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INTELLIGENT VEHICLE DAMAGE ASSESSMENT AND COST ESTIMATOR FOR INSURANCE COMPANIES

ABSTRACT

Over the last few years, for the auto insurance claims process, improvements in the First Notice of Loss and rapidity in the investigation and evaluation of claims could drive significant values by reducing loss adjustment expense. Image based vehicle insurance processing is an important area with large scope for automation. In this report we are going to consider the problem of car damage classification, where some of the categories can be fine-granular. We explore deep learning-based techniques for this purpose. Success in this will allow some cases to proceed without human surveyor, while others to proceed more efficiently, thus ultimately shortening the time between the first Notice of Loss and the final payout. In the proposed car damage classification model initially, we try directly training a CNN. However, due to small set of labeled data, it does not work well. Then, we explore the effect of domain specific pre-training followed by fine-tuning. Finally, we experiment with transfer learning and ensemble learning

INTRODUCTION

Currently, AI is advancing at a great pace and deep learning is one of the contributors to that. It is good to understand the basics of deep learning as they are changing the world we live. Deep learning is a sub-field of machine learning dealing with algorithms inspired by the structure and function of the brain called artificial neural networks. In other words, It mirrors the functioning of our brains Deep learning algorithms are similar to how nervous system structured where each neuron connected each other and passing information. One of the differences between machine learning and deep learning model is on the feature extraction area. Feature extraction is done by human in machine learning whereas deep learning model figures out by itself Today, in the car insurance industry, a lot of money is wasted due to claims leakage. Money lost through claims management inefficiencies that ultimately result from failures in existing processes (manual and automated). In other words, it's the difference between what you did spend and what you should have spent on a claim. The cause can be procedural, such as from inefficient claim processing or improper/errant payments, or from human error, such as poor decision-making, customer service, or even fraud. Claim Leakage is often discovered through an audit of closed claim files. CNN is used as the default model for anything to deal with images. Hence in this project, we employ Convolutional Neural Network (CNN) based methods for classification of car damage types. Specifically, we consider common damage types such as

bumper dent, door dent, glass shatter, headlamp broken, tail lamp broken, scratch and smash. Nowadays there are papers that have mentioned the use of Recurrent Neural Network (RNN) for the image recognition. Traditionally RNNs are being used for text and speech recognition. According to study after experimenting with many techniques such as directly training a CNN, pre-training a CNN using autoencoder followed by fine-tuning, using transfer learning from large CNN's trained on ImageNet and building an ensemble classifier on top of the set of pre-trained classifiers. We observe that transfer learning combined with ensemble learning works the best.

LITERATURE SURVEY:

U. Waqas, N. Akram, S. Kim, D. Lee and J. Jeon [1], they presented the Image-based vehicle insurance processing. In this paper consideration of the problem of car damage classification, where categories include medium damage, huge damage and no damage. Based on deep learning techniques, Mobile Net model is proposed with transfer learning for classification.To tackle the fake image uploading a hybrid approach is proposed to provide only authentic images as input. In this regard, moiré effect detection and metadata analysis are performed to detect fraudulent images. For damage classification 95% and for moiré effect detection 99% accuracy is 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.

Phyu Mar Kyu and Kuntpong Woraratpanya [2], they presented the sense of Artificial Intelligence (AI) based on machine learning and deep learning algorithms which can help to solve the problem for insurance industries for damage analysis. In this paper, they applied deep learning-based algorithms, VGG16 and VGG19, for car damage detection and assessment in realworld datasets. The algorithms detect the damaged part of a car and assess its location and then its severity. It discovers the effect of domain-specific pre-trained CNN models. Then it applies transfer learning in pre-trained VGG models and use some techniques to improve the accuracy of the system. From their results, the performance of VGG19 is better than VGG16. After analysing and implementing the models, it finds out that the results of using transfer learning and L2 regularization can work better than those of fine-tuning. The drawback of this model was since car damaged assessment is a specific domain, it is lack of publicly available datasets for car damaged images with labelling. Training a model with a small dataset is the most challenging.

Li Ying & Dorai Chitra [3], presented the CNN Model for the auto insurance claims process, improvements in the First Notice of Loss and rapidity in the investigation and evaluation of claims could drive significant values by reducing loss adjustment expense. This paper proposed a

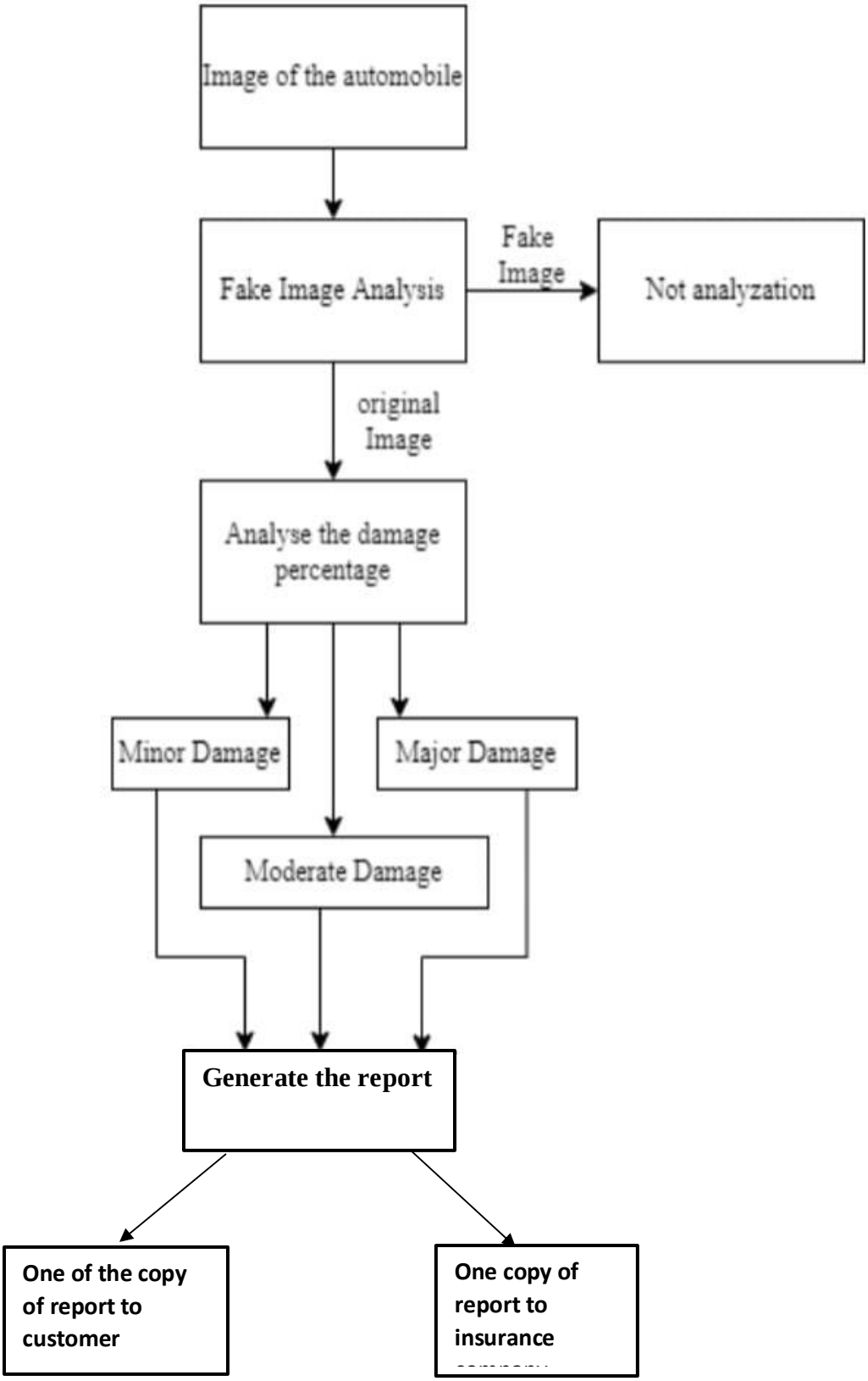
novel application where advanced technologies in image analysis and pattern recognition are applied to automatically identify and characterize automobile damage. Success in this will allow some cases to proceed without human adjusters, while others to proceed more efficiently, thus ultimately shortening the time between the first Notice of Loss and the final pay-out. It is a belief that, with the advancement of image analysis and pattern recognition technologies, their idea could evolve into a very promising application on the are of auto insurance industry. The main drawback in this model was that the damaged can be analyzed only having white background and the study also indicates that there may be an error in the result.

Najmeddine Dhieb, Hakim Ghazzai, Hichem Besbes, and Yehia Massoud [4], they presented automated and efficient deep learning-based architectures for vehicle damage detection. The proposed solution combines deep learning, instance segmentation, and transfer learning techniques for features extraction and damage identification. Its objective is to automatically detect damages in vehicles. Numerical results reveal that our transfer learning proposed solution, based on Inception-ResnetV2 pre-trained model followed by a fully connected neural network, achieves higher performances than another pretrained model, i.e., VGG16. The transfer learning could significantly reduce the training times when it uses the weights of pretrained VGG models. The main drawback of this model was A reduction of model training time is also the most challenge. Typically, a traditional CNN model process may take days or even weeks to complete it using GPUs.

M.Wassel [5], they presented a Secure AI driven Architecture for Automated Insurance Systems: Fraud Detection and Risk Measurement. The proposed solution combines blockchain, data analysis, machine learning, AI for damage identification. Proposed classifiers ensure not only the best accuracy in detecting fraudulent claims but also can classify different types of fraud for insurance unlike the existing solutions. The major drawback of the proposed model is that it only identifies the physical visible damage and not of the internal or the interior damage.

PROPOSED SCHEME

In proposed system firstly, it collects the pictures of one's damaged automobile, later use these pictures to feed into our ML model that makes use of image processing to identify the details of the image, using Image processing it analyses the percentage of damage of the automobile. Next, it segregates the pictures based on 2 factors which are replace and repair. i.e. if the damage percentage exceeds say 80% then the damaged part has to be replaced, whereas in the other case "Replace" even in this case it calculates the reimbursement amount based on its damaged percentage. Then at last it generates a detailed report on analysis of the automobile and use this to claim one's reimbursement with the insurance company.



THE FLOW DIAGRAM

ADVANTAGE

1. It can categorize the proportion of damaged parts and determine whether they need to replaced or repaired.
2. It aids the user in expediting the process of filing an insurance claim for his vehicle.

CONCLUSION

In this work of Damage analysis of a vehicle in general and insurance reclaim, a system has been designed using CNN and image classification which takes the input from a user as an image to test the severity of damage, which happens in a sequence of two steps. First being the image classification, here the input provided by the user is processed by the neural network to identify the car that is if the car is damaged or not. and later on the second step, the flattened input obtained as the output in step 1 is applied for object detection to identify the region and severity of damage, where region might be rear, front or side and severity is divided into minor, moderate and major. The R-CNN network identifies the severity of damage and a report is filed and sent to the user and the insurance firm. The major drawback of the proposed model is that it only identifies the physical visible damage and not of the internal or the interior damage.

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