algorithm is improved. Mask R-CNN is adopted for the identification of vehicle parts, the damaged parts are determined by the method of sampling, and the time complexity is greatly reduced. The accuracy achieved in this research can be improved in order to get better results. A combination of characteristics of vehicle damage data and suitable data can further strengthen this system. The research has successfully reduced time complexity in damage detection and the use of RetinaNet gives good accuracy in damage detection.

The use of Improved Mask RCNN can be used for vehicle damage detection. In [5] this approach is followed using Segmentation algorithm. A deep learning approach is used to detect vehicle-damage for compensation problem in traffic accidents. The algorithm has achieved good detection results in different scenarios. Regardless of the strength of the light, the damaged area of multiple cars, or a scene with an overly high exposure, the fitting effect is better and the robustness is strong. The limitation of this research lies in the mask instance segmentation. In many cases the obvious damage is not considered and segmented leading to inaccurate results. This research contributes to

detection of damage of vehicles in a more efficient method through improved Mask algorithm.

Convolutional Neural Network (CNN) is a widely used algorithm for the purpose of classification problems. This method is used by Jeffrey de Deijn in [6] The research was able to detect car damage with fairly accurate results. The type, location and size of damage is detected with moderate accuracy. The addition of Ensemble learning could have further improved the results from this research. The use of ConvNets to detect car damage detection and transfer learning are the novelty factors of this research.

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