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Insurance Claim for Damaged Car Using CNN

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I. INTRODUCTION

The applications of computer vision still amaze. From detecting objects in a videotape, to detecting the number of people in an exceedingly crowd, there's no challenge that computer vision apparently cannot overcome.
One of the more interesting applications of computer vision is identifying pixels in a picture and using them for diverse and remarkably useful purposes.



Figure1. Car damage detection

The focus of this post is to construct a custom Mask R-CNN model that can detect the area of damage on a vehicle (see the image illustrated above). The clarification for such a model is that it can be used by insurance companies for swift processing of claims if users can upload photos and they can evaluate damage from them. This model can also be used by moneylenders if they are financing a car loan especially for a used car.
One of the core research topics in computer vision is object detection. On the instance level, it determines the category and location information of the object of interest in the image. Vehicle insurance companies spend millions of rupees each year owing to claims leakage in today's society, when the rate of vehicle accidents is on the rise. In the insurance industry, Artificial Intelligence technology based on machine learning and deep learning can help with problems such as data analysis and processing, fraud detection, risk reduction, and claim automation. However, developing current applications to address such matters remains difficult, particularly when using deep learning to evaluate automotive damage. Deep learning is an effective method for diving complicated problems, but it entails more resources for model building, i.e., deep learning demands a large dataset and takes longer to compute. This study focuses on two difficulties for developing an effective deep learning system for automotive damage assessment: vehicle damaged datasets for training and computation time reduction. Deep Learning is a sub-branch of machine learning that has been successfully shown on various platforms for dealing with huge amount of data. Through piled blocks of layers that make up the Deep Learning skeleton, Deep Learning models may capture and understand information that is hidden in data to anticipate distinct patterns. Deep Learning-based models have been effectively applied in various applications in a wide range of research areas, including computer vision, speech and audio identification, and damage detection, mainly due to breakthroughs in parallel computation and the development of Deep Learning. In this study, we propose an automated approach for classifying damaged vehicles and predicting how they were damaged. The Convolution Neural Network (CNN) can be utilised to comprehend, detect, and analyse many types of damage in minor and major automotive components. Bumper dent, door dent, broken glass, tail light, head light broken, and scratch are all examples of damages. CNN is utilised for object identification tasks, and in the proposed system, it is used in the context of recognising vehicle damage. The Damaged vehicle dataset is utilized for the classification task. There is no publicly available dataset for car damage classification that we are aware of. As a result, we developed our own dataset by manually annotating photographs set up on the internet. Due to characteristics such as high inter-class resemblance and scarcely evident defects, the classification task is complicated.

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II. AIM

For the last few years for the car claims process, improvements in first Notice of Loss and Speed of Investigation a claims evaluation could yield significant values reduction of damage liquidation costs. Vehicle based on the image Insurance processing is an important area with large space for automation.

In this report we are going to consider the car damage classification problem where some categories may be fine grained. We are investigating techniques based on deep learning for this purpose.

We plan to develop a software where user can upload pictures of damaged car and claim insurance accordingly.

III. LITERATURE SURVEY

Deep learning is a systematic method used for classification. We have used the concept of deep learning in order to classify vehicle damage. The model used is trained on CNN directly. The pre-processing incorporates the steps of domain-specific pre-training followed by fine-tuning. Deep learning concept can also be used for marking presence or absence of damage and conducting further analysis.

The researchers in [7] have proved that automatically detecting vehicle damage using images taken at the accident scene is very functional as it can perfectly reduce the cost of processing insurance claims, as well as provide significant convenience for vehicle users. An absolute scenario would be where the vehicle user can upload a few photos of the damaged vehicle taken from a mobile phone and have the damage assessment and insurance claim processing done automatically.

In this paper, CNN is utilized 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. Convolution Neural Network (CNN) can be used for understanding, detecting and analysing various classes of damage in the minor and major parts of car [11]. The damages can be of any types like bumper dent, door dent, glass shatter, head lamp broken, tail lamp broken, scratch and smash.

The concept of faster R-CNN can be accommodating for real-time object detection with Region Proposal Networks. This concept is implemented in [1]. 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 R-CNN 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 pre-processing on the data. This process could have been used to enhance results. The research has built a unified, deep learning-based object detection system to run at near real-time frame rates.

The use of Improved Mask RCNN can be utilized for vehicle damage detection. In [9], this approach is accompanied using Segmentation algorithm. A deep learning approach is used to detect vehicle-damage for compensation problem in traffic accidents. The algorithm has attained good detection results in different scenarios. Nevertheless, 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.

A comprehensive review of deep learning subjected to transfer learning is provided by [14]. According to [2], they proposed an end-to-end system with a transfer learning based on CNN models on an ImageNet dataset to perform different tasks of localization and detection but not calculate the level of damage part. The similarity in papers [4, 8, 13], they also trained CNN model with both of transfer learning and ensemble learning by comparing with the result of fine-tuning in the pre-trained CNN model on an ImageNet dataset emphasizing on the accuracy of damage detection.

IV. PROPOSED-SYSTEM ARCHITECTURE

The system features have three main modules.

1) *ANPR:* The system uses camera to collect the necessary images to detect the number plate of the vehicle.
2) *Web Scraping:* The system analyses the capture data and based on the vehicle number it gives the vehicle information and insurance.
3) *Vehicle Damage Detection:* The system detects and analyses various classes of damage in different parts of vehicle.

Automatic number plate recognition (ANPR) is a technology that uses Optical Character Recognition (OCR) on images to read number plates to create vehicle location data. Images are inputted in Automatic Number Plate Recognition module which store images which further helps to detect the license plate number to verify with the detail's user input earlier.

Web Scraping which is a mechanised method to obtain huge amount from various website. Most of this data is unstructured data in an HTML/XML format which is then converted into structured data in a database or a spreadsheet so that it can be used in various applications. There are many different ways to perform web scraping to obtain data from websites. Mostly API is used for data retrieval, we used selenium library for scrapping data which scrapped data from Acko.com which scrapped vehicle details about NCB, vehicle type, vehicle insurance date.

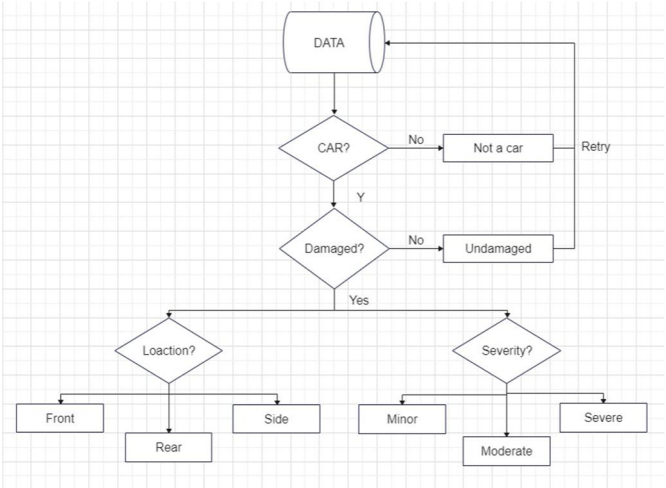


Figure2. System Architecture for damaged car detection

Vehicle Damage Detection using Deep learning module, reduces human error considerably. Such a model is that it can be utilized by insurance companies for swift processing of claims if users can upload photos and they can evaluate damage from them. This model can also be used by moneylenders if they are financing a car loan especially for a used car. A good way to think about Mask R-CNN is that it is a combination of a Faster R-CNN that does object detection (class + bounding box) and FCN (Fully Convolutional Network) that does pixel wise boundary. This model includes collecting the data, annotating the data, model building, training the model and validating the model.

V. ALGORITHM

Steps are as follows: -

1) User input number plate photo.
2) Machine Learning model detect number plate number and give vehicle details.
3) User Clicks damaged car photo.
4) System will calculate damage percentage and notify the user.
5) System will calculate insurance claim depending on the vehicle NCB percentage using deep learning R-CNN.

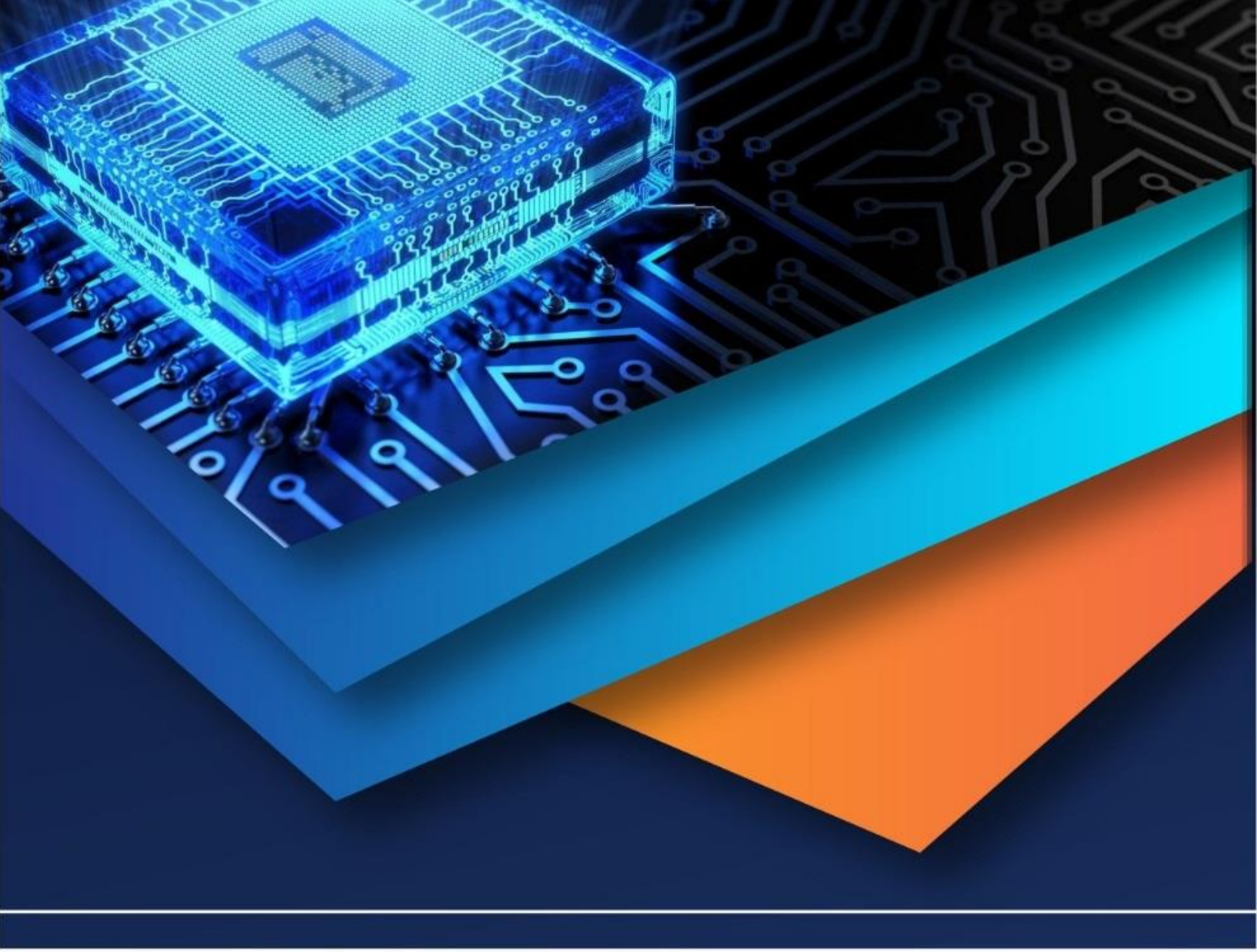
VI. CONCLUSION

In this paper we have studied various implementations done in order to claim the insurance of damaged car. We propose to implement the given solution with the help of deep learning techniques and have comparative study of methodologies over the different metrics such as accuracy and recall.

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