CAR DAMAGE ASSESSMENT & COST ESTIMATOR FOR INSURANCE COMPANIES

A PROJECT REPORT

Submitted By

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BONAFIDE CERTIFICATE

Certified that this project report **"Car Damage Assessment & Cost Estimator for Insurance Companies**" is the bonafide work of

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Submitted to the viva voce held on.....

INTERNAL EXAMINER

EXTERNAL EXAMINER

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ABSTRACT

This Project aims at building a model, which is used to predict the estimated cost of the vehicle damage. Nowadays, a lot of Money is being wasted in the car insurance business due to leakage claims. Claims leakage is characterized 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 predict these results. However, they impose delays in the processing of claims. Insufficient knowledge regarding insurance-related terms leads to false expectations among applicants. Due to this, they might feel cheated if the insurance company settles the claim for a lesser amount than what was expected by the insured while raising a claim for insurance. The amount of damaged vehicle is estimated by VGG 19 by using CNN (Convolutional neural network) with 19 layers of confirmation by using Deep learning Technology.

TABLE OF CONTENTS

KEY WORDS & ABBREVIATION

1. Deep learning
2. VGG 19 Layers
3. CNN (Convolutional neural network)
4. Tensor flow

CHAPTER 1

INTRODUCTION

1.1 PROJECT OVERVIEW

A CNN (Convolutional Neural Network) is a type of deep learning algorithm that is commonly used for image recognition and analysis. In the context of vehicle damage and insurance, a CNN algorithm could be trained to analyze images of damaged vehicles and assess the severity and extent of the damage. This information could then be used to determine the appropriate level of insurance coverage needed to repair or replace the vehicle.

1.2 PURPOSE

The purpose of this project would be to develop a more efficient and accurate way of assessing vehicle damage and estimating insurance costs. By automating this process with a CNN algorithm, insurers could potentially save time and resources while also improving the accuracy and consistency of their assessments. Furthermore, this project could also benefit policyholders by providing faster and more transparent claims processing. Overall, the goal of this project would be to leverage the power of AI and machine learning to streamline and improve the insurance claims process for both insurers and policyholders.

1.3 LITERATURE SURVEY

PAPER-I:

Authors: . Reshma Totare1, Varad Bhalsing2, Mayur Lende3, Tejas Maramwar4, Chirag Naikwadi5

Year: 2021

Title: CAR DAMAGE DETECTION AND PRICE PREDICTION USING MACHINE LEARNING

Methodology: This paper examines some of the latest AI patterns and activities.
System-Chatbots are made. In the banking industry, the introduction of Artificial Intelligence has driven chatbots and changed the face of the interaction between banks and customers.

Advantage:

- Speed is very fast
- Perfect Accuracy

Disadvantage:

- Security is very low
- Unfair result

PAPER-II:

Authors: Umer Waqas, Nimra Akram, Soohwa Kim, Donghun Lee, Jihoon Jeon

Year: 2021

Title: DAMAGE ASSESSMENT FOR CAR INSURANCE USING YOLO

Methodology: The proposed system designed by using YOLO(you only look once) algorithm to detect tha car damage, Here the multi sensor data fusion technique is allows to locate the portion of damage more accurately and performs detection faster compared to other algorithms which is fully automatic and doesn't require much human intervention

Advantage:

- Location of the damage is accuracy
- High speed performance
- Easy to use

Disadvantage:

- It can be difficult to detect small object
- It can be difficult to detect object that are not well-aligned with the grid

PAPER-III:

Authors: Tebaga Lucky Mamela, Nita Sukdeo, Sambil Charles Mukwakungu

Year: 2022

Title: Car Damage Assessment for Insurance Companies using VGG 16

Methodology: He proposed system uses deep learning based algorithm are VGG16 damaged car detection in the real world. This algorithm notice the severity of the damaged car based on the location.

Advantage:

- Accuracy 80 %
- Maintenance is easy

Disadvantage:

- It can predict images with white background only
- Accuracy is low
- It consumes more time to predict

CHAPTER 2

SYSTEM STUDY

2.1 FEASIBILITY STUDY

An important outcome of the preliminary investigation is the determination that the system requested is feasible. A feasibility study is carried out to select the best system that meets the performance requirements. A feasibility study is both necessary and prudent to evaluate the feasibility of the project at the earliest possible time.

Three key considerations involved in the feasibility analysis are.

- Economical Feasibility
- Technical Feasibility
- Operational Feasibility

2.1.1 ECONOMICAL FEASIBILITY

Economic feasibility is the cost and logistical outlook for this project. Thus, the developed system as well within the budget and this was achieved because most of the technologies used are freely available.The economical study analyses data to determine whether the cost ultimately profitable to the user. This project that requires the historical data. So it is not a difficult task to any user to analyze the patterns or predicting the sales. Due to this, it is economically feasible.

2.1.2 TECHNICAL FEASIBILITY

Technical feasibility is one of the first studies that must be conducted after the project has been identified. Any system developed must not have a high demand on the available technical resources. This leads to high demands on the available technical resources. This lead to high demands being placed on the client. This application has been developed with python, where it provides more general approach to data science. It is a general purpose language with a readable syntax.

2.1.3 OPERATIONAL FEASIBILITY

Assessing operational feasibility is to gain an understanding of whether the proposed system is to solve the User problems, or take advantage of the opportunities or not. Is important to understand how the new systems will fetch into the current day-to-day operations of the organization. Operational feasibility studies are generally utilized to Process, Evaluation, Implementation, and Resistance. Python also enables developers to roll out programs and get prototypes running, making the development process much faster.

CHAPTER 3
EXISTING SYSTEM

3.1 EXISTING SYSTEM

- In Existing 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.
- It uses VGG16 model algorithm to process the damaged image of car.

3.2 DRAWBACKS OF EXISTING SYSTEM

- It can predict images with white background only
- Accuracy is low
- It consumes more time to predict

3.3 PROPOSED SYSTEM

- CDAT- Claim Damage Assessment Tool is an analytical model that uses Advanced vision to detect damage of vehicle to facilitate the claim process.
- By Using VGG19 Model. It can predict 98% Accuracy
- This Tool can predict the image without white background.
- Damage type detected (Minor,Severe,Moderate)

3.4 ADVANTAGES OF PROPOSED SYSTEM:

- This Tool can predict the image without white background.
- Accuracy is high
- Time consuming is low
- Efficient Insurance Claim

CHAPTER 4

SYSTEM SPECIFICATION

4.1 HARDWARE REQUIREMENTS

WINDOW: Window 10

RAM: 4GB

Hard Drive: 512GB

4.2 SOFTWARE REQUIREMENTS

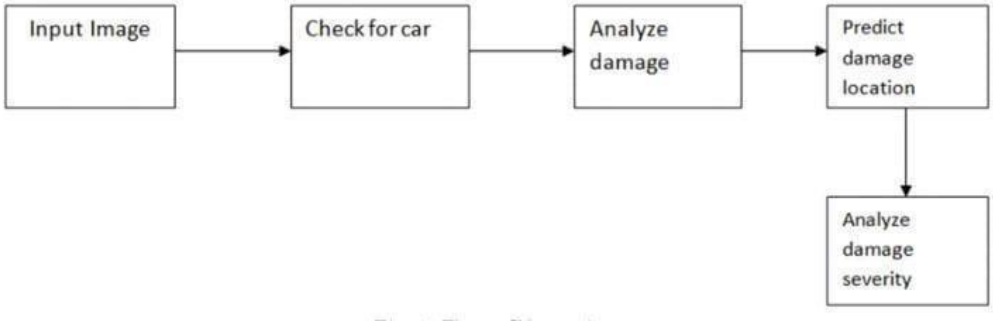
- HTML
- CSS
- Python
- Flask
- Tensor flow
- Deep learning
- CNN(convolutional neural network)
- VGG 19
- Bootstrap

CHAPTER 5

SOFTWARE DESCRIPTION OF TECHNOLOGY

5.1 VGG19 Algorithm

The Image Net Large Scale Visual Recognition Challenge is one of the visions of computer. They contain two jobs. Initial is to detect things within an image called object localization . Next is to classifying the images called image classification CNN is the one of the best vision model planning. In VGG19 contains four layers they are convolution, max pooling, and fully connected softmax. In this algorithm 19 refers to contain 19 layers.



In this diagram they tell about the working of the project. In the first block they took a damaged car as an input. Once this image is given as an input after that they apply neural network is to be interesting for detecting the image hold the car Car detection is done perfectly, then goes to the next step or else does not go to the next step. Detection of the car is done perfectly then analyse the damage of the car by applying the neural network. Check for car it may contains any damage then go to next step or does not proceed to the next step .Then the damage is detect in the system estimate the location in the damaged car like front,back, and side of the car The give the accurate result for the location of damaged car,and also give severity like minor,moderate,and severe.In this system they are carry out to some functions including car detection,car damage analysis,predict the location of the damages car and also car damaged severity.

5.2 CNN Model

CNN is one of the neural network .it is used for processing the image and then segmentation of the image. In this project we use a convolution neural network model for detect the image contains a car. The CNN is also used to analyses the damage of the car.

5.3 ARTIFICIAL INTELLIGENCE

Advances in the field of information technology have resulted in a variety of developments that have aided the technological revolution. Artificial intelligence (AI) is recognized as an umbrella term in many fields and rapidly received immerse amount of attention in the journey towards the technological revolution in many industries. It is considered as a widely implemented technologydue to the developments in machine learning and natural language processing capabilities which also made a growing interest in information systems (IS) research community to explore more on the subject matter (Collins, et al., 2021). According to International Data Corporation, the worldwide expenditures on AI systems are expected to reach $110 billion by 2024 (IDC, 2020) which signify the importance of AI in the development of economies (Loureiro, et al., 2021). Also, preliminary research reveals that enterprises are rapidly adopting AI as the cost of software and hardware components decreases, making it desirable to implement without incurring any costs.

From the social point of view the dawn of corona pandemic has also provided a significant potential towards the applications of AI in day-to-day life as it diminished the physical presence barriers of communications and increased the automations (Coombs, 2020).Artificial Intelligence as a field emerged at an academic conference in Dartmouth College, 1956 where it was officially defined as “The science and engineering of making intelligent machines” (McCarthy, 2007) by an American computer and cognitive scientist John McCarthy.

Today, AI has rapidly developed and has become the core aspect of revolutionizing many sectors such as manufacturing, healthcare, telco and banking (Velu, 2020).). There are several ways that AI is utilized in banks, examples such as robotic process automations which manages the repetitive tasks in automated fashion, artificial neural networks which use to identify transactional data patterns and IoT which enables banks to identify customer preferences and changing demands. Further banks has implemented AI-infused chatbots to enhance customer interactions while ensuring all their clients have access to affordable and useful banking products and service.

5.4 PYTHON FLASK

Flask is a web framework. Its a python module that lets you develop web applications easily. It has a small and easy to extend core. Its a micro framework it does not include an ORM(Object Relational Manager) or such features. It does have many cool features like url routing, template engine. It is a WSGI web app framework.

5.5 DEEP LEARNING

Deep learning is a subset of machine learning that uses artificial neural networks (ANNs) to model and solve complex problems. It is based on the idea of building artificial neural networks with multiple layers , called deep neural networks , that can learn hierarchical representations of the data.

5.5.1 Advantages of Deep Learning:

Automatic feature learning: Deep learning algorithms can automatically learn features from the data, which means that they don't require the features to be the hand-engineered. This is particularly useful for tasks, the features are difficult to define, such as image recognition.

Improved performance: Deep learning algorithms have been shown to achieve state-of-the- art performance on a wide range of problems , including image and speech recognition, natural language processing, and computer vision.

Handling structured and unstructured data: Deep learning algorithms can the handle both structured and unstructured data such as images, text, and audio.

Predictive modeling: Deep learning can be used to make predictions about the future events or trends , which can help organizations plan for the future and to make strategic decisions.

5.5.2 Disadvantages of Deep Learning:

While deep learning has many advantages, there are also some disadvantages to consider:

High computational cost: Training deep learning models requires significant computational resources, including powerful GPUs and large amounts of the memory. This can be costly and time-consuming.

Dependence on data quality: Deep learning algorithms rely on the quality of the data they are trained on. If the data is noisy, incomplete, or biased, then the model's performance will be negatively affected.

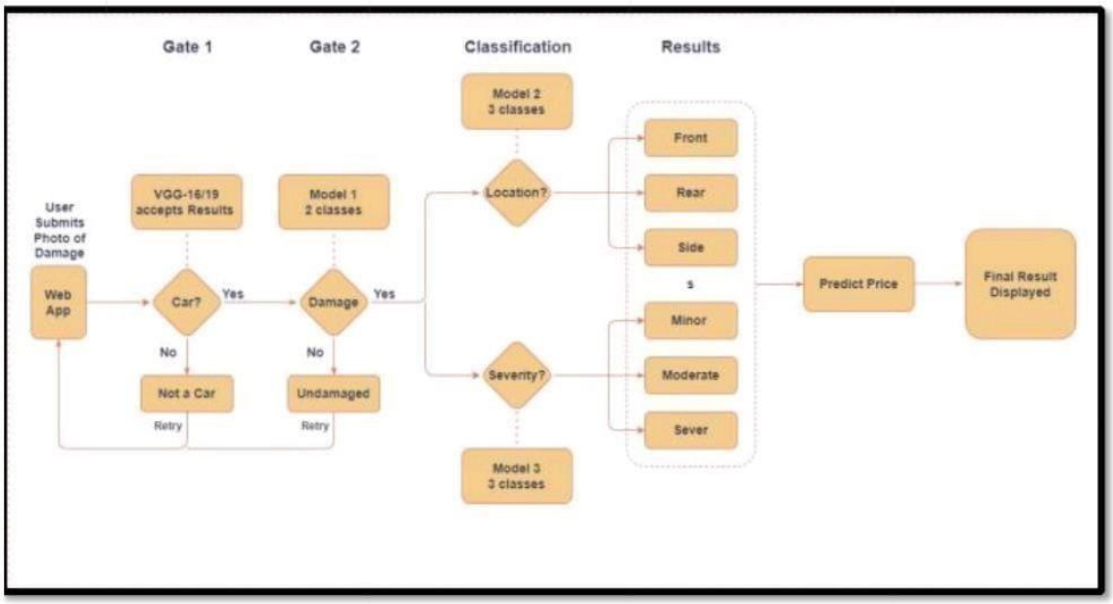
5.6 TensorFlow:

TensorFlow is an open-source, free machine learning and artificial intelligence software library. Although deep neural network training and the inference are given specific attention, it can be used for a variety of tasks The TensorFlow of library interface is provided by Keras.

CHAPTER 6

SYSTEM ARCHITECTURE

6.1 SYSTEM ARCHITECTURE



Here users can upload images of the damaged car or any random images which will be processed by our algorithm using the GUI which is created using HTML, CSS, Bootstrap and integrated by flask.

Module-1:

In this module, VGG-19is used to detect whether the uploaded image is a car or not..

Module-2:

Here, car damage is detected using VGG-19. The model that gives us the most accuracy is considered..

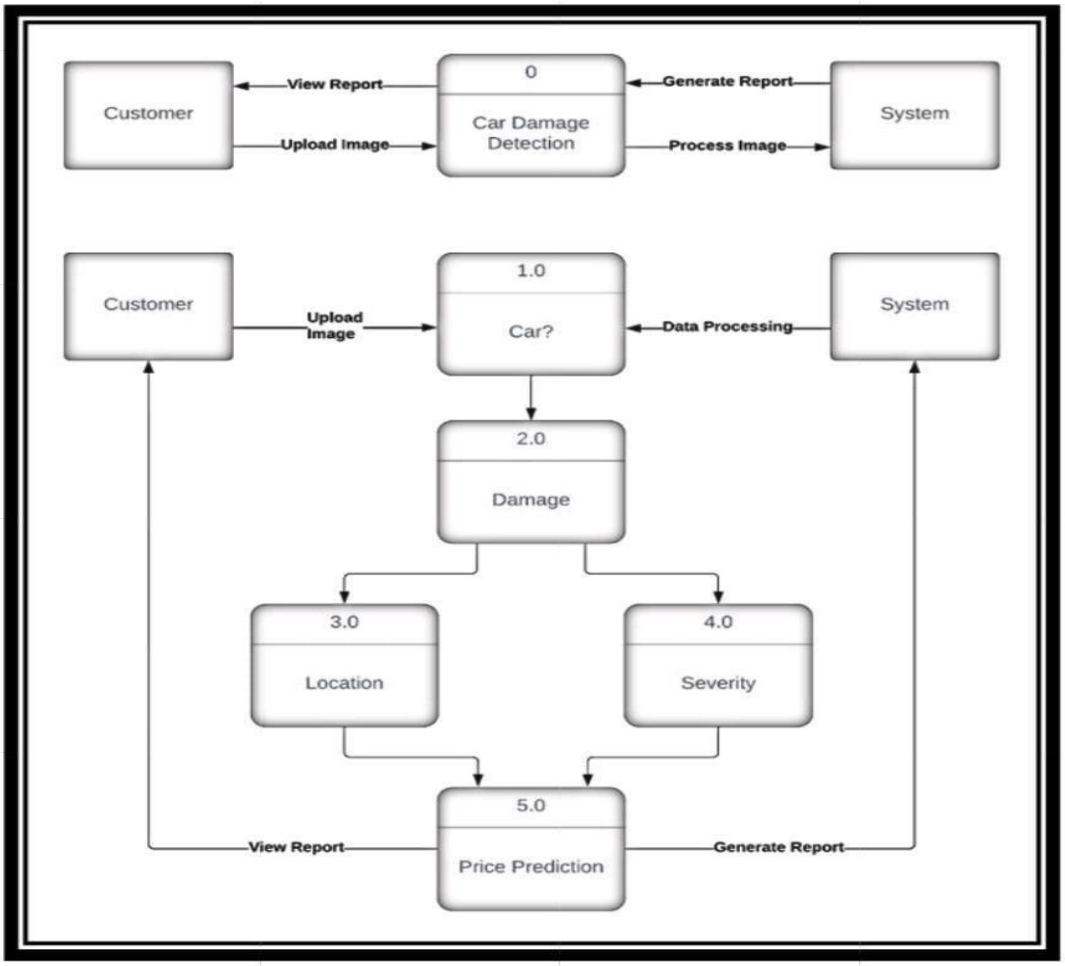
Module-3:

The side of the vehicle where the damaged is incurred i.e. In the rear part, front part or side part is identified using this module.

Module-4: The damage level is further decided in this module. The level of the damage is decided by data visualization using heat maps.

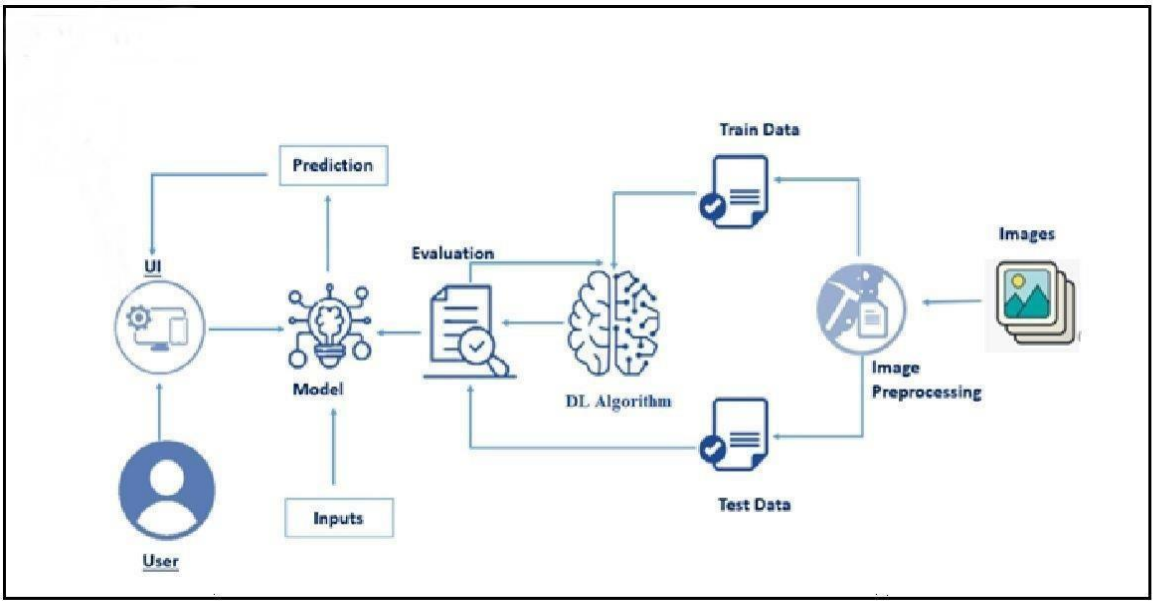
6.2 DATAFLOW DIAGRAM

The below figure , represents the Data Flow Diagram of proposed system. The customer/user uploads the image of car. Then that image is processed and the report damage is generated and it is sent back to the user.



Here, the first module detects whether the uploaded image is of car or not. If the car is not detected then it returns back to the initial stage. And if car is detected then further modules take place. The next module detects whether the uploaded image of car has damage or not. If the damage is not detected then it returns back to initial stage. Once the damage is detected, further modules detects location (front, side, back) and severity (minor, moderate, major). Above modules will help in predicting the price.

6.3 TECHNICAL ARCHITECTURE



CHAPTER 7

SYSTEM TESTING

The overall Damage Assessment for Car Insurance (DACI) can be divided in three parts:

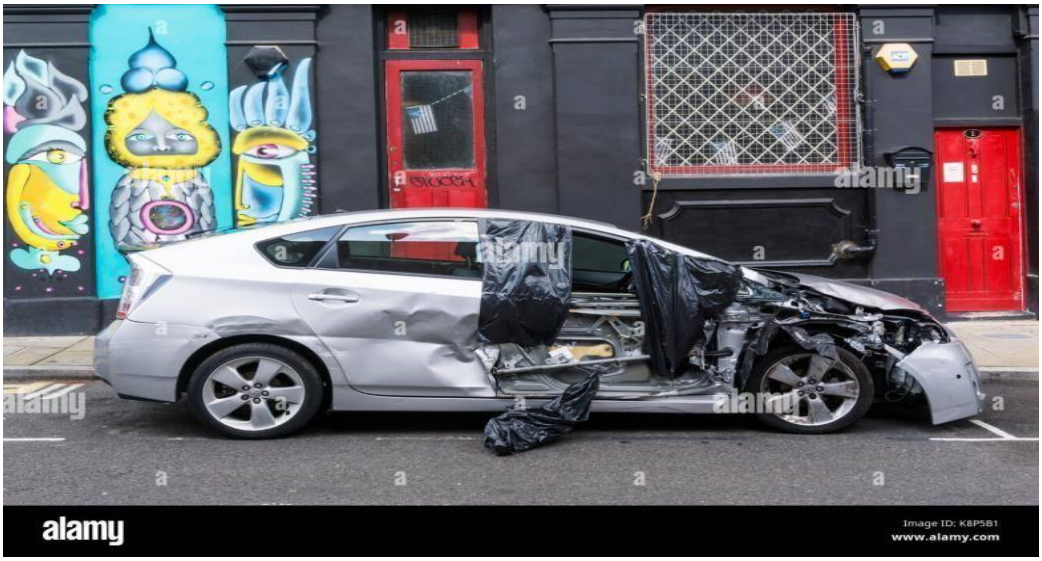
- Collecting Datasets
- Training and Testing Of Datasets
- Backend

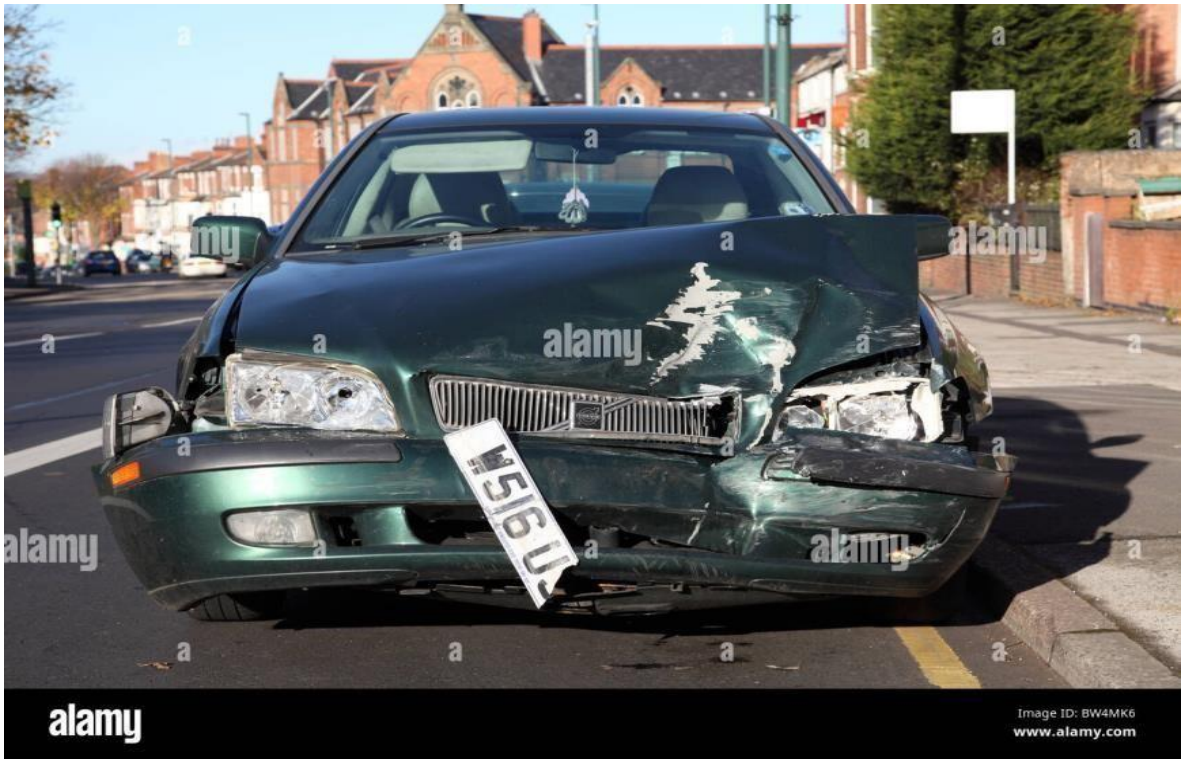
● Collecting Datasets:We have collected to commonly observed types of damages such as Bumper, door, door glass, grille, headlamp, hood, mirror, roof, taillamp,and windshield in addition .we also collected some images which does not belong to the damage class , some images were collected from the web and somewhere manually annotated.

● Training and Testing of Datasets: 3000 plus images were taken for training and 200-300 for testing. we synthetically enlarged the dataset approx. the five times by appending it with random rotations (between -20 to 20 degrees) and horizontal flip transformations. For the classification experiments , the dataset was randomly split into 80%-20% where 80% was used for training and 20% was used for testing.

● Backend :We created separate python package level.hs , body.hs it will predict car parts for recognize in image whether that car part is damaged or not.car of the damage part are classified as front, rear, side as a body part and the damage is detected as severe , minor and moderate damages.

PREDICTING IMAGES:




alamy
Image ID: BW4MK6
www.alamy.com

CHAPTER 8

8 CONCLUSION AND FUTURE ENHANCEMENT

This paper has generally discussed about design and implementation of damage the assessment for car insurance (DACI) by the developing deep learning car damages classification model on website development platform where user will upload image or images of damaged car with help of phone's camera . Then according to damage calculation, the total cost of car will be the displayed in a report format.This system is the tested over a wide range of images yielding high accuracy rate by using the VGG 19 for predicting the cost of vehicle damage.

APPENDIX-1

A.1 SOURCE CODE

PREDICTION PAGE.HTML :

```
<!DOCTYPE html>

<html>

<head>

 <title>Sample Page</title>

 <link rel="stylesheet" type="text/css" href="../static/style.css">

</head>

<body>

 <header>

 <div class="container">

 <h1>Intelligent Car Damage Assesment and Cost Esitmator for Insurance Company</h1>

</div>

 </header>

<main>

 <div class="container">

 <div class="subcontainer">

 <form class="login-form" action="/predict" method="post" enctype="multipart/form-data" name="form1">

 <h2>Cost Esitmator</h2>

 <div class="display_image" for="upload_image"><img src="../static/cloudupload-h0zk6Ejtz-transformed.jpeg" alt="upload file" id="uploaded-image" >

</div>
```

```
 <button type="submit" id="submit">Submit </button>

 <label for="upload_image" id="label">Upload image</label>

 <input type="file"  id="upload_image" name="upload_image"
accept="image/jpeg, image/png, image/jpg" onchange="previewImage(event)"
required>

 <div id="cost">{{comments}}{{prediction}}</div>

 </form>

 </div>

 </div>

 </main>

 <footer>

<div class="footer_cont">

 <div class="about">

<h3>Team Members</h3>

<p>

Maha Vishnu S <br>

Abdul Rahman H <br>

 Manoj Kumar S <br>

</p>

<br>

 </div>

            <ul>

                <li><a href="#">Privacy Policy</a></li>

                <li><a href="#">Terms of Service</a></li>

                <li><a href="#">Contact Us</a></li>
```

```
            </ul>
          </div>
  </footer>    </body> <script>
function previewImage(event) {
var input = event.target;
  var preview = document.getElementById('uploaded-image');   var submit
= document.getElementById('submit').style.display = "block";

  var reader = new FileReader();
reader.onload = function(){
    preview.src = reader.result;
  };
  reader.readAsDataURL(input.files[0]);
 }
</script>
</html>
```

Layout page:

```
<!DOCTYPE html>
<html lang="en">
<head>
<link href="../static/favicon.ico" rel="icon" type="image/x-icon" />  <title>Car
Damage Detective - Assessing Car Damage with Convolutional Neural
Networks</title>
<meta charset="utf-8">
```

```
<meta name="viewport" content="width=device-width, initial-scale=1">

<link rel="stylesheet"
href="https://maxcdn.bootstrapcdn.com/bootstrap/3.3.7/css/bootstrap.min.css">

<script
src="https://ajax.googleapis.com/ajax/libs/jquery/1.12.4/jquery.min.js"></script >

<script
src="https://maxcdn.bootstrapcdn.com/bootstrap/3.3.7/js/bootstrap.min.js"></scr
ipt>

<link href="https://fonts.googleapis.com/css?family=Oxygen" rel="stylesheet">


<!-- Jasny Bootstrap -->

<link rel="stylesheet"
href="//cdnjs.cloudflare.com/ajax/libs/jasnybootstrap/3.1.3/css/jasnybootstrap.mi
n.css">

<script
src="//cdnjs.cloudflare.com/ajax/libs/jasnybootstrap/3.1.3/js/jasnybootstrap.min.j
s"></script>


<!-- Scrolling Script-->

<script>

$(document).ready(function(){

  // Add smooth scrolling to all links in navbar + footer link

  $(".navbar a, footer a[href='#top'], .container-fluid a[href='#third']").on('click',
function(event) {


  // Make sure this.hash has a value before overriding default behavior   if

(this.hash !== "") {
```

```
    // Prevent default anchor click behavior     event.preventDefault();

    // Store hash     var hash
= this.hash;

    // Using jQuery's animate() method to add smooth page scroll
    // The optional number (900) specifies the number of milliseconds it takes to
scroll to the specified area     $('html, body').animate({       scrollTop:
$(hash).offset().top
    }, 900, function(){

      // Add hash (#) to URL when done scrolling (default click behavior)
window.location.hash = hash;
      });
    } // End if
  });
})
</script>
<!--Loading Script-->
<script type="text/javascript">// <![CDATA[        function
loading(){

          $("#loading").show();
        }
// ]]></script>
```

```
<!--Tooltip Script-->
<script>
$(document).ready(function(){
   $('[data-toggle="tooltip"]').tooltip();
});
</script>
<style> body
{
  font: 14px Oxygen, sans-serif;   lineheight:
1.8;

  color: #555555;  }
p {font-size: 14px;}
.margin {margin-bottom: 45px;}
.bg-0 {
  background-image: linear-gradient(       rgba(0,
0, 0, 0.25),       rgba(0, 0, 0,
0.25)),     url('../static/splash2.jpg');   background-size: cover;   color:
#ffffff;
}
.bg-1 {
  background-color: #18121E; /* Prussian Blue 0B3C5D, Sky Blue328CC1, Ivory
Black1D2731 Gold Leaf D9b310 */   color: #ffffff;
}
```

```
.bg-2 {
  background-color: #0B3C5D;   color:
#ffffff;
}
.bg-3 {
  background-color: #328CC1; /* Rusty Red #984B43 */   color:
#ffffff;

}
.bg-4 {
  background-color: #2d2d30;   color:
#ffffff;
}
/* Add a dark background color with a little bit see-through */
.navbar {     margin-bottom: 0;
background-color: #2d2d30;     border:
0;

    font-size: 20px !important;     letter-spacing:
5px;     opacity:0.9;
}
/* Add a gray color to all navbar links */
.navbar li a, .navbar .navbar-brand {      color:
#ffffff !important;
}
```

```
/* On hover, the links will turn white */
.navbar-nav li a:hover {     color:
#fff !important;
}

/* The active link */
.navbar-nav li.active a {     color: #fff
!important;     background-color:#29292c
!important;
}
/* Remove border color from the collapsible button */
.navbar-default .navbar-toggle {     bordercolor:
transparent;
}
#first {
  padding: 240px 240px 450px 240px;
} img {     display:
block;     margin:
auto; }
.dropdown {
    position: relative;     display:
inline-block;
}
.container-fluid {     padding:
```

```
70px 50px 70px 50px;
}
.container-fluid div { padding:
   10px; margin: 0 auto;
}
.container-fluid a {    color:
#d5d5d5;
}
.container-fluid a:hover {    color:
#777;    textdecoration: none;
} .btn {
   background-color: transparent;    color:
#FFFFFF;
}
/* Add a dark background color to the footer */
footer {    background-color: #2d2d30;
color: #f5f5f5;    padding: 16px;  } footer a {
color:
#d5d5d5 !important;
} footer a:hover
{  color: #ffffff !important;
text-decoration: none;  }
div#loading {    width:
```

```
150px;     height: 50px;
display: none;
   background: url(/static/loading_image.gif) no-repeat;     background-position:
center;     cursor: wait;
   }
.logo-small      {     color:
   #d5d5d5;     font-size:
50px;
} table {   width:
80%;   max-width:
400px;
} #picture {   width:
80%;   max-width:
400px;
} table, th, td
{  border-top: 1px solid #fff;
   border-bottom: 1px solid #fff;
   border-collapse: collapse;     margin:
auto;
}

tr:hover {background-color: #18121E}
th, td {     padding: 5px;     vertical-
align: middle;     text-align: center;
```

```
} td {     vertical-align:
middle;      }    label    {
textalign: left;  }
</style>  </head>
<!--Navigation Bar-->
<body id="top">
<nav class="navbar navbar-default navbar-fixed-top">
  <div class="container">
    <div class="navbar-header">
      <button type="button" class="navbar-toggle" data-toggle="collapse"
datatarget="#myNavbar">
        <span class="icon-bar"></span>
        <span class="icon-bar"></span>
      </button>
      <a class="navbar-brand" href="{{ url_for('home') }}">CAR DAMAGE
DETECTIVE</a>
    </div>
    <div class="collapse navbar-collapse" id="myNavbar">
      <ul class="nav navbar-nav navbar-right">
        <li><a href="#second">HOW IT WORKS</a></li>
        <li><a href="prediction.html">ASSESS DAMAGE</a></li>
      </ul>
    </div>
  </div>
</nav>
```

```
<!-- First Container (Splash)-->

<div class="container-fluid bg-0 text-center" id="first">

<h1>We're sorry that this happened. Let's help you get back on the road.</h1><br><br>

  <a href="#third" class="btn btn-default btn-lg">

  <span class="glyphicon glyphicon-phone"></span> Go to Damage Assessment

  </a>

</div>

<!-- Second Container (How this works)-->

<div class="container-fluid bg-1 text-center" id ="second">

  <h2>How it works</h2>

  <h4>Car Damage Detective allows you to upload a picture of your car damage to indepently assess damage location and severity,

easing the burden of filing an insurance claim and getting your car repaired.</h4>

  <br>

  <div class="row">

    <div class="col-sm-3">

      <span class="glyphicon glyphicon-phone logo-small"></span>

      <h4>SNAP</h4>

      <p>Take a picture of your car damage. For best results, try to focus on one major area of damage (e.g., front, side, or rear) and contain most of the car body in the picture.</p>

    </div>

    <div class="col-sm-3">

      <span class="glyphicon glyphicon-upload logo-small"></span>
```

```
    <h4>SUBMIT</h4>

    <p>Upload your picture to Car Damage Detective using our handy web app and image upload capabilities. </p>

   </div>

   <div class="col-sm-3">

    <span class="glyphicon glyphicon-cog logo-small"></span>

    <h4>ASSESS</h4>

    <p>Convolutional neural networks will identify where and how severely your car is damaged and provide an immediate assessment of your damage</p>
   </div>

   <div class="col-sm-3">

    <span class="glyphicon glyphicon-file logo-small"></span>

    <h4>RESULTS</h4>

    <p>Results can be used to obtain a cost estimate or submit to your insurance company to expedite claims handling</p>

   </div>

   </div>

   <br><br>

</div>


<!-- Third and Fourth Container (Results)-->

</body>

<footer class="bg-4 text-center">

  <a class="up-arrow" href="#top" data-toggle="tooltip" title="TO TOP">

    <span class="glyphicon glyphicon-chevron-up"></span>

  </a><br><br>
```

```
  <p>Created by MASS, 2016. <br>

  <a href="mailto:MASTAHN007@gmail.com" title="Email">Email</a> | <a
href="https://github.com/" title="Github">Github</a> | <a
href="https://www.linkedin.com/in/kai-ting-neo"
title="Linkedin">Linkedin</a></p>

</footer>

</html>
```

CSS Page :

```
 *  {    box-sizing:

borderbox;

margin:              0;

padding: 0; } body

{  background:

#fff;       font-family:

Arial,       sans-serif;

background-size:

cover;  }  header  {

height:              80px;

background-color:

#1B73E8;    padding:

20px;  boxshadow: 0

0  10px  rgba(0,  0,  0,

0.3);

}    header  h1  {

fontsize:     24px;
```

```
fontweight:  bold;
margin-bottom:
20px;
background:
#e3362c;
 color: #fff;
padding: 12px;  margin:
10px auto;  border-
radius:
30px;  cursor:  pointer;  width:
20%; }  input{  display: none; }
.login-form button[type=submit
]  {    font-size:
16px;
fontfamily:
Arial,      sans-
serif;    display:
none;   margin-
bottom:   20px;
background:
background:
#e3362c;
 color: #fff;
```

```
padding: 12px;  margin:
10px auto;  border-
radius:
30px;  cursor: pointer;  width:
20%; }  input{  display: none; }
.login-form button[type=submit
] {  font-size:
16px;
fontfamily:
Arial,  sans-
serif;  display:
none;  margin-
bottom:  20px;
background:
#e3362c;

 #e3362c;
color: #fff;
padding: 12px;  margin:
10px auto;  border-
radius:
30px;  cursor: pointer;
width:
```

```
20%;  border: none;

}

.login-form
button[type=submit
]:hover                    {
backgroundcolor:
#1B73E8;       margin-
right: auto;  color: #fff;
} .container {
background-color: #1B73E8;
max-
width: 900px;  margin:
0 auto;

} .login-form {  background-color:
#fff;  padding:
40px;  border-
radius:          5px;
boxshadow:   0   0
10px rgba(0, 0, 0,
0.3);   margin-top:
```

```
50px;    text-align:
center;
}

.login-form h2 {  margin-bottom:
20px;
}

.login-form label {
display: block;
margin-bottom:
20px;  background:
#e3362c;
 color: #fff;
padding: 12px;  margin:
10px auto;  border-
radius:
30px;  cursor:
pointer;   width:
20%;  }    input{
display: none; }
```

```
.login-form button[type=submit
] {  font-size: 16px;  fontfamily:
Arial, sans-serif;  display: none;
margin-bottom:                20px;
background: #e3362c;
 color: #fff;
padding: 12px;  margin:
10px auto;  border-
radius:
30px;  cursor: pointer;
width:
20%;  border: none;

}

.login-form
button[type=submit
]:hover                    {
backgroundcolor:
#1B73E8;
}

.display_image img{
width:
```

```
375px;  height:
211px;  border:
2px          dashed
#c2cdda;
backgroundpositio
n:           center;
background-size:
contain;
borderradius:
10px;    object-fit:
cover;
}

footer {  backgroundcolor:
#1B73E8;       color:  #fff;
padding: 20px;
 }


 .foot_cont {  max-
width:       1200px;
margin:   0   auto;
display:         flex;
justify-content:
space-between;
align-items: center;
```

```
} .about {
maxwidth: 400px;
} h3 {
fontsize: 24px;
margin-bottom:
10px;
} ul { list-style:
none; display: flex;
align-items: center;
}
li
{ margin: 0
10px;
} a { color:
#fff;
textdecoration:
none;
}
```

Main.py :

```
#Importing Libraries import re import
numpy as np import os from flask
```

```
import Flask, app, request,
render_template

from keras import models from
keras.models import load_model from
keras.utils import
load_img,img_to_array from
tensorflow.python. ops.gen_array_ops
import concat from
keras.applications.inception_v3 import
preprocess_input import requests from
flask import Flask, request,
render_template, redirect, url_for
#Loading the Model model1 =
load_model('level.h5') model2 =
load_model('body.h5')


app = Flask(__name__)
@app.route("/")         def
homepage():
    return render_template('pr
ediction.html')
@app.route("/predi ct",
methods=['GET', 'POST'])
def predict():
```

```
        if request.method == 'POST':
 f = request.files['upload_i
mage']          basepath =
os.path.dirname(__fil e__)
filepath =
os.path.join(basepath,
'uploads', f.filename)

f.save(filepath)
print(filepath)  img
=
load_img(filepath,
target_size=(224,
224)) x =
img_to_array(img)
x =
np.expand_dims(x
, axis=0) img_data
= preprocess_input(
x)         prediction1
=  np.argmax(model1.pr
edict(img_data))
prediction2 =
np.argmax(model2.
predict(img_data))
index1 = ['front',
'rear', 'side']
```

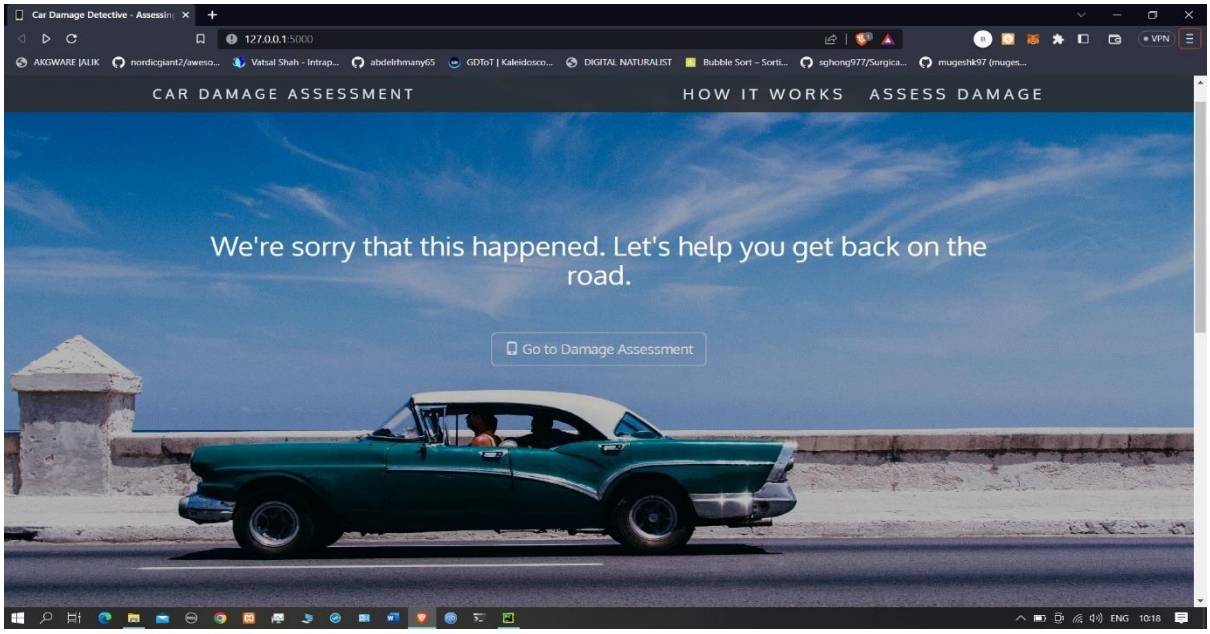
```
index2 =
['minor','moderate', severe']

        result1 = index1[prediction1]        result2
   = index2[prediction2]        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"          comments="Estimated cost is :"

return  render_template('prediction.html',
prediction=value ,  comments=comments,
result1=result1,result2=result2)

if __name__ == '__main__':
    app.run(debug=True, use_reloader=True)
```

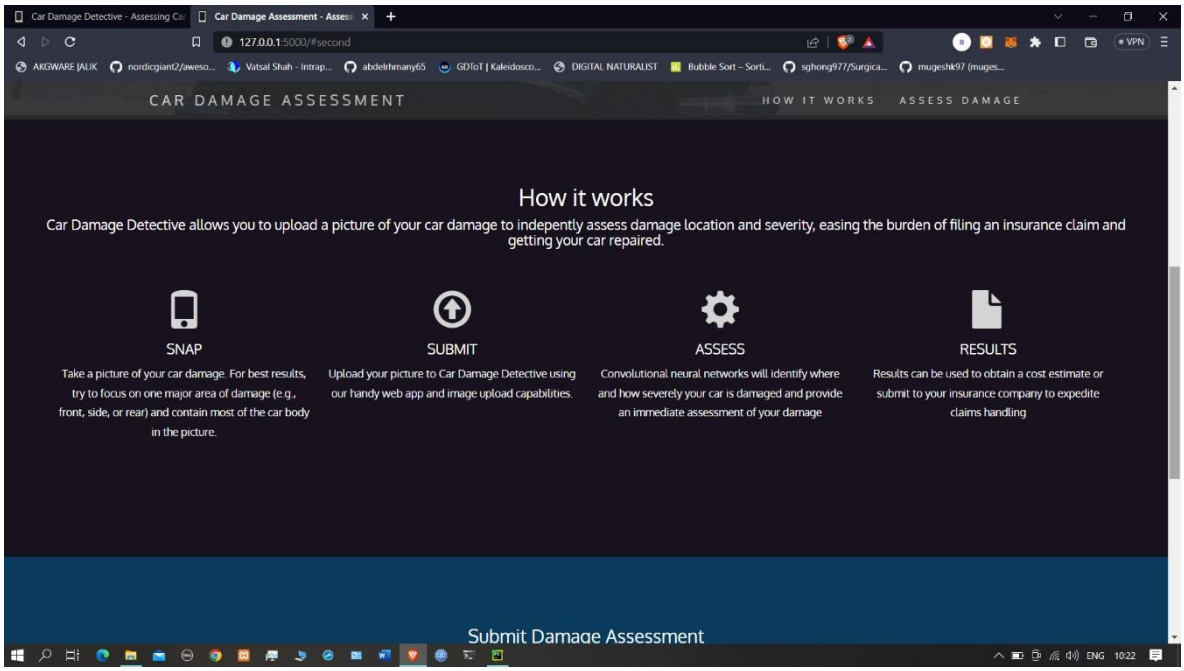
APPENDIX-2

A.2 SCREENSHOTS

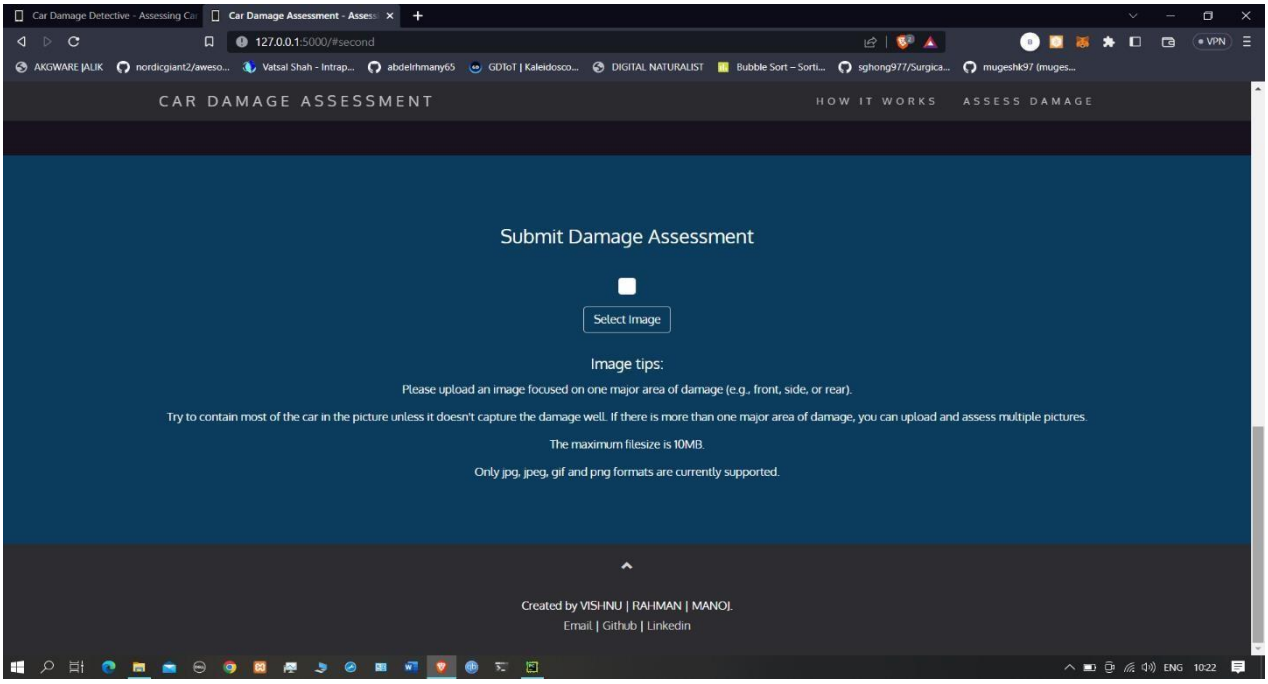
HOMEPAGE



WORKING



DAMAGE ASSESMENT



SELECT DAMAGED IMAGE

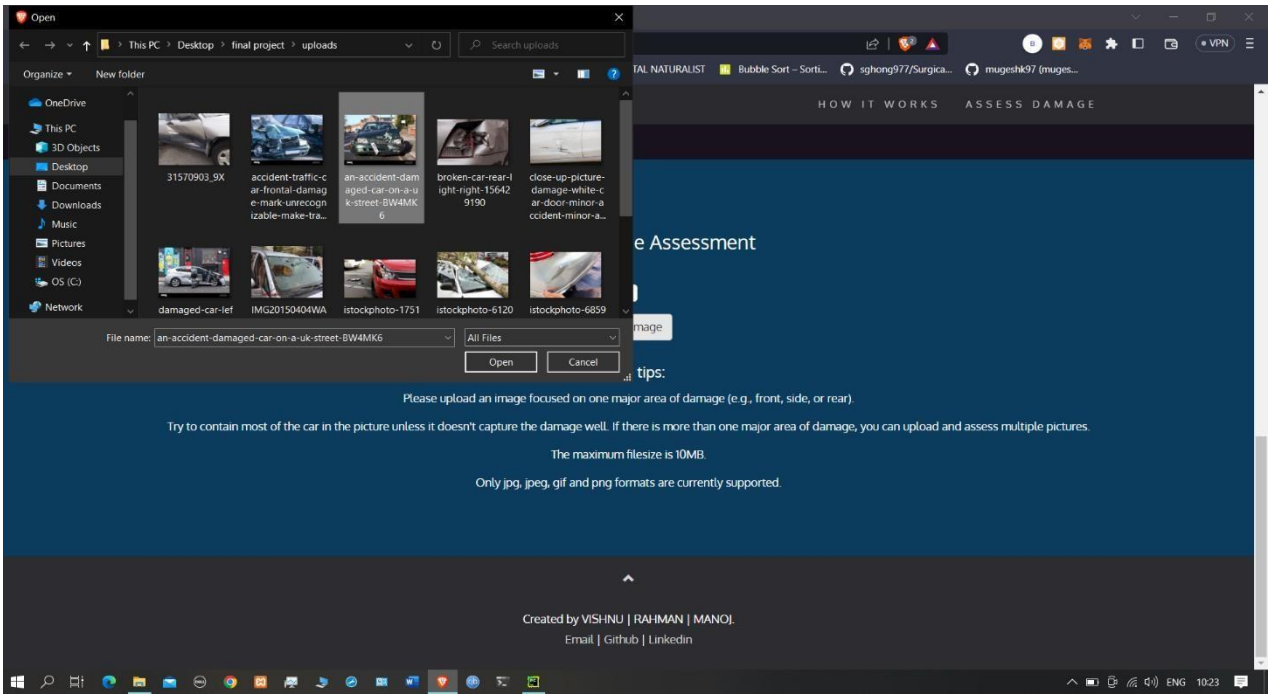
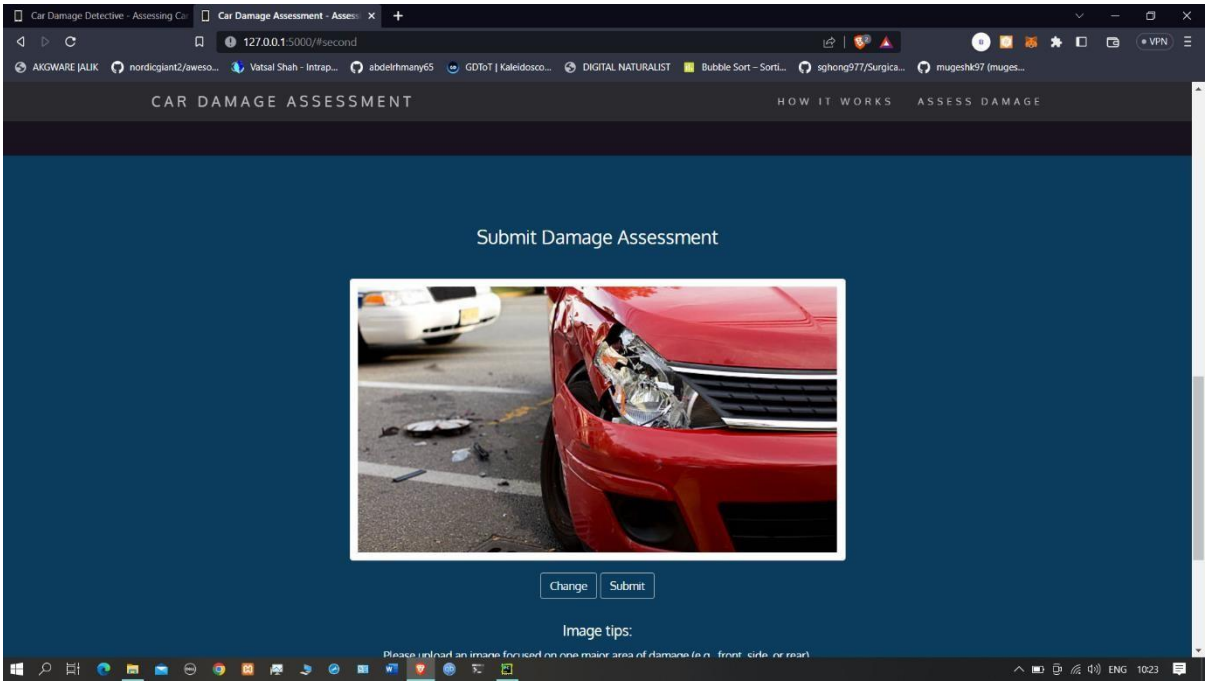
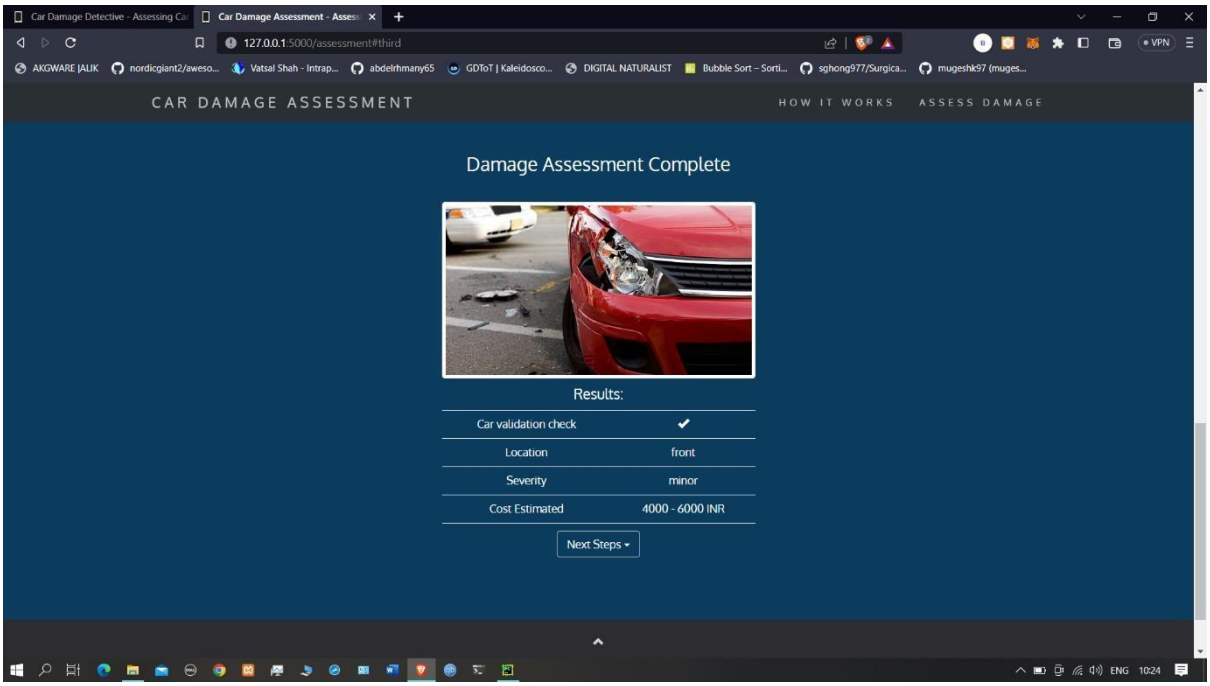


IMAGE UPLOADS



AMOUNT CALCULATION



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