INTELLIGENT VEHICLE DAMAGE ASSESSMENT AND COST ESTIMATOR FOR INSURANCE COMPANIES

TEAM ID :PNT2022TMID44954

TEAM MEMBERS:

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ABSTRACT:

The motor insurance sector loses a lot of money as a result of leakage claims. The gap between the amount actually paid for claims and the amount that would have been paid had all of the best practice in the industry been followed is known as underwriting leakage. These results have been reached using both testing and visual assessment. However, they do delay the processing of claims. By reducing loss adjustment costs, improvements in the First Notice of Loss and the speed with which claims are examined and evaluated might save a lot of money in the automobile insurance claims process. Car damage is automatically identified and classified using advanced picture analysis and pattern recognition technology, a method for automatically locating the damaged area by comparing photos of the automobile from before and after an accident. This project's proposed a CNN model that can recognize a car's damage area. If users upload images, the model can evaluate damage (be it a dent or scratch from an object), and it can also estimate the extent of damage. Insurance firms can handle claims more efficiently as a result. When accepting a car loan, particularly one for a used vehicle, lenders may also consider this model.

1. INTRODUCTION

PROJECT OVERVIEW

Vehicles are significantly rising in today's globe. Because there are more cars on the road, accidents happen more frequently because individuals are driving them at high speeds. When an accident occurs, the people file a claim with their auto insurance for the necessary funds to repair the car, because to inaccurate claims, the corporation behaves improperly and doesn’t make payments now. This occurs as a result of claims leakage, which is the discrepancy between the sums secured by the firm and the sums that it should have secured in accordance with the claims. Even if the car's damage is easily seen, the claim procedure will take longer than usual in accordance with company policy. Despite the company's best efforts, there is a delay in the claims procedure. Differentiate the suggested approach to perhaps speed up the process of assessing automotive damage. Instead of taking hours to accomplish automotive damage detection if it were visually inspected, a system may perform it in a minute by just providing a picture of a damaged vehicle. The system can determine the analysis of the damage, the position of the damage, and the degree of the damage using machine learning and computer vision.

PURPOSE

Today's world is seeing a substantial increase in automobiles. Because there are more automobiles on the road and more people are driving them at high speeds, accidents happen more frequently. When an accident happens, the parties involved submit a claim with their auto insurance to obtain the money needed to repair the vehicle since, according to false claims, the company acts inappropriately and withholds payments.

2. LITERATURE REVIEW

EXISTING PROBLEM

TITLE:DAMAGE ASSESSMENT OF A VEHICLE AND INSURANCE RECLAIM

AUTHOR NAME: Vaibhav Agarwal 2022

By reducing loss adjustment costs, improvements in the First Notice of Loss and the speed with which claims are examined and evaluated might save a lot of money in the automobile insurance claims process. Car damage is automatically identified and classified using advanced picture analysis and pattern recognition technology. A technique that compares before-and-after-accident car images to automatically detect the damaged location.

TITLE :CAR DAMAGE AND COST EVALUATION USING MASK R-CNN

AUTHOR NAME :J D Dorathi jayaseeli 2021

Detecting the damage on a car is an image-based processing method with enormous scope for automation. This concept of automated detection of the extent of exterior damage on a car and subsequent quantification of the damage severity would benefit car insurers, car rentals and repair services. In this paper, we propose employing Convolution Neural Networks to build a Mask R-CNN model that can detect the area of damage on a car. The dataset used consists of images of damaged vehicles with a single class named scratch. The images are precisely annotated with the area of damage. The model is trained using the base weights of mrcnn coco dataset. The images are processed for 21 epochs. After processing, the final result is visualized using a color splash technique, wherein the area of damage is highlighted. This model would help in reducing the cost of processing insurance claims and lead to greater customer satisfaction. Car dealers can eliminate the manual process of damage assessment and the labor cost accompanied by it. Accuracy and transparency in pricing cars and their potential repairs will be made more prevalent. Fraudulent vehicle insurance claims can also be diminished. On implementing our model, we achieved an overall loss of 0.3888.

TITLE: PREVENTING CAR DAMAGE USING CNN AND COMPUTER VISION

AUTHOR NAME:Avinash Sharma 2019

This research contain convolutional neural network are used to recognize whether a car on a given image is damage or not, from where it is damage and severity of the damage. Using transfer learning to take advantage of available models that are trained on a more general object recognition task, very satisfactory performance has been achieved, which indicate great opportunities of this approach. Car accidents are stressful and the auto claims process is ripe for disruption. Using computer vision to accurately classify vehicle damage and facilitate claims triage.

TITLE: ASSESSING CAR DAMAGE WITH CONVOLUTIONAL NEURAL NETWORK

AUTHOR NAME:Harit Bandi 2019

Manual estimation of damages in fields like construction, vehicular accidents has been the mainstay of the insurance business. However, such methods are replete with biases and inaccurate estimations. This paper deals with estimating car damage, primarily with auto insurers as our key potential customers. For this purpose, three distinct Transfer Learning approaches are used which detect the presence of damage, location, and severity of the damage. The basis for algorithms used lies in Convolutional Neural Networks, customized to optimize accuracy. Each approach is analyzed and varying degrees of accuracy were achieved across different models deployed ranging from 68% to 87%. Accuracy as high as 87.9% was obtained during the course of experiments. This research fine-tunes a number of existing approaches and opens doors for collaboration in image recognition, particularly for the car insurance Domain

REFERENCES:

1) Kyu, Phyu & Woraratpanya, Kuntpong. (2020). Car Damage Detection and Classification. 1-6. 10.1145/3406601.3406651.

2) 5. Jayaseeli, J. D., & Malathi, D. (2020). An Efficient Automated Road Region Extraction from High Resolution Satellite Images using Improved Cuckoo Search with Multi-Level Thresholding Schema. *Procedia Computer Science*, *167*, 1161-1170.

3). A. Krizhevsky, I. Sutskever, and G. 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. Curran Associates, Inc., 2012, pp. 1097–1105.

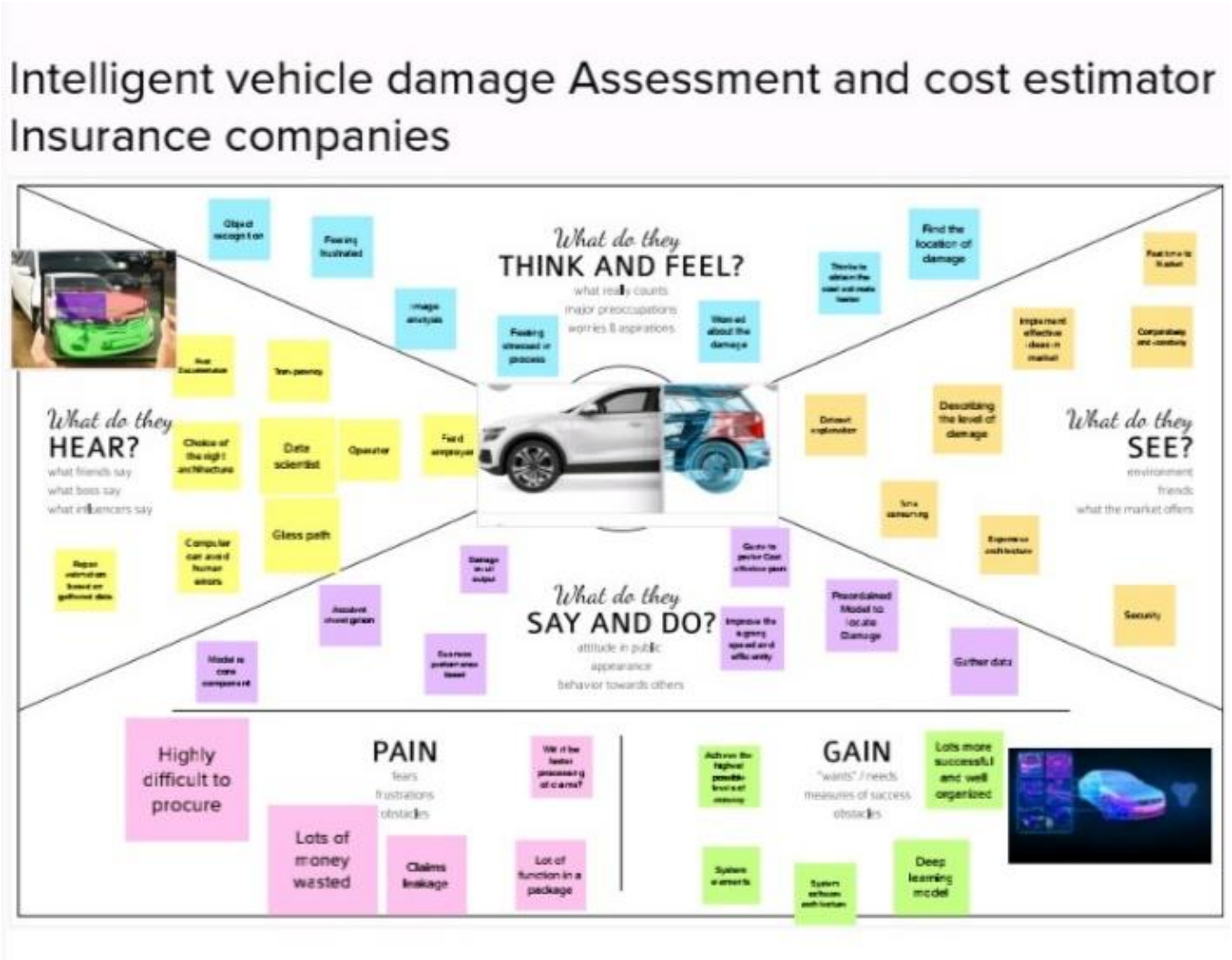
4)K. Patil, M. Kulkarni, A. Sriraman and S. Karande, "Deep Learning Based Car Damage Classification," 2017 16th IEEE International Conference on Machine Learning and Applications (ICMLA), 2017, pp. 50-54, doi: 10.1109/ICMLA.2017.0-179

PROBLEM STATEMENT DEFINITION

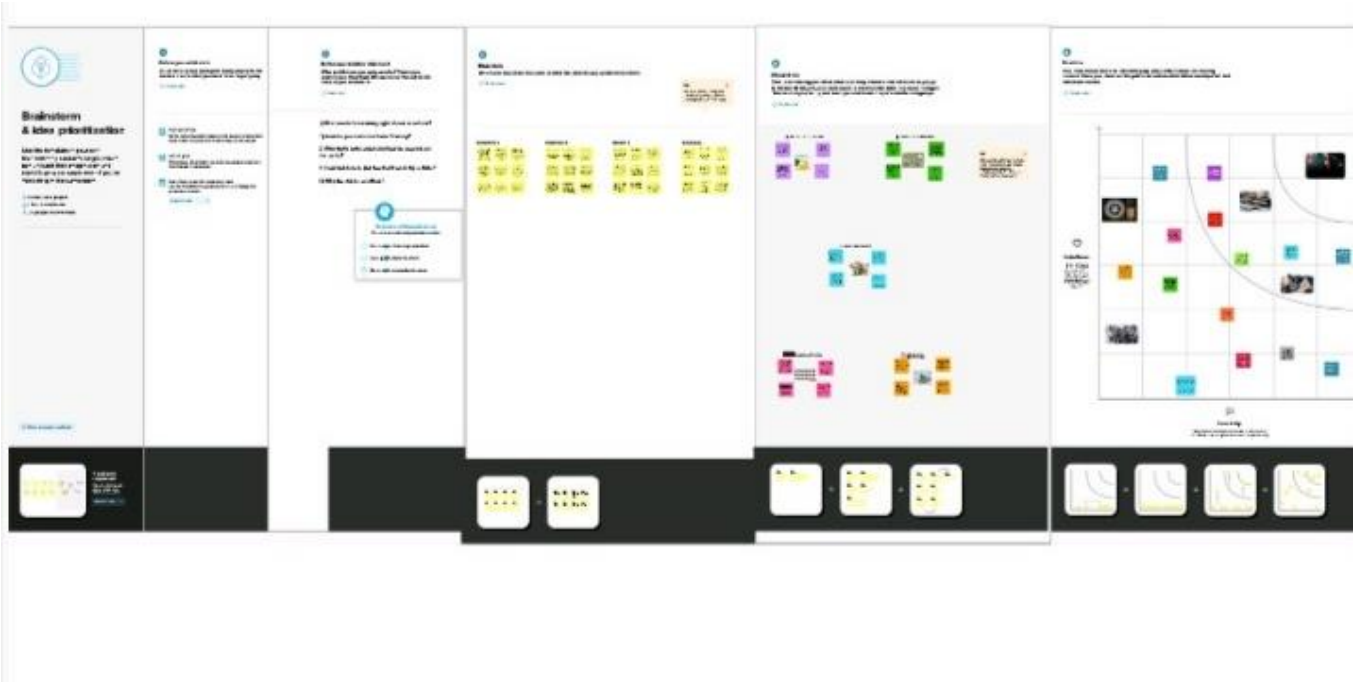
In existing system, the procedure of making an insurance claim for an automobile is laborious, and there is a delay before the first reimbursement is authorized. Insurance firms lose millions of dollars each year due to claim leakage as a result of the expansion of the vehicle sector and the daily rise in the number of accidents. The discrepancy between the company's actual spending and what they should have really spent is known as claim leakage. Ineffective claim processing, erroneous payments, human error such as a lack of quality control or poor customer service or even claim fraud may be to blame for this. Auditing closed claim files is the only way to find claim leakage.

3. IDEATION & PROPOSED SOLUTION

EMPATHY MAP CANVAS



BRAINSTROMING



PROPOSED SOLUTION

The proposed approach collects photographs of a person's damaged automobile, then utilizes those images as input for a deep learning model that use image processing to recognize the elements of the image and determine the percentage of the vehicles'' damage. After then, the images are separated into two groups: replace and repair. When the damage percentage is less than 80, the damaged part must be replaced; however, in the other case, the compensation amount is set depending on the damage percentage. Finally, it generates a comprehensive analysis report on the vehicle that is used to ask the insurance company for payment.

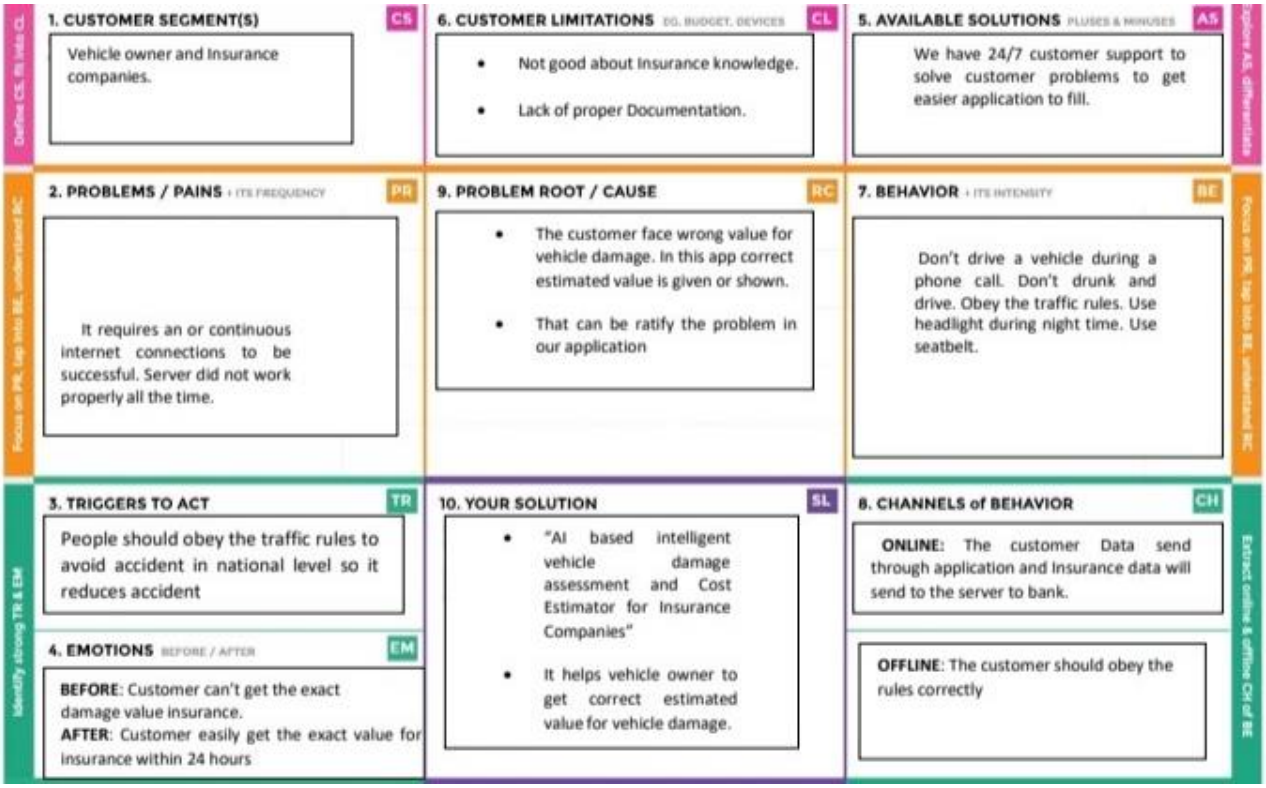
S.No.	Parameter	Description
•	Problem Statement (Problem to be solved)	1. proposed model is that it only identifies the physical visible damage and not of the internal or the interior damage 2.Embedding low-power, low-latency, reliable, and trustworthy intelligence into the network edge is an inevitable trend and disruptive shift in both academia and industry. 3.There are many ways to learn a new skill, but learning in a supervised manner is the most effective and efficient. This is because you're teaching the computer what you want it to do while you're working on the skil. .
•	Idea / Solution description	1. Split DL further provides a flexible way to train a DNN by dividing it into lower and upper segments located at the edge device-side and edge server-side, respectively . 2. It is generally accepted that AI can be considered in two ways: as a science aimed at trying to discover the essence of intelligence and developing generally intelligent machines, or as a science providing methods for solving complex problems
		3. 3..Machine learning is a powerful tool that can be used in almost any situation or task. Here, we will focus on when machine learning is best used in the process of doing research. .
•	Novelty / Uniqueness	they applied deep learning-based algorithms, **VGG16 and VGG19**, for car damage detection and assessment in real world datasets. The algorithms detect the damaged part of a car and assess its location

•	Social Impact / Customer Satisfaction	Cars are a major contributor to **air pollution producing significant amounts of nitrogen oxides, carbon monoxide, and particulate matter**. 80-90% of cars' environmental impact comes from fuel consumption and emissions of air pollution and greenhouse gases. **Vehicle pollutants harm our health and contain greenhouse gases that cause climate change**. Burning gasoline and diesel fuel creates harmful byproducts like nitrogen dioxide, carbon monoxide, hydrocarbons, benzene, and formaldehyde. In addition, vehicles emit carbon dioxide, the most common greenhouse gas.
•	Business Model (Revenue Model)	

		
•	Scalability of the Solution	**VGG16.** The transfer learning could significantly reduce the training times when it uses the weights of pre trained VGG models , it had demonstrated significant progress on how to solve classification problems when the small dataset was not enough to train a **CNN model**

SOLUTION FIT

There is no systematic approach to receive a rapid answer from an insurance company. A week of waiting is required. The proposed solution should enable consumers to contact with the insurance provider and receive payments both online and offline. After uploading the damaged image and determining the extent of the damage, the user may obtain insurance only if the company approves the damaged image and the condition is more than 80%.



4. REQUIREMENT ANALYSIS

FUNCTIONAL REQUIREMENT

Framework Creation:

This approach provides a way for evaluating vehicle damage that insurance companies may utilise when processing claims. This module offered a framework for submitting a vehicle's damaged parts and requesting insurance from an organization. The dataset needed to train the Damage Detection and it has prepared by an admin. In order to make the images useful for training, they were manually annotated; damages were categorized into 7 distinct types such as Door Dent, Bumper Dent, Body Scratch, Broken Windshield, Broken Glass, Broken Lights and Smash By modifying its settings and loading the learned dataset, the model was set up to train on user data.

Object Detection

Employ a specially trained CNN model utilizing transfer learning on to identify the object. This model takes different forms of damage into account validation sets such as Bumper Dent, Bumper Scratch, Door Dent, Door Scratch, Glass Shattered, Head Lamp, Tail Lamp, Undamaged, etc. The classification of car damage severity is as follows: Minor Damage which typically involves slight damage to the vehicle that does not impede the vehicle to cause severe injuries. It includes the headlight scratches, dents and digs in the hood or windshield, from gravel or debris, scratches in the paint. Moderate Damage which deals with any kind of damage that impairs the functionality of the vehicle in any way is moderate damage. It involves large dents in hood, fender or door of a car. Even if the airbags are deployed during collision, then it comes under moderate damage. Severe Damage – Structural damages such as bent or twisted frames, broken/bent axels, and missing pieces of the vehicles and in some cases even the destruction of airbags. These types of damages are a big threat to the human life.

Damage Detection:

To locate damaged areas in a picture and create a bounding box around each object found, object localization is used which combines object localization and classification to provide a bounding box and a class for each item for object detection. Use CNN to generate a convolutional features map from an image to forecast the class and bounding box of an item. If the car is undamaged then it simply detects it and if it's a damaged one, then there are further localizations made models. The model shows accuracy on the validation set. To automate such a system, the easiest method would be to build a Convolution Neural Network model capable of accepting images from the user and determining the location and severity of the damage. The model is required to pass through multiple checks would first ensure that given image is that of a car and then to ensure that it is in fact damaged. These are the gate checks before the analysis begins. Once all the gate checks have been validated, the damage check will commence. The model will predict the location of the damage as in front, side or rear, and the severity of such damage as in minor, moderate or severe.

Claim Insurance

The procedure of claiming insurance is done by persons who are in need. For access to the company's insurance, the user must register and authenticate. After that, users may access their insurance information and submit an insurance claim request. The request for an insurance claim can be viewed and approved by the insurance company. Once the damaged image has been uploaded and the degree of the damage has been determined, the user may receive insurance only if the firm accepts the damaged image and the condition is greater than 80%.

NON FUNCTIONAL REQUIREMENTS

Usability

The system shall allow the users to access the system with pc using web application. The system uses a web application as an interface. The system is user friendly which makes the system easy

Availability

The system is available 100% for the user and is used 24 hrs a day and 365 days a year. The system shall be operational 24 hours a day and 7 days a week.

Scalability

Scalability is the measure of a system's ability to increase or decrease in performance and cost in response to changes in application and system processing demands.

Security

A security requirement is a statement of needed security functionality that ensures one of many different security properties of software is being satisfied.

Performance

The information is refreshed depending upon whether some updates have occurred or not in the application. The system shall respond to the member in not less than two seconds from the time of the request submittal. The system shall be allowed to take more time when doing large processing jobs. Responses to view information shall take no longer than 5 seconds to appear on the screen.

Reliability

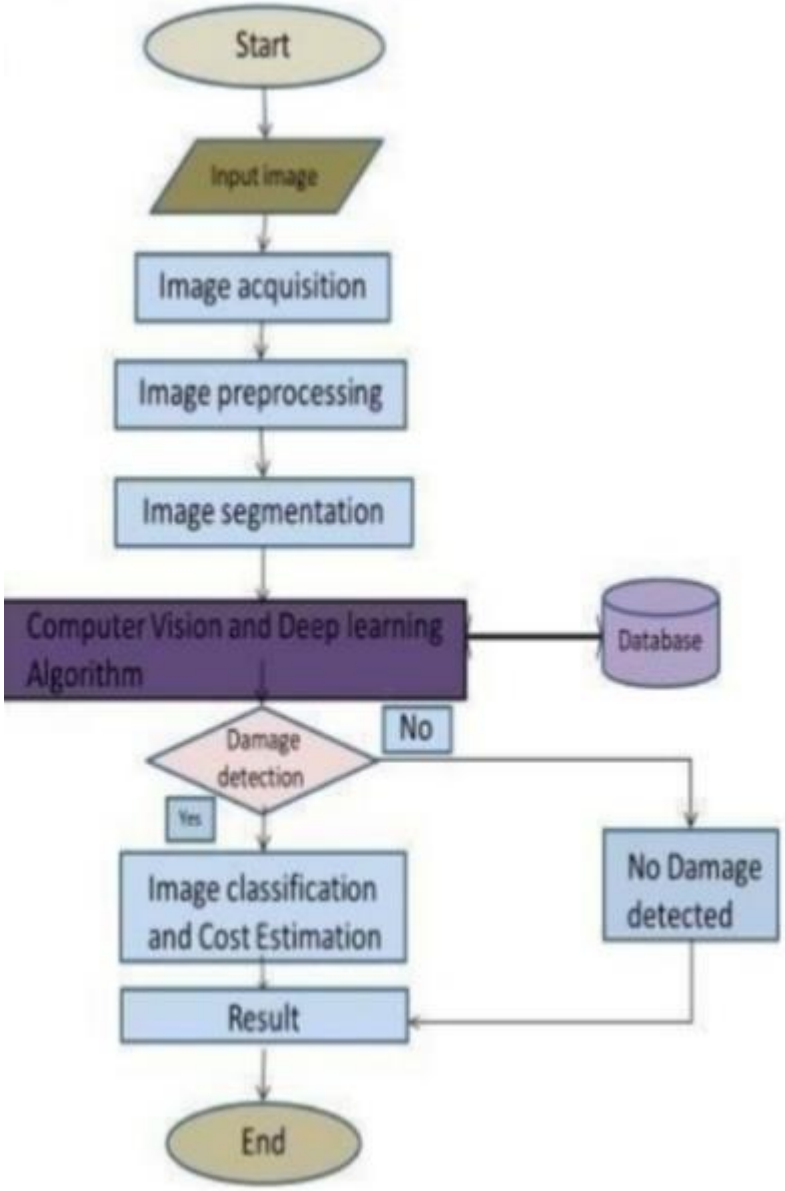
The system has to be 100% reliable due to the importance of data and the damages that can be caused by incorrect or incomplete data. The system will run 7 days a week. 24 hours a day.

5. PROJECT DESIGN

DATA FLOW DIAGRAMS

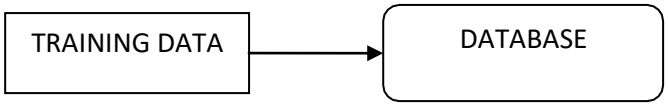
A two-dimensional diagram explains how data is processed and transferred in a system. The graphical depiction identifies each source of data and how it interacts with other data sources to reach a common output. Individuals seeking to draft a data flow diagram must identify external inputs and outputs, determine how the inputs and outputs relate to each other, and explain with graphics how these connections relate and what they result in. This type of diagram helps business development and design teams visualize how data is processed and identify or improve certain aspects.

Data Flow Diagram



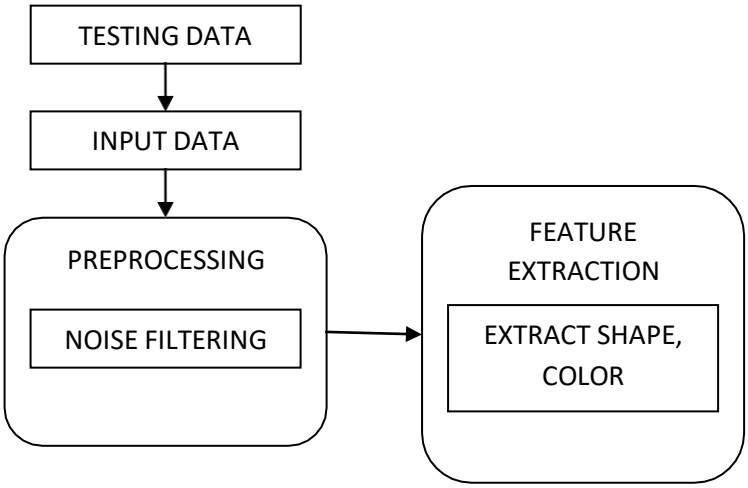
LEVEL 0

The Level 0 DFD shows how the system is divided into 'sub-systems' (processes), each of which deals with one or more of the data flows to or from an external agent, and which together provide all of the functionality of the system as a whole. It also identifies internal data stores that must be present in order for the system to do its job, and shows the flow of data between the various parts of the system.



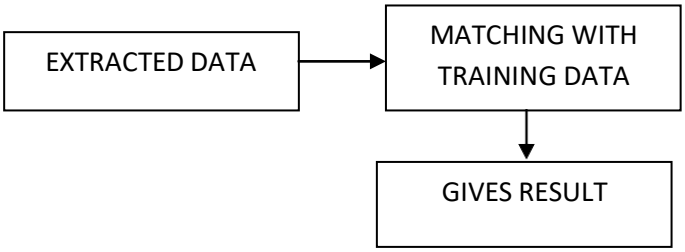
LEVEL 1

The next stage is to create the Level 1 Data Flow Diagram. This highlights the main functions carried out by the system. As a rule, to describe the system was using between two and seven functions - two being a simple system and seven being a complicated system. This enables us to keep the model manageable on screen or paper.



LEVEL 2

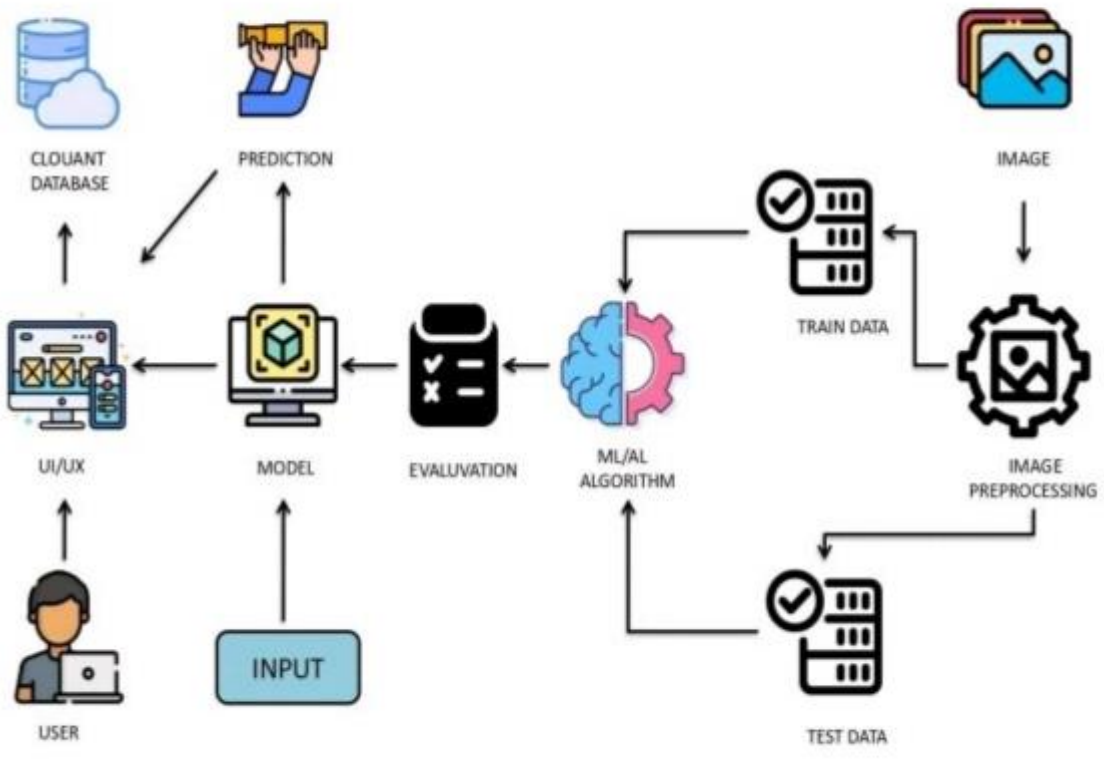
A Data Flow Diagram (DFD) tracks processes and their data paths within the business or system boundary under investigation. A DFD defines each domain boundary and illustrates the logical movement and transformation of data within the defined boundary. The diagram shows 'what' input data enters the domain, 'what' logical processes the domain applies to that data, and 'what' output data leaves the domain. Essentially, a DFD is a tool for process modelling and one of the oldest.



SOLUTION & TECHNICAL ARCHITECTURE

A system architecture or systems architecture is the conceptual model that defines the structure, behavior, and more views of a system. An architecture description is a formal description and representation of a system, organized in a way that supports reasoning about the structures and behaviors of the system. System architecture can comprise system components, the externally visible properties of those components, the relationships (e.g. the behavior) between them. It can provide a plan from which products can be procured, and systems developed, that will work together to implement the overall system. There have been efforts to formalize languages to describe system architecture, collectively these are called architecture description languages.

Solution Architecture Diagram:



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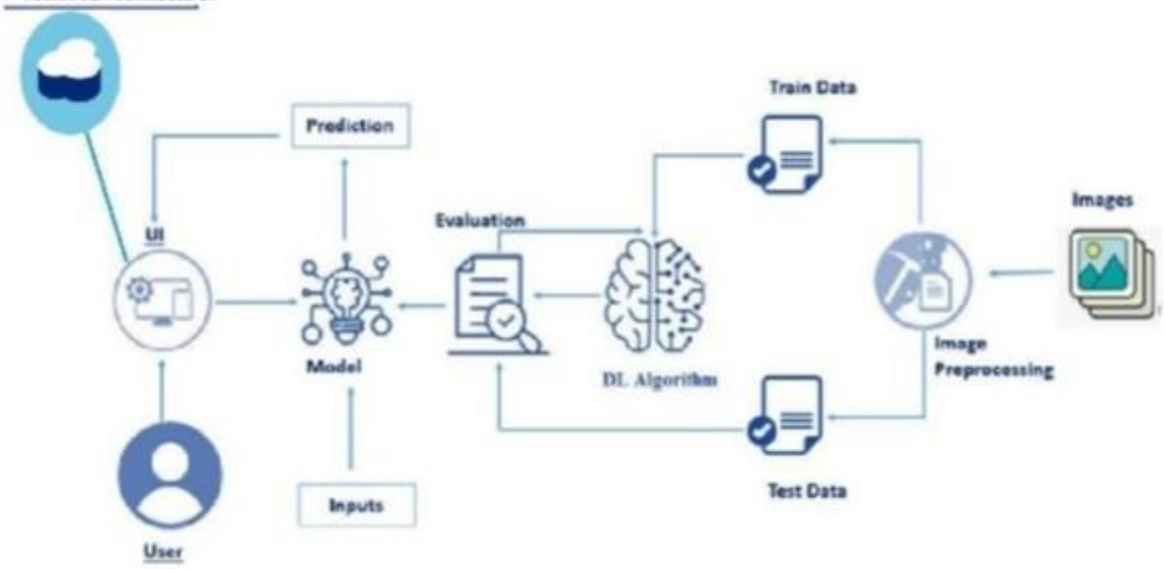
Technical Architecture:



USER STORIES

↓

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User registration	Download the app Registration Done via Gmail Create an account Follow the instructions
FR-2	User Confirmation	Confirmation through Email Confirmation through OTP
FR-3	Interface	Understandable Interface for user to operate
FR-4	Accessing datasets	Details about user Details about vehicle Details about insurance companies
FR-5	Mobile application	AI and camera sensor in the field can be access by mobile application.

6. PROJECT PLANNING & SCHEDULING

SPRINT PLANNING:

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Data collection (Dataset)	USN-1	As a user, I will download a dataset of gestures for this project.	2	High	Vihashini Vinoth Yasikhan
Sprint-2	Image Preprocessing	USN-2	As a user, I will import necessary libraries for configuration of image datagenerator and apply them to test and train datasets.	2	High	Vihashini Vinoth Yasikhan
Sprint-2	Model Building	USN-3	As a user, I can import necessary libraries and models of CNN and add Dense layers.	2	Low	Vihashini Vinoth Yasikhan
Sprint-2	Model Building	USN-4	As a user, I will train, save and test the model.	2	Medium	Vihashini Vinoth Yasikhan
Sprint-3	Application Building	USN-5	As a user, I create html front pages (CSS for styling web page and JS to connect back end).	1	High	Vihashini Vinoth Yasikhan

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
						Vihashini Vinoth
Sprint-3	Application Building	USN-6	As a user, I use python flask for building back end(for server side scripting).	2	High	Vihashini Vinoth Yasikhan
Sprint-3	Application Building	USN-7	As a user, I'm going to run the application by combining both front end and back end.	2	High	Vihashini Vinoth Yasikhan
Sprint-4	Train the model on IBM	USN-8	As a user, register for IBM cloud.	1	Medium	Vihashini Vinoth Yasikhan
Sprint-4	Train the model on IBM	USN-9	As a user, train the model on IBM and integrate it with the flask application.	2	High	Vihashini Vinoth Yasikhan

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	29 Oct 2022	3 Nov 2022	20	30 Oct 2022
Sprint-2	20	6 Days	04 Nov 2022	9 Nov 2022	20	06 Nov 2022
Sprint-3	20	6 Days	10 Nov 2022	15 Nov 2022	20	11 Nov 2022
Sprint-4	20	6 Days	16 Nov 2022	21 Nov 2022	20	20 Nov 2022

Report from jira:

Velocity:

Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

Where

Average Velocity - Story points per day

Sprint Duration - Number of days (Duration) for Sprints

Velocity - Points per Sprint

A=20/5=4

Average Velocity is 4 points per sprint.

Burndown Chart:

A burndown chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burn down charts can be applied to any project containing measurable progress over time.

Burndown Chart:

CODING:

Html coding:

```
<!DOCTYPE html>

<html lang="en">

<head>

<meta charset="UTF-8">
```

<meta http-equiv="X-UA-Compatible" content="IE=edge">

<meta name="viewport" content="width=device-width, initial-scale=1.0">

<title>SignUp</title>

<link rel="stylesheet" href="index.css">

</head>

<body>

<nav>

<ul class="navigation">

<!-- Making menu icon clickable to display the navigation menu on smaller screens -->

HOME

GO BACK

</ub<!DOCTYPE html>

<html lang="en">

<head>

<meta charset="UTF-8">

<meta http-equiv="X-UA-Compatible" content="IE=edge">

<meta name="viewport" content="width=device-width, initial-scale=1.0">

<title>SignUp</title>

<link rel="stylesheet" href="index.css">

</head>

<body>

<nav>

<ul class="navigation">

** **

**<!-- Making menu icon clickable to display the navigation menu on smaller screens --> **

** **

** **

**HOME
**

**<a class="left" href="./Login/news.html">
GO BACK**

** **

</ub
</nav>

<I-NAVIGATION END HERE -->

<section class="form">

** **

<h1>JOIN OUR NEWS TRACKING APPLICATION TO KNOW

ABOUT THE WORLD NEWS</h1>

```
<hr width="20%" style="border: 1px solid #daa800;">

<br>

<form action="">

<input class="name-surname" type="text" name="name" placeholder="Name">

<input class="name-surname" type="text" name="surname"

placeholder="Surname"><br> <input type="text" name="email"
placeholder="Email"><br>

<div class="checkbox">

<h3 style="color: #daa800;"><span>SELECT WHAT NEWS YOU NEED FROM

THOSE LIST</span></h3>

<input type="checkbox" name="Categories" id="p1">

<label for="p1">World News</label>

<input type="checkbox" name="Categories" id="p2"> <label for="2">Weather
News</label><br>

<input type="checkbox" name="Categories" id="p3">

<label for="p3">Sports</label>

<input type="checkbox" name="Categories" id="p4">

<label for="p4">Tecnology</label><br>

<input type="checkbox" name="Categories" id="p5">

<label for="p5">Political News</label>

<input type="checkbox" name="Categories" id="p6">

<label for="p6">Trending Today</label> <br><br>
```

** **

**
 <input type="password" name="password" placeholder="Password">
 <input type="password" name="conf_password" placeholder="Confirm Password">
**

<button formaction="/Login/news.html">JOIN</button>

** Already have an account? Login Here **

</form>

** **

</section>

<I-FOOTER STARTS HERE -->

<footer>

** **

** Company Name-Copyright © 2018 All Rights**

**Reserved. **

** **

</footer>

<-FOOTER ENDS HERE->

</body>

</html>

Model summary:

Model: "sequential 1"

Model Sum mary

Layer (type)

Output Shape

conv28 13 (Conv20)

(None, 224,

224,

64)

conv2d 14 (Conv20)

(None,

224,

224,

64)

max_pooling2d 5 (MaxPooling (None, 112, 112, 64) 20)

conv2d 15 (Conv20)

(None, 112, 112, 128)

conv2d 16 (Conv20)

(None, 112, 112, 128)

max_pooling2d 6 (MaxPooling (None, 56, 56, 128)

20)

conv2d 17 (Comv20)

(None,

56,

56,

256)

conv2d 18 (Conv20)

(None, 56, 56, 256)

conv2d 19 (Conv20)

(None,

56,

56,

256)

max_pooling2d 7 (MaxPooling (None, 21, 28, 256)

20)

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conv2d 28 (Conv20) conv2d 21 (Conv20)

(None, 28, 28, 512)

(None,

28, 28, 512)

conv2d 22 (Conv20)

(None, 28, 28, 512)

max_pooling2d 8 (MaxPooling 20)

(None, 14, 14, 512)

conv2d 23 (Conv20)

(None, 14, 14, 512)

conv2d 24 (Conv20)

(None, 14, 14, 512)

conv2d 25 (Conv20)

(None,

14,

14, 512)

max_pooling2d_9 (MaxPooling (None, 7, 7, 512)

20)

flatten 1 (Flatten)

(None, 25088)

dense (Dense)

(None, 4096)

dense 4 (Dense)

(None, 4096)

dense 5 (Dense)

(None, 3)

Total params: 134,272,835 Trainable params: 134,272,835 Non-trainable params: 0

Preprocessing code:

For Body Damage:

```
#Passing training data to train variable for body xtrain =

train_datagen flow from directory("/content/damage vehicle/body/training".

target_size=(224,224). class_mode="categorical".

batch_size=10)

#Passing testing data to test variable for body xtest = test_datagen
flow_from_directory/content/damage vehicle/body/validation,

target_size=(224,224),

class mode categorical",

batch_size=10)
```

For Level Damage:

```
#Passing training data to train variable for body

x_train = train_datagen.flow_from_directory('/content/damage vehicle/level training.
target_size=(224,224),

class_mode='categorical".

batch_size=10)

#Passing training data to test variable for body
```

x_test=test_datagen_flow_from_directory/content/damage vehicle/level/validation,

target_size=(224,224). class_mode='categorical".

batch_size=10)

0

7. TESTING

TEST CASES

USER ACCEPTANCE TESTING

This sort of testing is carried out by users, clients, or other authorized bodies to identify the requirements and operational procedures of an application or piece of software. The most crucial stage of testing is acceptance testing since it determines whether or not the customer will accept the application or programme. It could entail the application's U.I., performance, usability, and usefulness. It is also referred to as end-user testing, operational acceptance testing, and user acceptance testing (UAT).

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the [ProductName] project at the time of the release to User Acceptance Testing (UAT).

2. Defect Analysis

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	7	7	9	7	30
Duplicate	4	0	2	0	6
External	1	2	0	2	5
Fixed	14	1	6	8	29
Not Reproduced	0	0	1	0	1
Skipped	0	0	2	1	3
Won't Fix	0	4	1	0	5
Totals	26	14	21	19	80

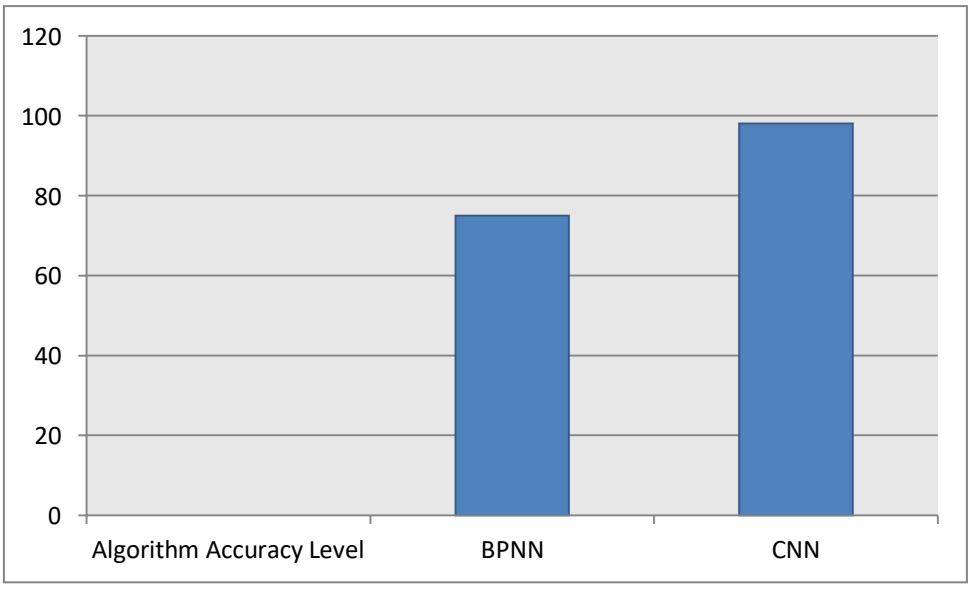
3. Test Case Analysis

This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	5	0	0	5
Client Application	28	0	0	28
Security	2	0	0	2
Outsource Shipping	1	0	0	1
Exception Reporting	6	0	0	6
Final Report Output	8	0	0	8
Version Control	1	0	0	1

8. RESULTS

PERFORMANCE METRICS



9. ADVANTAGES & DISADVANTAGES

ADVANTAGES

- Digitalized claim process makes easy to use
- Give the accurate result of the damaged vehicle
- Helps the insurance company to analyze the damaged vehicle and also payment process.
- Legal requirement

DISADVANTAGES

- It will take more time to claim the insurance in manual process
- Because of incorrect claims, the company behaves badly and doesn't make payments currently.
- Poor customer support
- Time taking process
- Hassle –free claim settlement

10. CONCLUSION

In this research proposal, a neural network-based solution for automobile detection will be used to address the issues of automotive damage analysis and position and severity prediction. This project does several tasks in one bundle. The method will unquestionably assist the insurance firms in conducting far more thorough and systematic analyses of the vehicle damage. Simply sending the system a photograph of the vehicle, it will evaluate it and determine whether there is damage of any type, where it is located, and how severe it is.

11. FUTURE SCOPE

In future work, need to use several regularization methods with a big dataset in our next work. Anticipate the cost of a car damaged component more accurately and reliably if we have higher quality datasets that include the attributes of a car (make, model, and year of production), location data, kind of damaged part, and repair cost. This study makes it possible to work together on picture recognition projects in the future, with a focus on the auto insurance industry. The study was able to accurately validate the presence of damage, its location, and its degree while eliminating human bias. These can be further enhanced by adding the on the fly data augmentation approaches.

12. APPENDIX

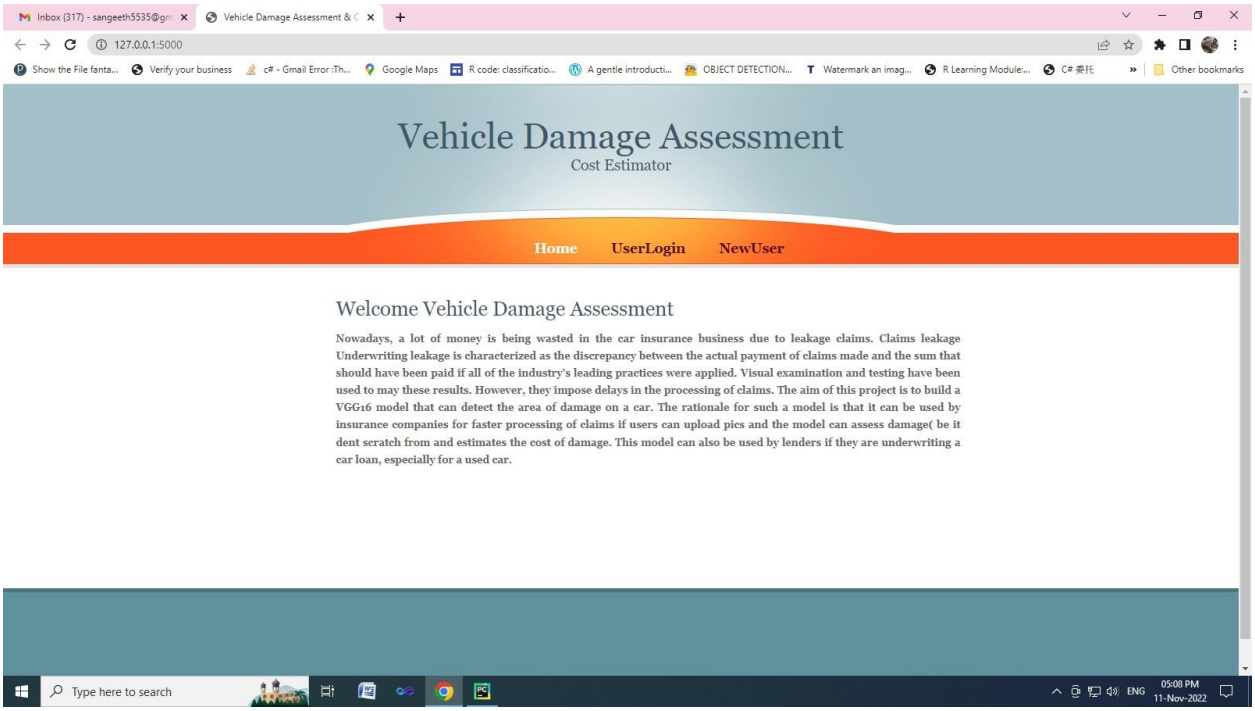
SOURCE CODE

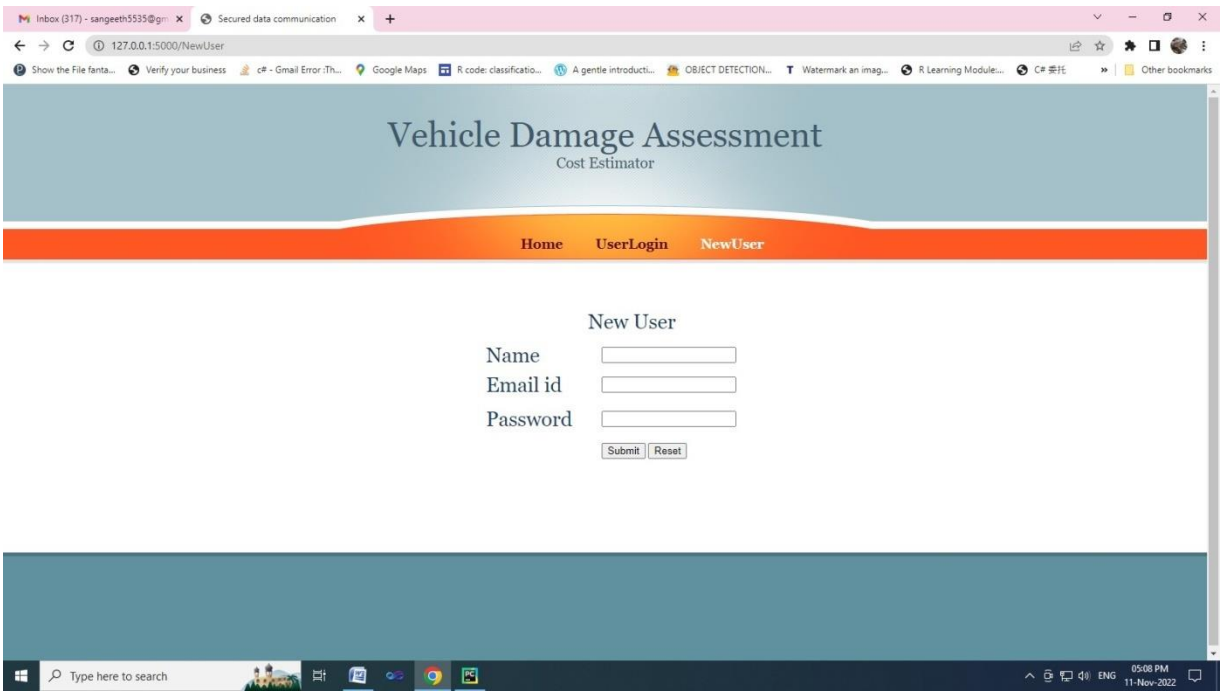
```
from flask import Flask, render_template, flash, request,session
from cloudant.client import  Cloudant
import cv2
client = Cloudant.iam("eb55a2b7-ae45-4df8-8d1c-69c5229ffdbe-
bluemix","YzG5FZg9Vs_HScOBZaWyVXm7PpNjbPrmPaPMfHx7w3X9",connect=
True)
my_database = client.create_database("database-dharan")
app = Flask(_name_)
app.config.from_object(__name__)
app.config['SECRET_KEY'] = '7d441f27d441f27567d441f2b6176a'
@app.route("/")
def homepage():
    return render_template('index.html')
@app.route("/userhome")
def userhome():
    return render_template('userhome.html')
@app.route("/addamount")
@app.route("/NewUser")
def NewUser():
    return render_template('NewUser.html')


@app.route("/user")
def user():


    return render_template('user.html')
@app.route("/newuse",methods=['GET','POST'])
def newuse():
    if request.method == 'POST':
        x = [x for x in request.form.values()]
        print(x)
        data = {
```

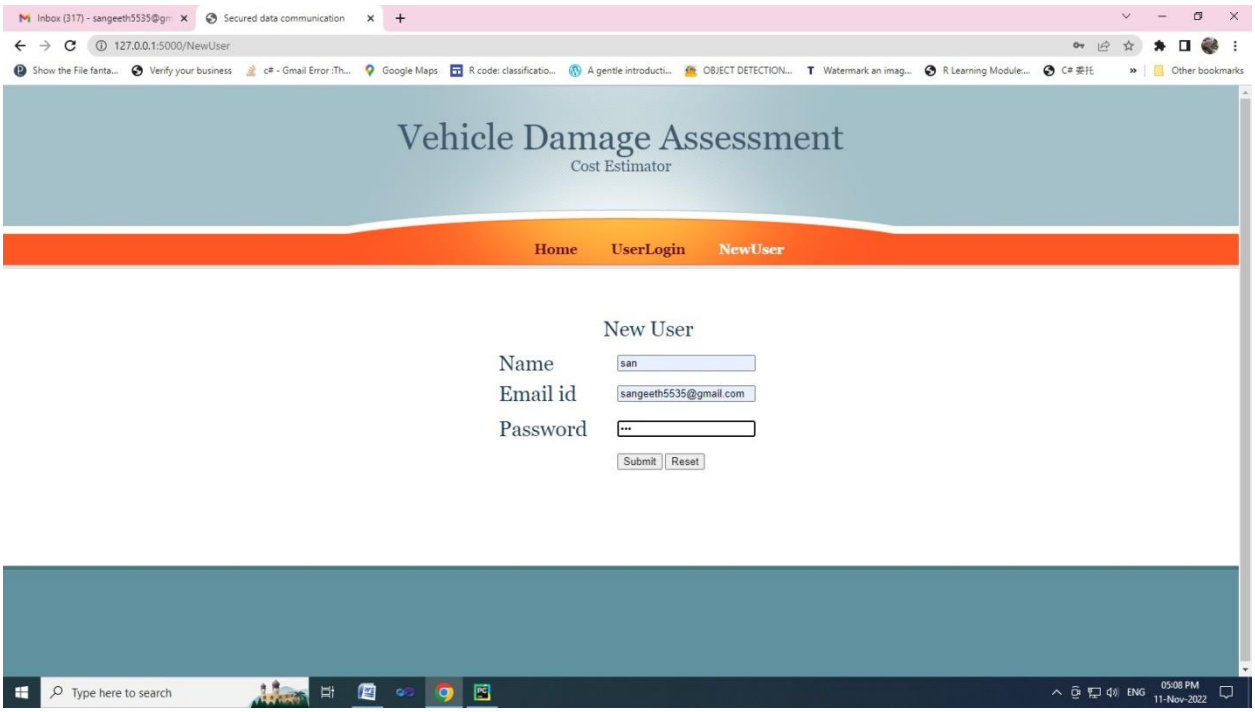
```
            '_id': x[1],
            'name': x[0],
            'psw': x[2]
        }
        print(data)
        query = {'_id': {'Seq': data['_id']}}
        docs = my_database.get_query_result(query)
        print(docs)
        print(len(docs.all()))
        if (len(docs.all()) == 0):
            url = my_database.create_document(data)
            return render_template('goback.html', data="Register, please login using your details")
        else:
            return render_template('goback.html', data="You are already a member, please login using your details")
@app.route("/userlog", methods=['GET', 'POST'])
def userlog():
        if request.method == 'POST':
            user = request.form['_id']
            passw = request.form['psw']
            print(user, passw)
            query = {'_id': {'$eq': user}}
            docs = my_database.get_query_result(query)
            print(docs)
            print(len(docs.all()))
            if (len(docs.all()) == 0):
                return render_template('goback.html', pred="The username is not found.")
            else:
                if ((user == docs[0][0]['_id'] and passw == docs[0][0]['psw'])):
                    return render_template("userhome.html")
                else:
                    return render_template('goback.html',data="user name and password incorrect")
```

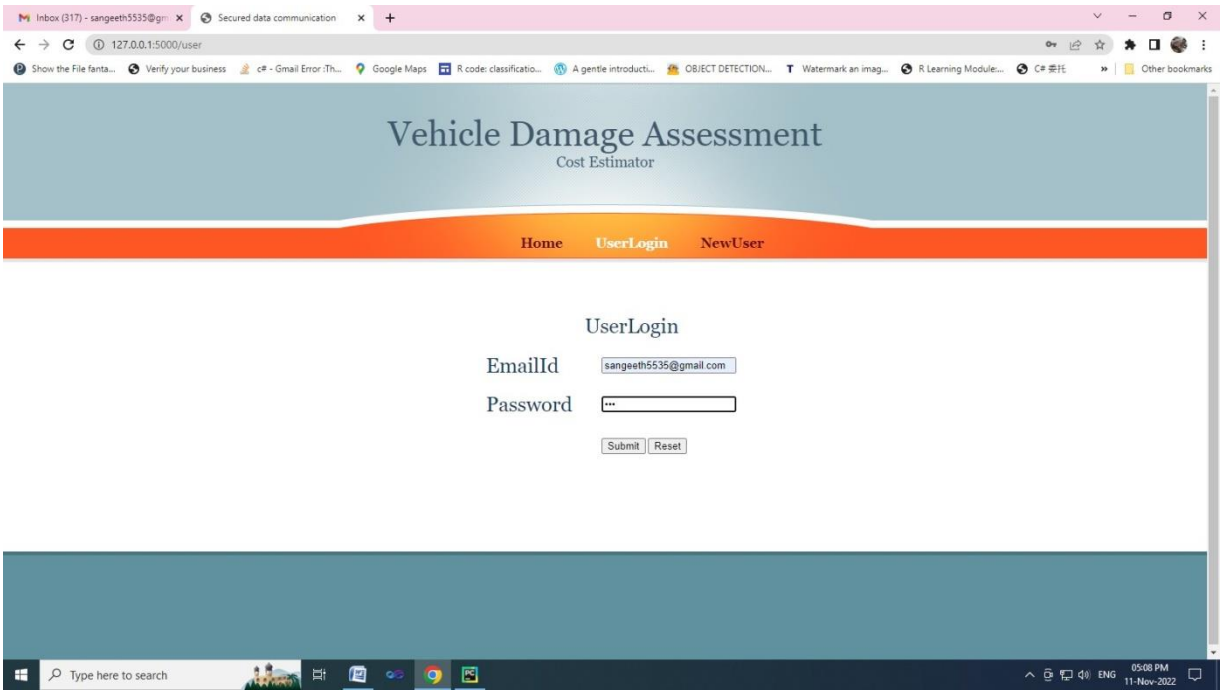
```
@app.route("/predict", methods=['GET', 'POST'])
def predict():
    if request.method == 'POST':
        file = request.files['fileupload']
        file.save('static/Out/Test.jpg')
        import warnings
        warnings.filterwarnings('ignore')
        import tensorflow as tf
        classifierLoad = tf.keras.models.load_model('body.h5')
        import numpy as np
        from keras.preprocessing import image
        test_image = image.load_img('static/Out/Test.jpg', target_size=(200, 200))
        img1 = cv2.imread('static/Out/Test.jpg')
        # test_image = image.img_to_array(test_image)
        test_image = np.expand_dims(test_image, axis=0)
        result = classifierLoad.predict(test_image)
        result1 = ''
        if result[0][0] == 1:
            result1 = "front"
        elif result[0][1] == 1:
            result1 = "rear"
        elif result[0][2] == 1:
            result1 = "side"
        file = request.files['fileupload1']
        file.save('static/Out/Test1.jpg')
        import warnings
        warnings.filterwarnings('ignore')
        import tensorflow as tf
        classifierLoad = tf.keras.models.load_model('level.h5')
        import numpy as np
        from keras.preprocessing import image
        test_image = image.load_img('static/Out/Test1.jpg', target_size=(200, 200))
        img1 = cv2.imread('static/Out/Test1.jpg')
        # test_image = image.img_to_array(test_image)
```

```
            test_image = np.expand_dims(test_image, axis=0)
            result = classifierLoad.predict(test_image)
            result2 = ''
            if result[0][0] == 1:
                result2 = "minor"
            elif result[0][1] == 1:
                result2 = "moderate"
            elif result[0][2] == 1:
                result2 = "severe"
            if (result1 == "front" and result2 == "minor"):
                value = "3000 - 5000 INR"
            elif (result1 == "front" and result2 == "moderate"):
                value = "6000 8000 INR"
            elif (result1 == "front" and result2 == "severe"):
                value = "9000 11000 INR"
            elif (result1 == "rear" and result2 == "minor"):
                value = "4000 - 6000 INR"
            elif (result1 == "rear" and result2 == "moderate"):
                value = "7000 9000 INR"
            elif (result1 == "rear" and result2 == "severe"):
                value = "11000 - 13000 INR"
            elif (result1 == "side" and result2 == "minor"):
                value = "6000 - 8000 INR"
            elif (result1 == "side" and result2 == "moderate"):
                value = "9000 - 11000 INR"
            elif (result1 == "side" and result2 == "severe"):
                value = "12000 - 15000 INR"
            else:
                value = "16000 - 50000 INR"
            return render_template('userhome.html', prediction=value)
        if __name__== '_main_':
app.run(debug=True, use_reloader=True)
```


Vehicle Damage Assessment
Cost Estimator
Home
UserLogin
NewUser
Welcome Vehicle Damage Assessment
Nowadays, a lot of money is being wasted in the car insurance business due to leakage claims. Claims leakage Underwriting leakage is characterized as the discrepancy between the actual payment of claims made and the sum that should have been paid if all of the industry's leading practices were applied. Visual examination and testing have been used to may these results. However, they impose delays in the processing of claims. The aim of this project is to build a VGG16 model that can detect the area of damage on a car. The rationale for such a model is that it can be used by insurance companies for faster processing of claims if users can upload pics and the model can assess damage(be it dent scratch from and estimates the cost of damage. This model can also be used by lenders if they are underwriting a car loan, especially for a used car.


Vehicle Damage Assessment
Cost Estimator
Home
UserLogin
NewUser
New User
Name
Email id
Password
Submit
Reset


Inbox (317) - sangeeth5535@gm
Secured data communication
127.0.0.1:5000/NewUser
Vehicle Damage Assessment
Cost Estimator
Home
UserLogin
NewUser
New User
Name
san
Email id
sangeeth5535@gmail.com
Password
Submit
Reset
Type here to search
ENG
05:08 PM
11-Nov-2022


Inbox (317) - sangeeth5535@gm
Secured data communication
127.0.0.1:5000/user
Vehicle Damage Assessment
Cost Estimator
Home
UserLogin
NewUser
UserLogin
EmailId
sangeeth5535@gmail.com
Password
Submit
Reset
Type here to search
ENG
05:08 PM
11-Nov-2022

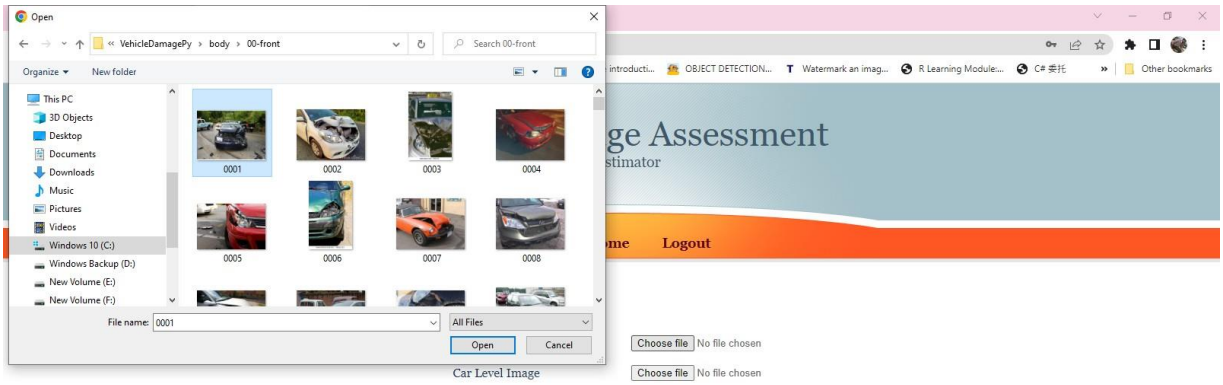
Upload Image

Car Body Image — Choose file — No file chosen

Car Level Image — Choose file — No file chosen

Estimate Cost

Submit Reset

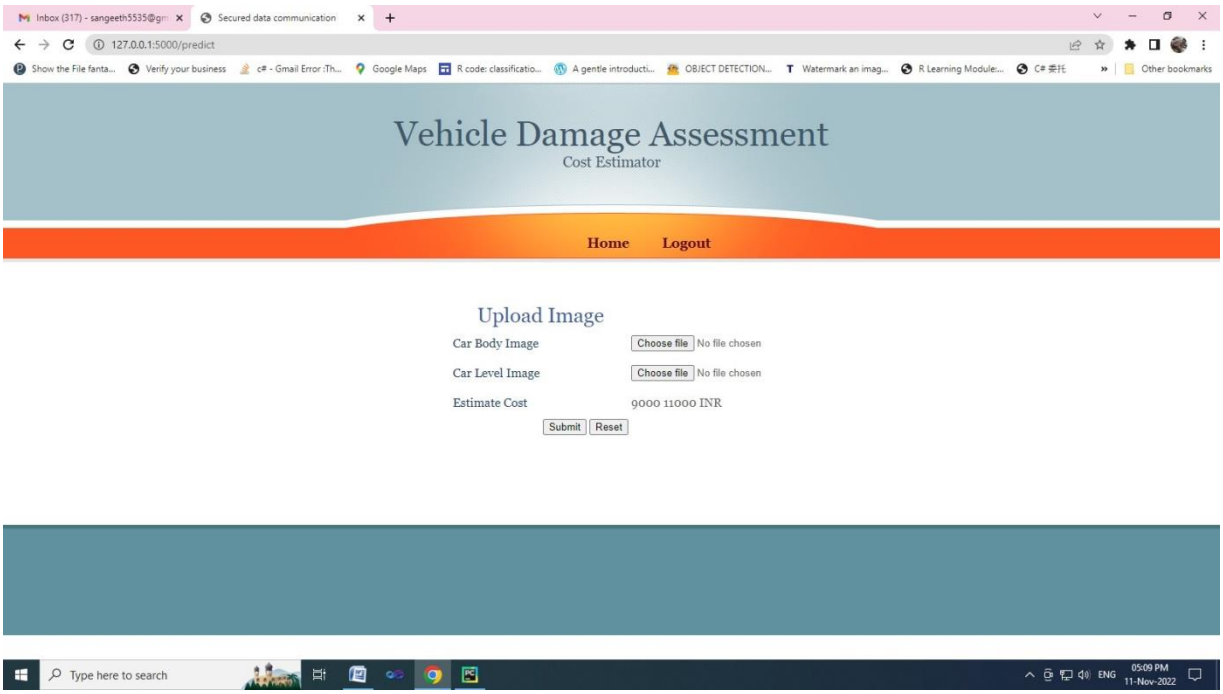


Choose file — No file chosen

Car Level Image — Choose file — No file chosen

Estimate Cost

Submit Reset


Inbox (317) - sangeeth5535@gm
Secured data communication
127.0.0.1:5000/predict
Show the File fanta...
Verify your business
c# - Gmail Error :Th...
Google Maps
R code: classificatio...
A gentle introducti...
OBJECT DETECTION...
Watermark an imag...
R Learning Module:...
C# 委托
Other bookmarks
Vehicle Damage Assessment
Cost Estimator
Home
Logout
Upload Image
Car Body Image
Choose file
No file chosen
Car Level Image
Choose file
No file chosen
Estimate Cost
9000 11000 INR
Submit
Reset

Type here to search
ENG
05:09 PM
11-Nov-2022

GITHUB LINK:

https://github.com/IBM-EPBL/IBM-Project-6094-1658823499