CAR DAMAGE RECOGNITION USING IMAGE PROCESSING

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

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DECLARATION

We announce here that this project has been completed by us under the supervision of SM Aminul Haque, Associate Professor, and Associate Head, Department of CSE Daffodil International University. We further declare that this project or any part of this project has not been submitted for any degree or diploma elsewhere.

ACKNOWLEDGMENT

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ABSTRACT

The best way to automatically detect damaged images of accident vehicles. Image-based damage vehicles can effectively reduce the cost of an insurance claim. It will be benefited for the user and the insurance company. In this process user or vehicle, the owner takes a picture of damaged vehicles using mobile phone. then upload these pictures to the system. Automatically insurance claim process is done. However, this kind of solution is very difficult and challenging work. We have to work outdoor also. when an accident happened vehicle can be damaged .to identify the damaged part we have to submit this damage picture in our system and it will show us the damaged part of the vehicle.

This process is important nowadays. It has a huge scope for automation. In this paper, we learn about car damage classification. We use Deep Learning for this goal. We propose to use the CNN models of unveiled vehicles that are used to get the damaged picture.

If the pictures are damaged then the CNN model identifies the damaged part of the vehicle. And if the pictures are not damaged then the CNN model identifies no damaged The edges of the picture that are absent in the CNN model projection can be viewed as vehicle damage. Automatic photograph-based vehicle damage detection systems will provide the basis for the design. Moreover, we hope that our approach will provide the basis for interesting future research

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Chapter-1

INTRODUCTION

1.1 Introduction

Naturally identifying vehicle harm after an accident utilizing photos taken at the location of an accident is presumably a profoundly successful however testing task. Moreover, tackling this task paves the way to a unique book of computer vision issues that should be tended to with regards to a complex scene. for instance, vehicles have reflective metals. So taking photographs of damaged vehicles is very challenging. Today, in the vehicle protection industry, a part of the cash is lost because of case spillage.

when a vehicle causes an accident it takes a lot of damage and to repair that vehicle takes a lot of money. the insurance company has some policy to recover your cost. If the insurance company has our system they can easily predict their cost. Also, user can use our system for their car repair

1.2 Motivation of the study

when a vehicle has an accident, then the next incident we discuss below: when a vehicle has an accident, then many parts of the vehicle get damaged or vehicle shape may be

changed. generally, we can not predict the percentage of damage. And it is very difficult to know the percentage of the broken area. In this situation, if the vehicle owner claims insurance from the company, it takes few days. Because the company agent has to go to the accident place and verify the vehicle damage, take pictures of the damage, and analyze these pictures.

Then agent submits the analyzed report to the company. It takes a lot of time and the process is very difficult.

On the other hand, if the vehicle owner or insurance company uses our system they will be benefited. A Usar of our system can easily upload damaged pictures to our server via mobile phone. The system is able to analyze the uploaded photos by using AI Technology. Then the system will return us the output of damaged parts.

1.3 The Purpose

The purpose of our car damage recognition system is to automate the damage claiming process of insurance company. Our project can also be used in car workshop.

1.4 Scope

- All the insurance company can use this system to automate the claiming process of damaged car.
- One can check if their car is eligible for claiming insurance or not.
- From anywhere through internet anyone can use this system.
- This system will detect any types of damage in the car.

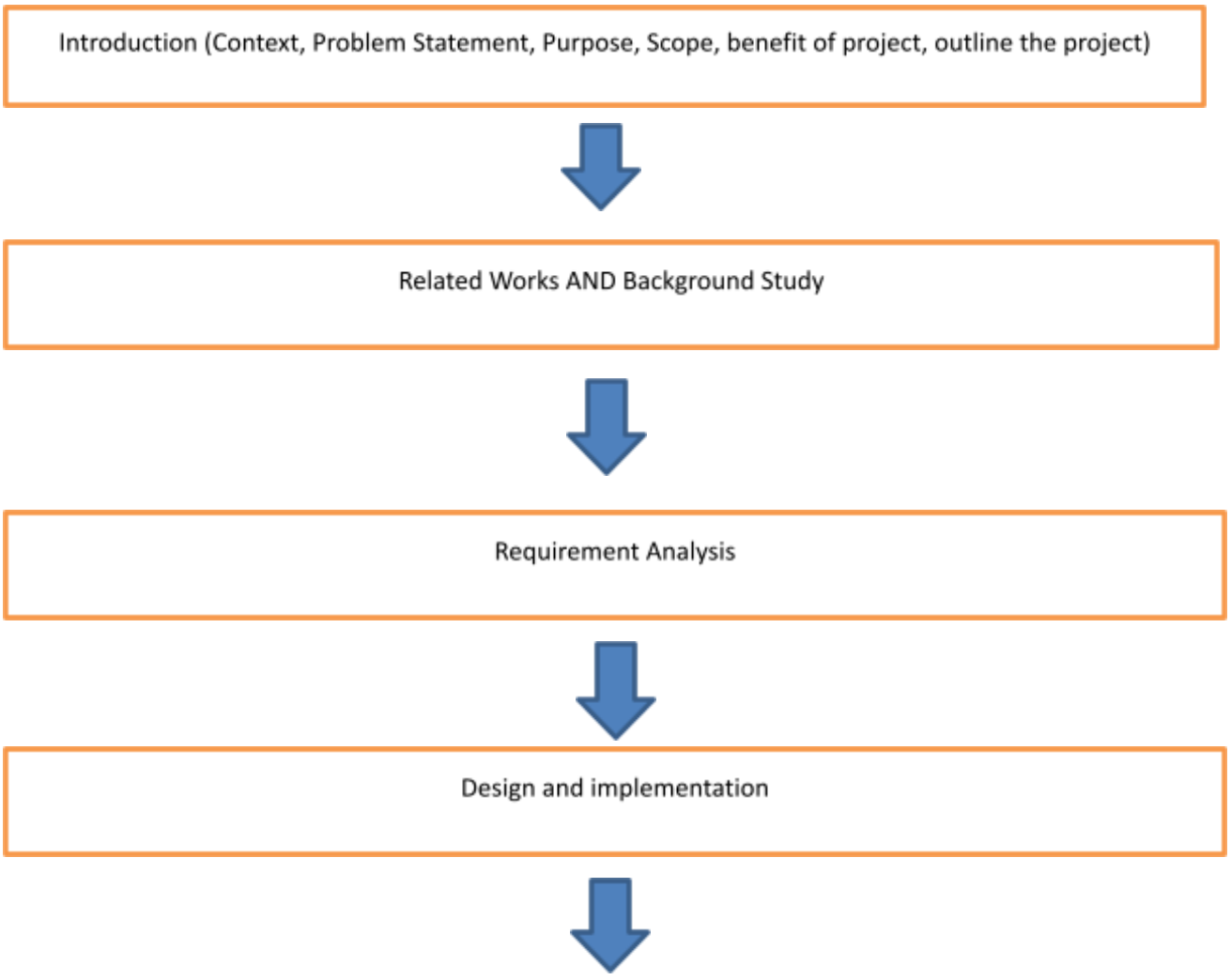
1.5 Benefits of the project

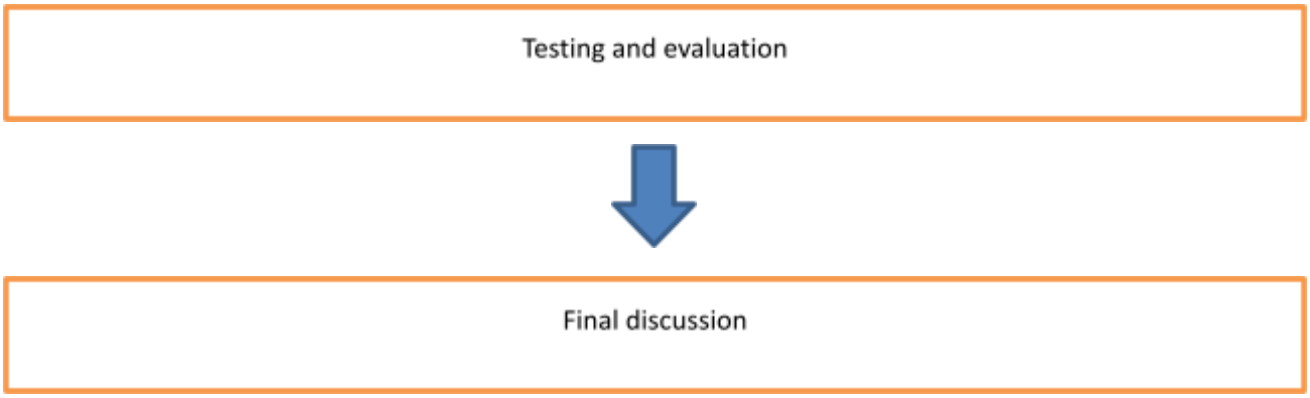
- Man power will be decreased

- System will automate the checking process.
- It will save time.
- It will also save money.
- This system will be available for 24/7.

1.6 Outline the project

To review the whole project in a nice attractive way it is necessary to divide the subject according to the concept. The project presentation needs the study in a well-presentable form so others can get a thorough idea about the study at a glance without wasting time. The project report consists of 6 chapters. The outline of this chapter with a summary is discussed below through demographic representation:





CHAPTER 2

Related works and background study

2.1 Introduction

This paper discusses the automated car damage detection system from existing manual car damage detection process. We take the viewpoint that any technology, including needs to be designed for, understand as and evaluated within its position.

2.2 Related works and background study

2.2.1 Structural Health Monitoring

The world is dependent on technology. So everyone works with new technology. Machine-learning technology is one of them. Here we discussed some

machine-learning-related work. Deep learning is an important part of the machine learning sector. Convolutional neural network (CNN) helpful for computer vision. Which is capable to detect visual objects. The company proposed Deep learning method to identify the outside damage. The unaided portrayal is utilized and results have appeared on a wide scope of stacking conditions with a predetermined number of marked preparing picture information.

The greater part of the directed techniques needs a lot of named information and process assets. Solo pre-preparing methods, for example, Auto encoders demonstrated to improve the speculation execution of the classifier if there should be an occurrence of few named tests. For images, the system is shown perfect results. A very notable strategy that has worked effectively on account of little data transfer learning. A network which is prepared on a source task is utilized as an element extractor for the target task.

There are numerous CNN models prepared on ImageNet which are accessible freely, we can easily find on the internet

2.2.2 Structural health monitoring system

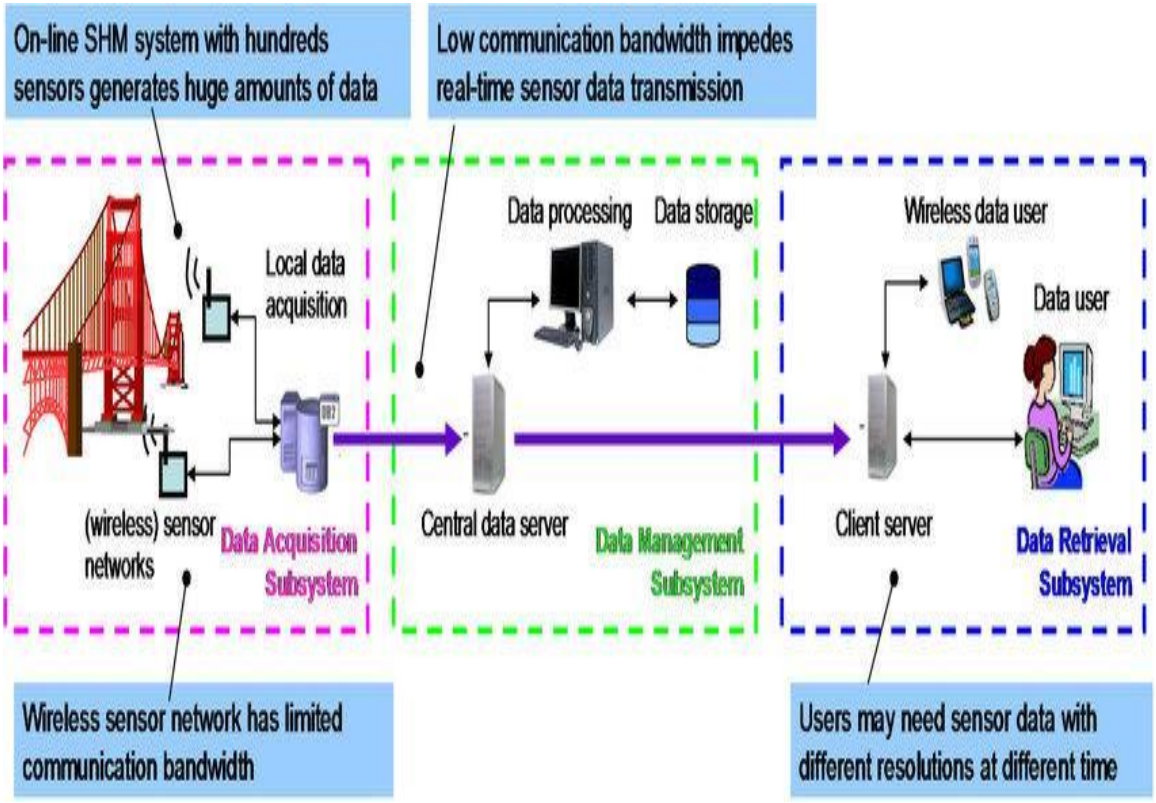


Figure 2.1: Structural health monitoring

2.2.2 Automated road damage detection System

Figure 2.2: Automated road damage detection

2.2.3 Disaster damage detection

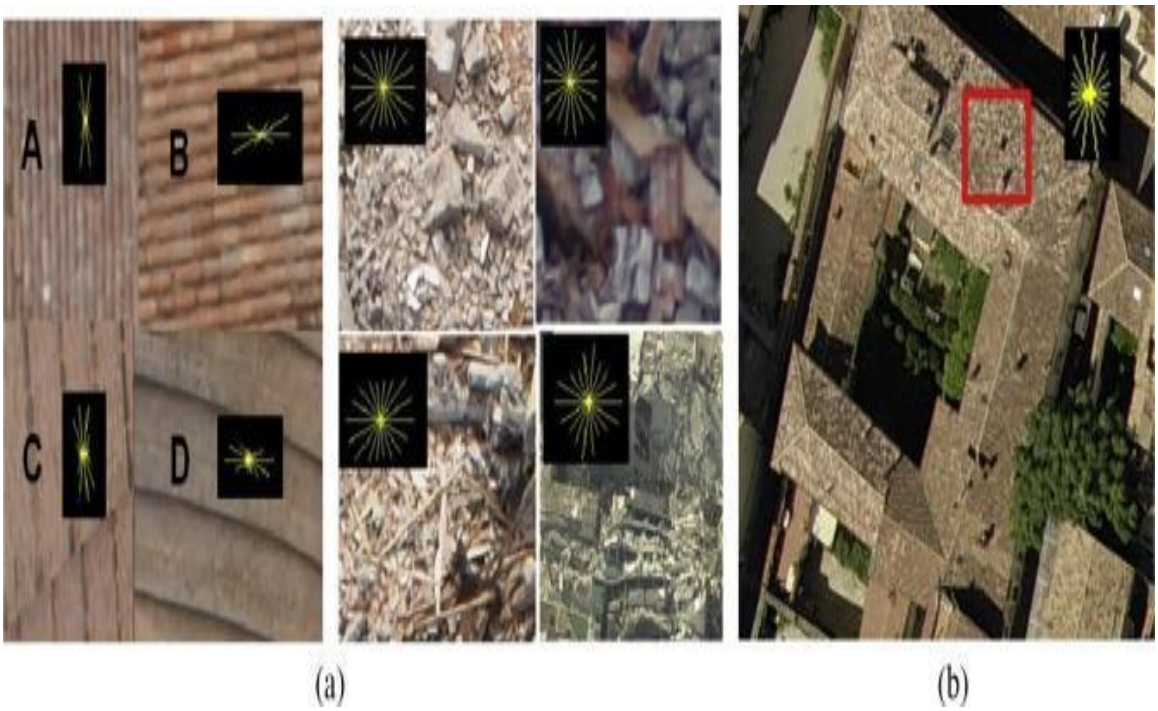


Figure 2.3: Disaster damage detection

2.2.4 Research and Development of Car Damage Recognition System

Usually, a machine learning algorithm is used for automated damage detection. There has a method for vehicle scratch detection. In many geographical regions, damage detection is tried using satellite captured images. After a survey, we find out that deep learning algorithm-based knowledge is not used for automated vehicle damage detection.

In this system we develop that it can detect any damaged part of the car. It will show the result as the car is damaged or not. We have researched about the model which we need to use. We also find the dataset of damaged car and undamaged car.

2.3 Conceptual Framework

A conceptual framework is a systematic tool with different variations and contexts. It is used to make theoretical exceptions. These conceptual frameworks capture something real that is easy to memorize and apply. The conceptual frameworks in this study are described as the body of ideas that are observed to be more in explaining the format of the Car Damage Recognition System. The study is presented as follows:

CHAPTER 3

Requirement

3.1 Requirement Analysis

Requirement analysis is a very important process for any development project. It must be documented, measurable and testable. It also can be architectural, structural, functional, non - functional. The development project requires some requirements to make the project run better. The project creator should discover the minimum requirement for both hardware and software.

Requirement analysis has two part:

- Primary Research: Collect all requirement and essential things from different sources and survey.

Secondary Research: compare the requirement of other existing software

3.2 Technologies

- Tensorflow
- Keras
- Python
- Numpy
- OpenCV
- Matplotlib
- CNN model

3.3 Hardware

- Operating System (Windows, Linux)
- RAM 8 GB (Minimum)
- 64 Bit

3.4 Visual Environment

- Python environment with required functions
- Public IP server

when we create a project on your computer, we have to care about some points when we run our project on the computer it may show some errors.

Because of the computer environment. We have to set up TensorFlow, Keras, OpenCV for a visual environment. When we install all requirements our computer creat a python environment

3.5 Tensorflow

TensorFlow is an open-source library created by Google fundamentally for profound learning applications. It additionally upholds customary AI. TensorFlow was initially produced for huge mathematical calculations without remembering profound learning.

3.6 Functional Requirements

- create dataset
- train dataset
- automatic damage prediction
- calculate the result

These are the functional requirements for this system. To develop this system we need to full-fill these.

3.7 System Design:

System design is a method to define the architecture, modules to complete the requirement. It helps to client chose hardware and software for a particular project.

3.8 Dataset Description

We don't have an available dataset for car damage. So we build a dataset for different types of car damage, that consisting of car damage photos. We think about six usually noticed kinds of damage as the back, front, side, minor, moderate, extreme. We collect photos from the web that belongs to a no damage class.

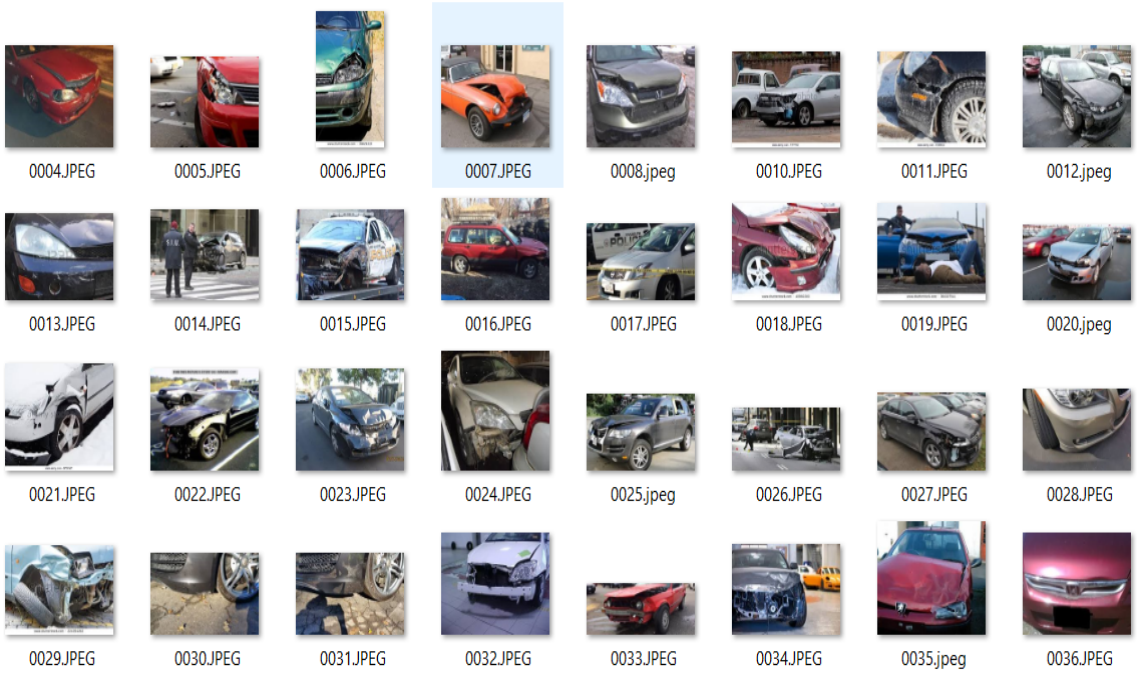


Figure 2.5: Sample dataset

3.1.1 Trainning A CNN

At first, we trained a CNN model for random initialization. Our CNN model has divided into ten layers.

- 1 Conv1
- Pool1
- Conv2

- Pool2
- Conv3
- Pool3
- Conv4
- Pool4
- FC
- Softmax

In that case, Conv, pool, FC, Softmax have represented the convolution layer, pooling layer, fully connected layer, and a softmax layer.

Each raised level has 16 channels of size 5 each 5 a hesitant nonlinearity is utilized for each parcel level. In this system basically, we trained augmented dataset and CNN model.CNN is a powerful algorithm and it is more used for image recognition. Basically CNN model adds two layers. The feature extraction layer is one of them. The second one is the preceding layer. These two-layer connected to each other.

Ordinarily, just keep up principal parts of the information which will in general help the arrangement task. A completely associated autoencoder, especially on account of pictures, starts to an enormous number of teachable parameters. Convolutional Autoencoders provide the best option. It shares weight and connects a number of parameters. We trained CAE layer-wise. We prepared every layer separately. For the subsequent layer, the output of an early layer performs as an input. All sets of layers are massed by backpropagation. It uses the physical function of cross-entropy. We use unlabeled pictures from online and some pictures are captured personally. For the purpose of CAE training. By adding rotation and flip transformations, we increased dataset size. Our dataset is related to vehicle damage solutions. It will help to learn the exact features for the classification task. Classification assignment takes the help of an auto encoder pre-training. Finally, we find that there are few recharge on that topic.

3.1.2 Advantage of car damage recognition

- Anyone can use this system themselves

- ❖ Insurance company can use this system
- ❖ Rental car service can use it

Analyze data faster

CHAPTER 4

Experimental Result

4.1 Screenshots of the Application

In figure 2.6, dataset is training with steps_per_epoch is 50 and epoch is 100. To train data it takes two or three minute. As a result we can get 97% accuracy.

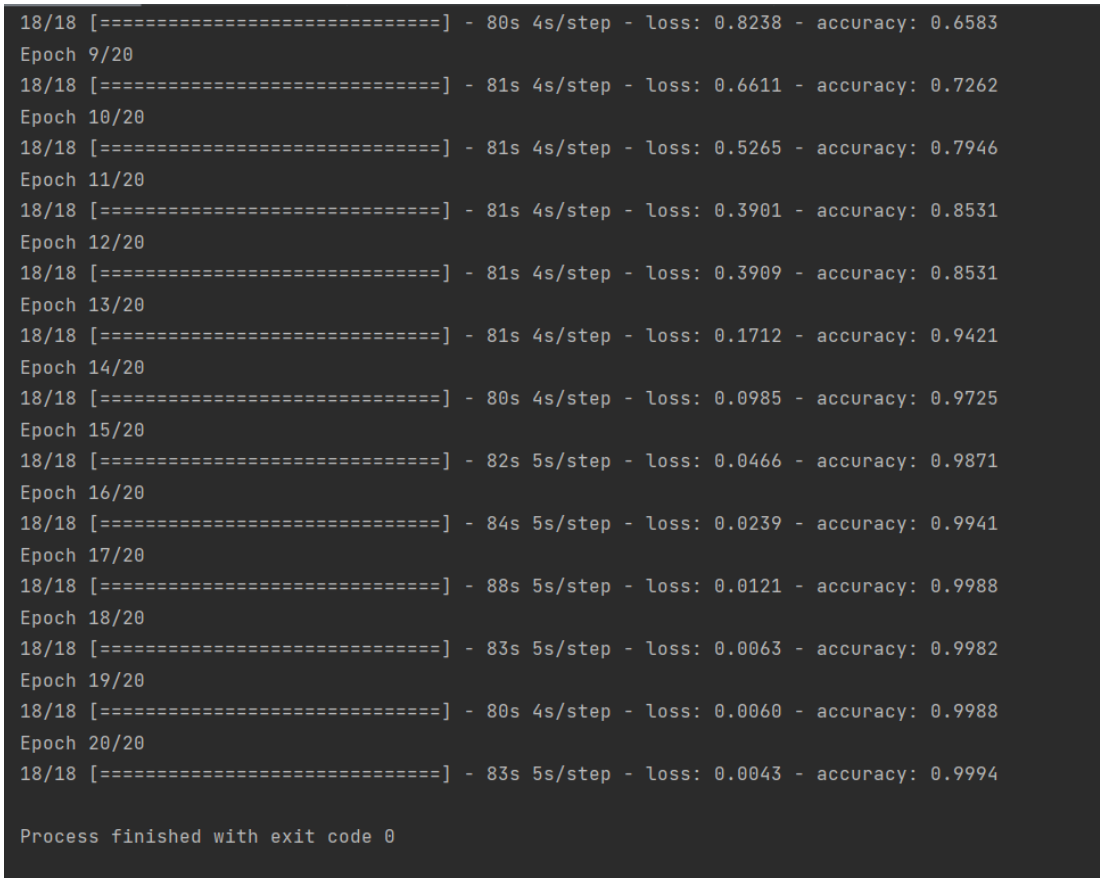


Figure 2.6: Training dataset

Output:

In the screenshot figure 2.7 and 2.8 we can see that it can predict the car which is not damaged. The system will show “CAR IS NOT DAMAGRD”. On the other figure 2.9, 3.0, 3.1 the system can predict that the car which is damaged.

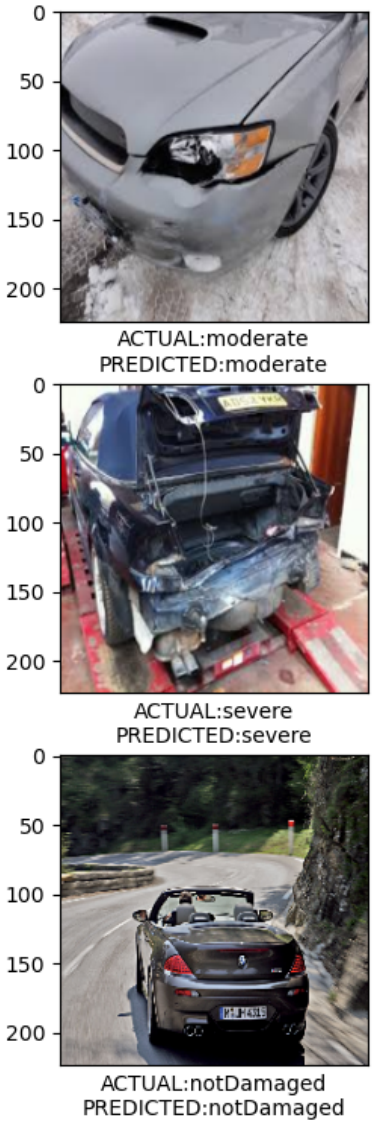


Figure 2.7

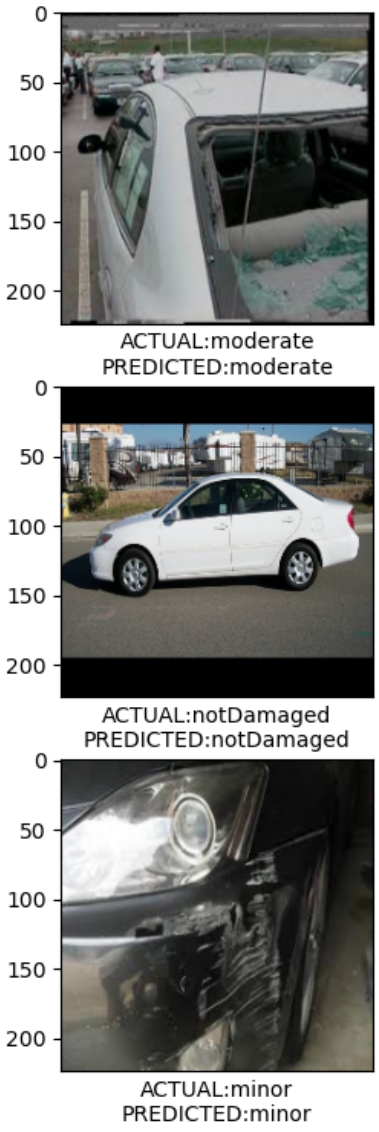
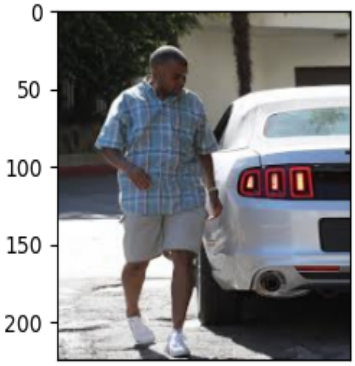
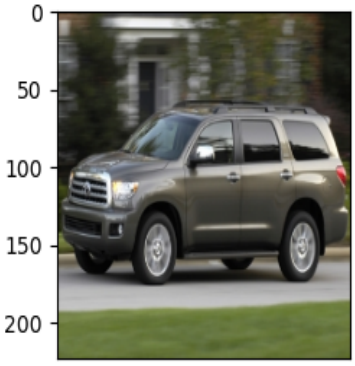


Figure 2.8



ACTUAL:minor
PREDICTED:severe



ACTUAL:notDamaged
PREDICTED:notDamaged

ACTUAL:moderate
PREDICTED:moderate

Figure: 2.9

Chapter 5

Conclusion

In our project, we are trying to make our car damage system more efficient. Our country is digital and our people also smart. Within a short time, they want better work. In this modern world, most of the people are using smartphones. We hope, our project will help people to identify car damage within a short time. We are trying to increase our dataset. Our project will help people and it is going to our success

Reference:

Conference/Journal Papers:

1) "http://www.ey.com/publication/vwluassets/ey-doesyour-firm-need-a-claims-leakage-study/ey-does-yourfirm-need-a-claims-leakage-stud

2) “https://www.irmi.com/articles/expertcommentary/controlling-claims-leakage-throught echnology,”
3) “http://www.sightcall.com/insurance-visual-claimsfight-fraud-and-reduce-cos
4) http://www.tractable.io/,” .
5) Bengio Y. Lecun Y., Bottou L. and Haffner P., “Gradient-based learning applied to document recognition,” Proceedings of IEEE, vol. 86, no.
6) Alex Krizhevsky, Ilya Sutskever, and Geoffrey E. Hinton, “Imagenet classification with deep convolutional neural networks,” in Advances in Neural Information Processing Systems 25, F. Pereira, C. J. C. Burges, L. Bottou, and K. Q. Weinberger, Eds., pp. 1097–1105. Curran Associates, Inc., 2012.
7) Michael Giering Mark R. Gurvich Soumalya Sarkar, Kishore K. Reddy, “Deep learning for structural health monitoring: A damage characterization application,” in Annual Conference of the Prognostics and Health Management Society, 2016.
8) Dumitru Erhan, Yoshua Bengio, Aaron Courville, Pierre-Antoine Manzagol, Pascal Vincent, and Samy Bengio, “Why does unsupervised pre-training help deep learning?,” Journal of Machine Learning Research, vol. 11, no. Feb, pp. 625–660, 2010.
9) Jonathan Masci, Ueli Meier, Dan Cires¸an, and Jurgen ¨ Schmidhuber, “Stacked convolutional auto-encoders for hierarchical feature extraction,” in International Conference on Artificial Neural Networks. Springer, 2011, pp. 52–59
10) Jason Yosinski, Jeff Clune, Yoshua Bengio, and Hod Lipson, “How transferable are features in deep neural networks?,” in Advances in neural information processing systems, 2014, pp. 3320–3328
11) Maxime Oquab, Leon Bottou, Ivan Laptev, and Josef Sivic, “Learning and transferring mid-level image representations using convolutional neural networks,” in Proceedings of the IEEE conference on computer vision and pattern recognition, 2014, pp. 1717–1724.
12) Karen Simonyan and Andrew Zisserman, “Very deep convolutional networks for large-scale image recognition,” arXiv preprint arXiv:1409.1556, 201
13) Christian Szegedy, Vincent Vanhoucke, Sergey Ioffe, Jonathon Shlens, and Zbigniew Wojna, “Rethinking the inception architecture for computer vision,” arXiv preprint arXiv:1512.00567, 2015.
14) Linjie Yang, Ping Luo, Chen Change Loy, and Xiaoou Tang, “A large-scale car dataset for fine-grained categorization and verification,” in Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, 2015, pp. 3973–3981.
15) Kaiming He, Xiangyu Zhang, Shaoqing Ren, and Jian Sun, “Deep residual learning for image recognition,” arXiv preprint arXiv:1512.03385, 2015.
16) Srimal Jayawardena et al., Image based automatic vehicle damage detection, Ph.D. thesis, Australian National University, 2013.
17) F Samadzadegan and H Rastiveisi, “Automatic detection and classification of damaged buildings, using high resolution satellite imagery and vector data,” The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, vol. 37, pp. 415–420, 2008.
18) K Kouchi and F Yamazaki, “Damage detection based on object-based segmentation and classification from highresolution satellite images for the 2003 boumerdes, algeria earthquake,” in Proceedings of the 26th Asian conference on Remote Sensing, Hanoi, Vietnam, 2005.

19) Ellen Rathje and Melba Crawford, “Using high resolution satellite imagery to detect damage from the 2003 northern algeria earthquake,” in 13th World Conference on Earthquake Engineering, August, 2004, pp. 1–6.
20) Jonathan Krause, Michael Stark, Jia Deng, and Li FeiFei, “3d object representations for fine-grained categorization,” in Proceedings of the IEEE International Conference on Computer Vision Workshops, 2013, pp. 554–561.