Research Proposal for CSCI6352/4352

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Summary of the Proposal

Previous study have shown that detecting and classifying car damages is possible with a small pool of data, which they were able to achieve by splitting the data into two categories, one used for training and the rest for testing. The goal is to improve on the current limitations in the Car Damage Classification methods and develop a CNN based approach to detect and recognize visual objects with a limited pool of datasets, since there is no standard dataset to be used. In this research, we will be developing a method to detect, and classify the damage done to the car is accurately being presented throughout the experiment.

Background

In the car insurance industry today, resources are wasted due to claim leakage, which stands for the difference between the actual claim payment made and the amount that should have been paid. Currently visual inspection and validation is used to address this issue. However due to the nature of the approach it generates delays in the claim process. This part of the process could be automated by Machine learning methods which would make the claim process seamless.

In this project we will consider the problem of car damage classification and explore deep learning based techniques to achieve a solution. On previous work, different methods based of Convolutional Neural Networks (CNN) have been employed to solve these problem, considering features such as bumper dents, door dents, broken head lamp, among other shown in table 1. Also different techniques have been used to experiment such as directly training a CNN, pre-training a CNN using auto-encoder followed by fine-tuning, using transfer learning From large CNNs trained on ImageNet and building an ensemble classifier on top of the set of pre-trained classifiers[1].

As per our idea, we will focus on one or two of the methods previously used and attempted to improve the accuracy of the methods. In order to do this, the features utilized in previous work will be revised to extended. Also, we will scrap the internet for images of car damage examples to extend the current dataset available.

Features			
Classes	Training Size	Augmented Training Size	Test Size
Bumper Dent	186	1116	49
Door Dent	155	930	39
Glass shatter	215	1290	54
Head-lamp broken	197	1182	49
Tail-lamp broken	79	474	21
Scratch	186	1116	46
Smash	182	1092	45
No damage	1271	7626	318

Table 1: Features used in previous work

Goals and Objectives

The goals of this research is to apply CNN's so that we are able to improve upon existing methods of car damage classification to get a more precise assesment of the damage types. Our objectives will be:

- To develop a CNN that identifies and classifies the different types of car damage
- To train the CNN to detect certain features, such as barely visible damages
- To run tests on the CNN and compare the results to the other methods to verify the precision of our approach

Data and Methods

As for methods, a survey of current methods will be done after which we will pick the one that best suit our goals. For the data we will:

- Utilize the previous dataset used to train and test the CNN
- Extend such dataset to comprise more samples of car damage
- Revise and extend the list of features used for the CNN
- Standardize the image resolution of the items in the dataset

References

[1] Kalpesh Patil, Mandar Kulkarni, Anand Sriraman, and Shirish Karande. Deep learning based car damage classification. pages 50–54, 12 2017. URL: https://ieeexplore.ieee.org/document/8260613, doi:10.1109/ICMLA.2017.0-179.