INTELLIGENT VEHICLE DAMAGE ASSESSMENT AND COST ESTIMATOR FOR INSURANCE COMPANIES- PROJECT REPORT

1. INTRODUCTION

1.1 Project Overview

An automatic vehicle damage detection platform can increase the market value of car insurance. In this paper, we present a damage vehicle part detection platform, called Intelligent Vehicle Damage Assessment & Cost Estimator for Insurance Companies which provides an artificial intelligence as a service. It helps automatically assess vehicle parts' damage and severity level. A system and method are provided for automatically estimating a repair cost for a vehicle. The role of auto-insurance companies is to provide services to their customers supporting the claims process. Providing fast service in the field and fast damage repair quotations are the keys success to satisfy their customers. The traditional approach may take many days of waiting for a user to get the repair quotation from the insurance experts at the company where the car must be seen before the quotation can be done. Field employees spend a lot of time to inspect the vehicle at an accident site in the traditional claim process.

1.2 Purpose

The traditional claiming process begins with an appraisal where either the insurance company will send someone out to the customer car to evaluate the damage, or the customer brings the car to the company or a registered body shop. This is usually a time consuming process. With the advancement of artificial intelligence, the traditional claim processing time can be shorted while the customer satisfaction is increased. The assistance of artificial intelligence can allow the field employee to process the claim automatically and can complete the quotation in minutes. Our proposed service system can be integrated with the existing system.

2. LITERATURE SURVEY

2.1 Existing problem

In today's world, accidents are very common because the people are driving cars very fast on the road. People claim the money for repair through vehicle insurance when the accident happens. The damaged car is examined and it will take more time to claim the amount checking all the company policies. And because of incorrect claims, the company doesn't make payments properly. So, just by sending the image of damaged car, the website of Intelligent Vehicle Damage Assessment and Cost Estimator for Insurance Companies performs damage detection in a minute rather than days if it is inspected visually.

S. no	Paper Title	Author(s)	Year	Abstract	Functions	Resource Link
1.	Intelligent Vehicle Damage Assessment system based on computer vision	Zhu Qianqian, Guo Weiming, Shen Ying, and Zhao Zihao	2020	At present, under the guidance of the new generation of information technology, the rapid accumulation of data, the continuous improvement of computing power have made profound changes in the development environment of artificial intelligence.	The system completes the whole process of survey and damage determination through four functions. 1) Accident investigation, 2) Intelligent image damage assessment, 3) Damage result output, 4) Vehicle insurance anti- fraud.	(PDF) Research on Intelligent Vehicle Damage Assessment System Based on Computer Vision (researchgate.net)
2.	Car Damage Assessment for Insurance Companies	Mandara G and Prashant Ankalkoti	2022	Analysis of the damaged vehicle can be automatic claiming insurance that takes human resource, time and effort. Image processing and machine learning techniques are analyzing the vehicle damage in the proposed solution. In Advanced solution helps to speed up the claiming process sufficiently.	Detect the car damage using photo taken at the accident scene is very useful to reduce the cost of processing insurance claims, as well as provide greater convenience for vehicle users. Describing the level of damage, CNN Model and VGG16 Algorithm.	Paper5048.pdf (ijarsct.co.in)

3.	Image Based Automatic Vehicle Damage Detection	Srimal Jayawardena	2013	Automatically detecting vehicle damage using photographs taken at the accident scene is very useful as it can greatly reduce the cost of processing insurance claims, as well as provide greater convenience for vehicle users.	To use the 3D CAD model projection to help in segmenting and separating components of a vehicle body like the doors and fenders which are separated by weak boundary cues.	(PDF) Image Based Automatic Vehicle Damage Detection (researchgate.net)
4.	A Very Deep Transfer Learning Model for Vehicle Damage Detection and Localization	Najmeddi ne Dhieb, Hakim Ghazzai, Hichem Besbes, and Yehia Massoud	2019	Claims leakage is a major problem engendering tremendous losses for insurance companies. Those losses are due to the difference between the amount paid by insurance companies and the exact amount that should be spent, which cost millions of dollars yearly.	Deep learning, CNN, and transfer learning techniques are used.	(PDF) A Very Deep Transfer Learning Model for Vehicle Damage Detection and Localization (researchgate.net)

2.2 References

[1]. Zhu Qianqian, Guo Weiming, Shen Ying, and Zhao Zihao, Intelligent Vehicle Damage Assessment system based on computer vision, 2020.

[2]. Mandara G and Prashant Ankalkoti, Car Damage Assessment for Insurance Companies, 2022

[3]. Srimal Jayawardena, Image Based Automatic Vehicle Damage Detection, 2013

[4]. Najmeddi ne Dhieb, Hakim Ghazzai, Hichem Besbes, and Yehia Massoud,
 A Very Deep Transfer Learning Model for Vehicle Damage Detection and Localization, 2019
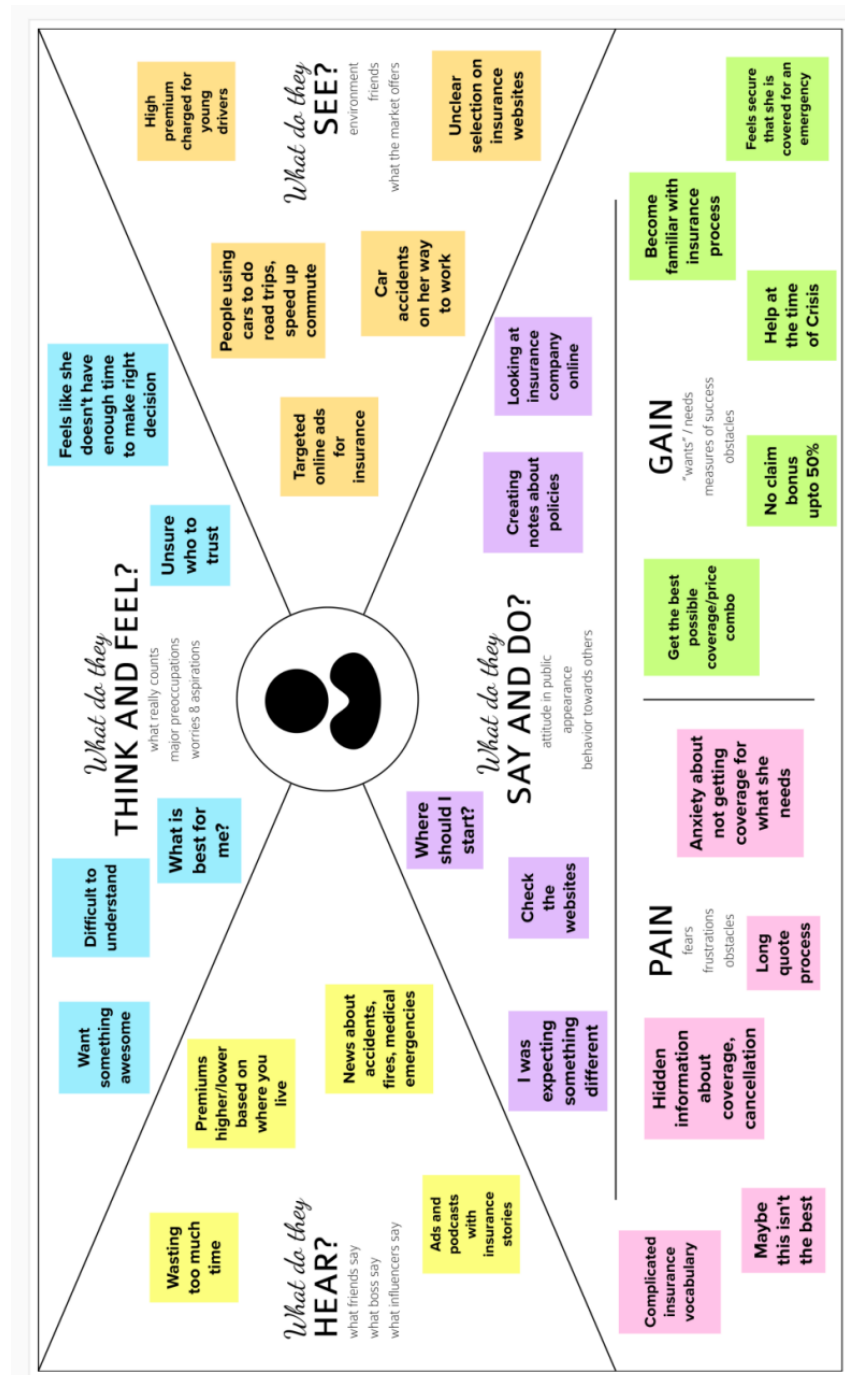
2.3 Problem Statement Definition

Car insurance companies lose millions of dollars each year due to claims leakage as car accidents continue to rise every day. Claims leakage is the difference between the best possible settlement and the one that is actually reached. For a long time, car damage assessment has been done through visual inspection and validation to reduce claims leakage. However, visual inspection has its downsides which include time-consuming, leading to delays in the processing of claims and susceptibility to errors, resulting in inaccurate cost estimations. AI has the ability to quickly assess vehicle damage and the auto insurance industry can greatly benefit from this. Recent advancements in ML, AI and computer vision, which include adopting quick, scalable and trainable end-to-end convolutional neural networks, have made it technically feasible to conduct automatic car damage recognition using convolutional neural networks. Using machine learning and artificial intelligence technology, it is possible to establish car damage detection dataset for car damage assessment deep learning.

I am	I'm trying to	But	Because	Which makes me feel
a car owner	claim an insurance	my money is wasted	of claim leakage	annoyed.

I am	I'm trying to	But	Because	Which makes me feel
an insurer	be good with customers	they try to fool me	they try to get money from false claims	betrayal

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas

Empathy Map Canvas

What do they THINK AND FEEL?
what really counts
major preoccupations
worries & aspirations

- Feels like she doesn't have enough time to make right decision
- Unsure who to trust
- What is best for me?
- Difficult to understand
- Want something awesome

What do they SEE?
environment
friends
what the market offers

- High premium charged for young drivers
- Unclear selection on insurance websites
- People using cars to do road trips, speed up commute
- Car accidents on her way to work
- Targeted online ads for insurance
- Feels secure that she is covered for an emergency

What do they HEAR?
what friends say
what boss say
what influencers say

- Premiums higher/lower based on where you live
- News about accidents, fires, medical emergencies
- Ads and podcasts with insurance stories
- Wasting too much time

What do they SAY AND DO?
attitude in public
appearance
behavior towards others

- Looking at insurance company online
- Creating notes about policies
- Where should I start?
- Check the websites
- I was expecting something different

PAIN
fears
frustrations
obstacles

- Anxiety about not getting coverage for what she needs
- Long quote process
- Hidden information about coverage, cancellation
- Complicated insurance vocabulary
- Maybe this isn't the best

GAIN
"wants" / needs
measures of success
obstacles

- Become familiar with insurance process
- Help at the time of Crisis
- No claim bonus upto 50%
- Get the best possible coverage/price combo

3.2 Ideation & Brainstorming

Step-1: Team Gathering, Collaboration and Select the Problem Statement

Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

- 10 minutes to prepare
- 1 hour to collaborate
- 2-8 people recommended

Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

⏱ 10 minutes

A Team gathering
Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

B Set the goal
Think about the problem you'll be focusing on solving in the brainstorming session.

C Learn how to use the facilitation tools
Use the Facilitation Superpowers to run a happy and productive session.

Open article →

Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

⏱ 5 minutes

PROBLEM
How might we [your problem statement]?

Key rules of brainstorming
To run an smooth and productive session

- Stay in topic.
- Defer judgment.
- Go for volume.
- Encourage wild ideas.
- Listen to others.
- If possible, be visual.

Step-2: Brainstorm, Idea Listing and Grouping

Janani.K.S

Providing efficient and convenient customer support	Working in a very fast and intelligent manner	Available 24/7
Providing instant solution for the users	Maintaining a user friendly interface	Individual pattern recognition
Facilitating constant guidance to customer on insurances	Maintaining confidential conversation with customers	Providing quick responses for the queries

Kavipriya.R

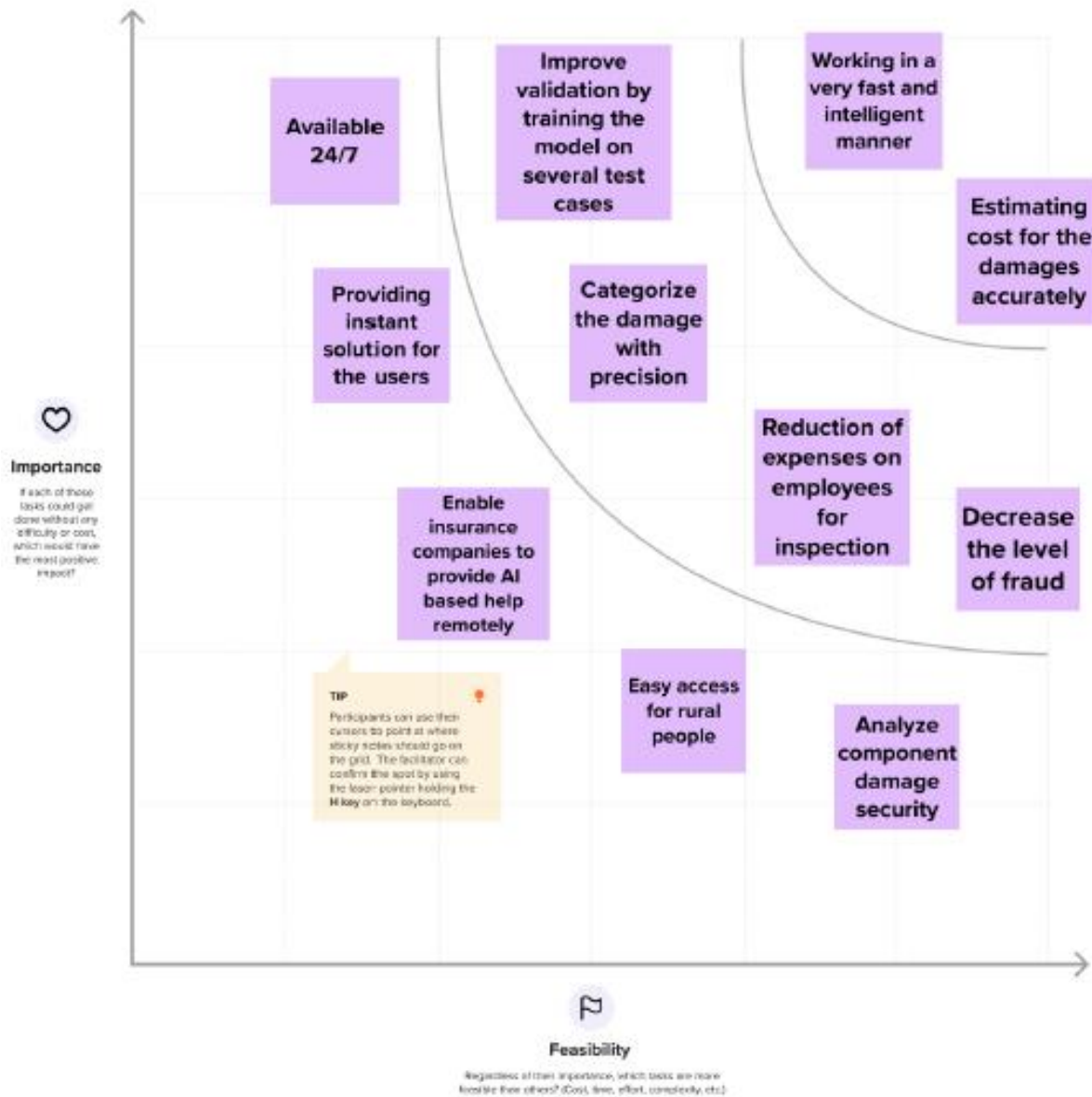|		
Saving user's time	Estimating cost for the damages accurately	Securing details of the customer
Updating the insurance cost for damages regularly	Solve the technical issues instantly	Site should be user friendly for customers
Predicting output based on sample dataset	Providing instant cost details about damages	It is trustworthy

Aashika.J.S

User friendly web application	Providing reliable services	Guiding the customer in all possible ways
Increase customer happiness	Analyze component damage security	Compatibility & Scalability
Decrease the level of fraud	Fast time to market	Decrease operational costs

Bushra.A

Make the interface convenient for customers	Generate quick responses and reports	Recognize damage and estimates
Categorize the damage with precision	Providing effective and convenient customer support	Enable insurance companies to provide AI based help remotely
Improve validation by training the model on several test cases	Reduction of expenses on employees for inspection	Easy access for rural people

Step-3: Idea Prioritization

Importance
If each of those tasks could get done without any difficulty or cost, which would have the most positive impact?

Feasibility
Regardless of their importance, which tasks are more feasible than others? (Cost, time, effort, complexity, etc.)

Sticky notes on the grid:

- Available 24/7
- Improve validation by training the model on several test cases
- Working in a very fast and intelligent manner
- Estimating cost for the damages accurately
- Providing instant solution for the users
- Categorize the damage with precision
- Reduction of expenses on employees for inspection
- Enable insurance companies to provide AI based help remotely
- Decrease the level of fraud
- Easy access for rural people
- Analyze component damage security

TIP
Participants can use their cursors to point at where sticky notes should go on the grid. The facilitator can confirm the spot by using the laser pointer holding the H key on the keyboard.

3.3 Proposed Solution

S.no	Parameter	Description
1.	Problem Statement (Problem to be solved)	The major issues of insurance companies are the rise of fraudulent claims in the insurance sector. The major issues of customers are the raise of claim leakage (the difference between the final settled amount paid out by an insurer, and the amount that they could've paid had the claims process been more efficient).
2.	Idea / Solution description	"Intelligent Vehicle Damage Assessment and Cost Estimator for Insurance Companies" is a system which is necessary to stop the fraudulent claims and claim leakage. Car insurers can review client claims using this system more quickly and accurately than with other conventional, labor-intensive approaches.
3.	Novelty / Uniqueness	A collection of ML algorithms with an API that makes use of computer vision make up the "Intelligent Vehicle Damage Assessment and Cost Estimator for Insurance Companies" system. The algorithms, which are based on deep learning, automatically identify the body of a car and assess the severity of the damage. Machine learning makes it possible to identify damaged parts, anticipate the type of repair that will be required, and calculate the potential cost of the repair.
4.	Social Impact / Customer Satisfaction	"Intelligent Vehicle Damage Assessment and Cost Estimator for Insurance Companies" has its advantages as it enables quick damage assessments and repair cost estimates without the need to wait for an inspector. The following steps are necessary for each insurance claim to be processed: - Analyze the user-submitted image of the damaged car. - Examine a vehicle model. - Find faulty auto parts. - Evaluate the extent of component damage. - Produce a report.
5.	Business Model (Revenue Model)	The approach reduces the amount of time it takes to process data, protects from fraud claims (by 90% or more), and lowers the cost of hiring new employees. Businesses that use Car Damage Recognition replace the time-consuming human-operated claims processes.

		Traditional Method: The claim is submitted by the customer to the insurance company via application forms. Documents are processed manually by the insurers. Third party evaluates the damage on the car. Insurance claim is approved for the customer. Modern Method: The self service claim is raised by the customer by uploading the picture of damaged car. Computer vision evaluates the damage and in fraction of seconds the amount to be issued is known.
6.	Scalability of the Solution	The client relationships and the reputation of the business will suffer from inaccurate and delayed estimations. There are number of strategies that have better results than the traditional ones to increase accuracy and speed up the process. They must have the ability to quickly evaluate and analyze the data from multiple sources and offer precise estimates.

3.4 Problem Solution fit

It helps in understanding the existing situation in order to improve it for your target group.

The structure explains

Customer State fit: to make sure you understand your target group, their limitations and their currently available solutions, against which you are going to compete.

Problem-Behavior fit: to help you filter out the noise and identify the most urgent and frequent problems, understand the real reasons behind them and see which behavior supports it. Is this behavior weak or infrequent — is it a problem worth solving?

Communication-Channel fit: to help you sharpen your communication with strong triggers, emotional messaging and reaching customers via the right channels.

Solution guess: translate all the validated data you have gathered into a solution that fits the customer state and his/her limitations, solves a real problem and taps into the common behavior of your target group.

Define CS, fit into CC	**1. CUSTOMER SEGMENT(S)** `CS` Who is your customer? i.e. working parents of 0-5 y.o. kids Drivers **aged between 25 and 65** are the most common age group of customers for car insurance.	**6. CUSTOMER CONSTRAINTS** `CC` What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices. Customers may feel that our website is **not trustworthy** due to some other scam websites.	**5. AVAILABLE SOLUTIONS** `AS` Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking Just by sending the image of damaged car to our website, customer gets the details of amount to be **claimed in a minute** rather than days if it is inspected visually. There won't be any claim leakage problems.	Explore AS, differentiate
Focus on J&P, tap into BE, understand RC	**2. JOBS-TO-BE-DONE / PROBLEMS** `J&P` Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides. Customers limit themselves from claiming insurance for minor damages because of **claims leakage** (Difference between the final settled amount paid out by an insurer and the amount that they could've paid had the claims process been more efficient).	**9. PROBLEM ROOT CAUSE** `RC` What is the real reason that this problem exists? What is the back story behind the need to do this job? i.e. customers have to do it because of the change in regulations. The real problem arises when the customer has severe damage on the car and they get **minimum amount** than expected. Since many people are involved at various stages of a claim, there is lack of visibility which makes the process to **slow down** and **over-complicated** at different stages.	**7. BEHAVIOUR** `BE` What does your customer do to address the problem and get the job done? i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace) Whenever the customer has damage on the car, they **meet the insurer** and apply for claim amount. As this process is time consuming, the customers **search** for car insurance websites to claim the amount. They upload the image of damaged car and get the details of claim amount within fraction of seconds.	Focus on J&P, tap into BE, understand RC
Identify strong TR & EM	**3. TRIGGERS** `TR` What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news. Being **transparent** to the customers by not making any false guarantees **4. EMOTIONS: BEFORE / AFTER** `EM` How do customers feel when they face a problem or a job and afterwards? i.e. lost, insecure > confident, in control - use it in your communication strategy & design. We should prove that our website is better than others by providing good customer support, gaining the customer trust and provide customer satisfaction.	**10. YOUR SOLUTION** `SL` If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality. If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour. The aim of this project is to estimate the cost of damaged car accurately by detecting the area of damage, categorizing the damage with precision in a **fast and intelligent manner**. It can be used by insurance companies for faster processing of claims if users can upload pictures.	**8. CHANNELS of BEHAVIOUR** `CH` **8.1 ONLINE** What kind of actions do customers take online? Extract online channels from #7 ➢ Select the model of damaged car. ➢ Select the city where you live. ➢ Upload the image of damaged **8.2 OFFLINE** What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development. ➢ Meeting the insurer. ➢ Filling application forms. ➢ Submitting the required documents.	Identify strong TR & EM

4. REQUIREMENT ANALYSIS

4.1 Functional requirement

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-3	User Registration	Registration through Form Registration through Gmail Registration through LinkedIn
FR-3	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User details	Users are required to give details like Name, Date of Birth, Residential area, Driving License, Car registration number, Car Model, etc.,
FR-3	User requirements	The user uploads vehicle damage images. The software will instantly generate accurate claim amount in a reading format familiar to the customer.
FR-3	Interface	User friendly and simple website.
FR-3	Results	Models are trained with high accuracy and results are displayed to user with easy interpretability.

4.2 Non-Functional requirements

Nonfunctional requirements, not related to the system functionality, rather define how the system should perform.

Usability: -

Users can easily understand what the application does and feel satisfied with the service.

Security: -

With the help of the username and password it provides more security in which it can access more securable and the data are private.

The authenticity of the user and the confidentiality of car details of the owner should be maintained.

Reliability: -

The application should be able to achieve good accuracy in damaging assessment as well in cost estimation so that the users are provided with accurate and unbiased insurance amount.

Performance: -

The application supports more than 1000 users per hour and provides less response time in a desktop browser. The performance of this application is effective and efficient.

Availability: -

The application must be available to the users 24/7 i.e., any time even during business hours. Users can access this application anytime, anywhere and should be compatible in both mobiles and computers.

Scalability: -

The application must be scalable enough to support more than 10,000 visits at the same time while maintaining optimal performance and efficient to retrieve image in large scale thus improving scalability.

# 5.PROJECT DESIGN

5.1 Data Flow Diagrams

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.
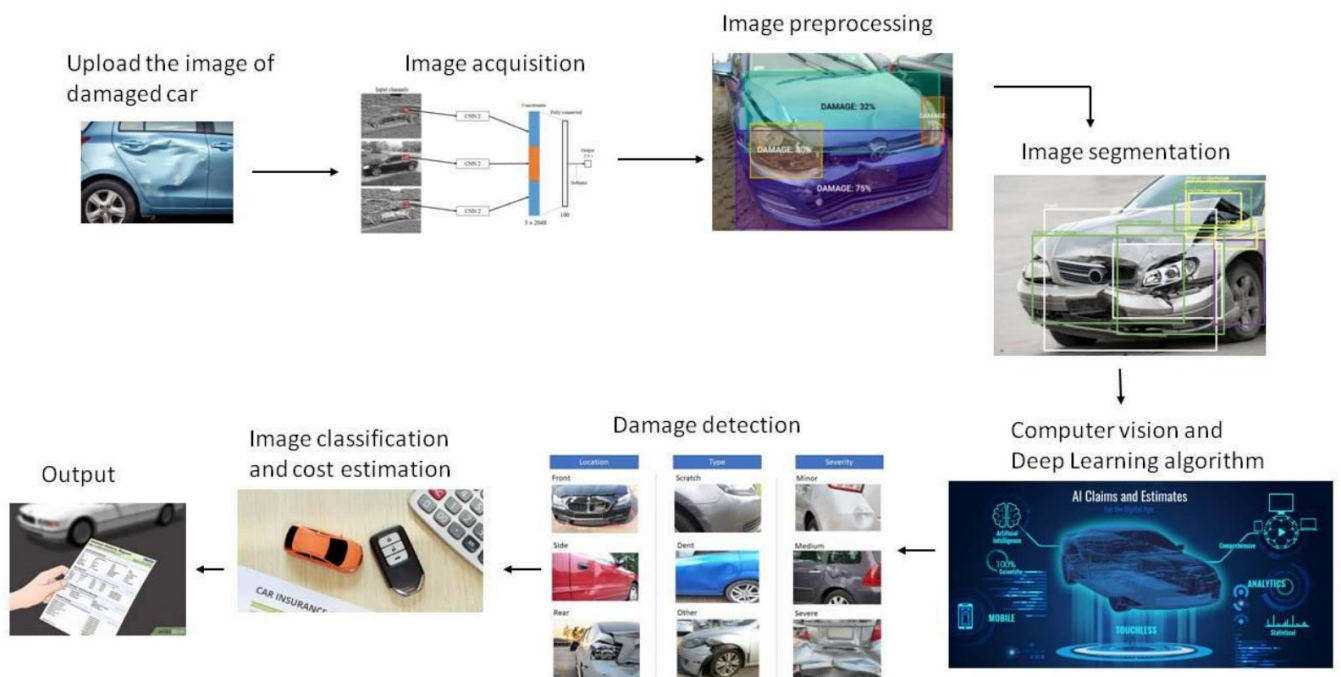
5.2 Solution & Technical Architecture

A solutions architect creates the overall technical vision for a specific solution to a business problem. A solutions architect creates the overall technical vision for a specific solution to a business problem. They design, describe, and manage the solution. The solution architecture helps ensure that a new system will fit the existing enterprise environment. To perform this task, a solution architect has to understand how all parts of the business model work together including processes, operating systems, and application architectures.
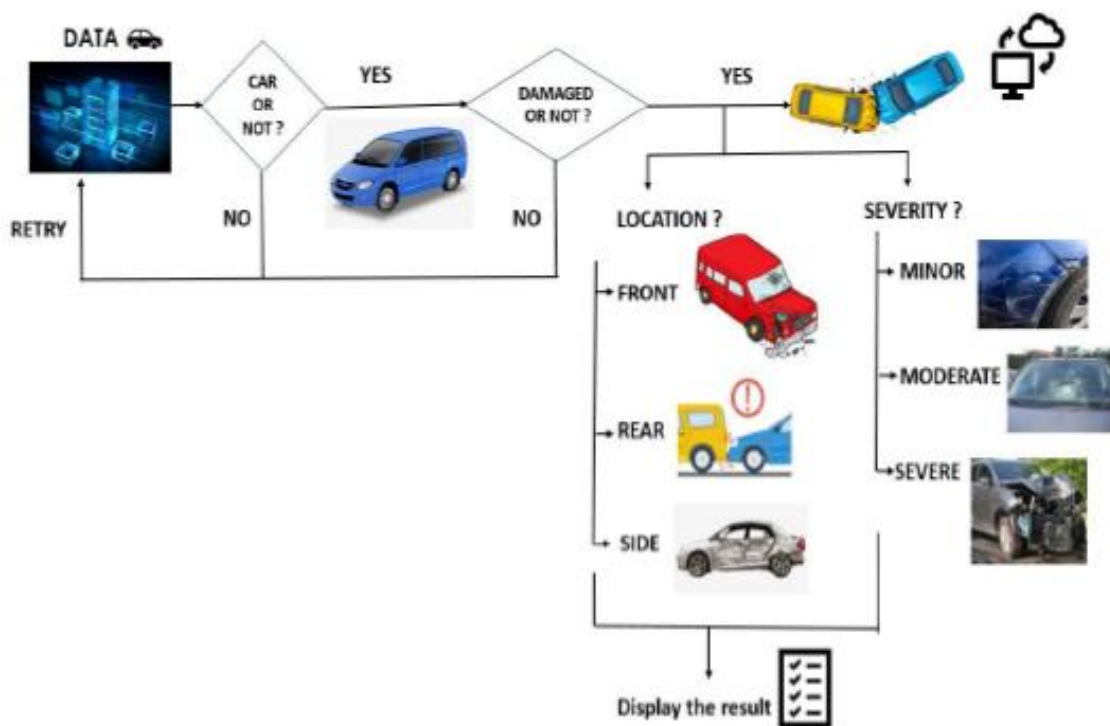
5.3 User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
Customer Details	Login	USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
Customer Uses	Dashboard	USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
Customer Options	Details about insurance companies	USN-4	As a user, I can register for the application through Gmail	I can register & access the dashboard with Gmail	Medium	Sprint-1
Customer usage	Login	USN-5	As a user, I can log into the application by entering email & password	I can log in and view my dashboard at my demand on any time	High	Sprint-1
Customer needs to do	Web page	USN-6	As a user I must capture images of my vehicle and upload it into the web portal	I can capture the entire vehicle and upload	High	Sprint-2
Customer (Web user)	Details about estimated cost based on damage	USN-7	As a user I must receive a detailed report of the damages present in the vehicle and the cost estimated	I can get the estimated insurance cost	High	Sprint-3

Customer Care Executive	Provide friendly and efficient customer support and sort out the queries	USN-8	As a user, I need to get support from developers in case of queries and failure of service provided	I can have smooth user experiences and all the issues raised is sorted	Medium	Sprint-4
Administrator	Overview the entire process and act as a bridge between user and developers	USN-9	We need to satisfy the customer needs in an efficient way and make sure any sort of errors are fixed	I can finish the work without any problems	High	Sprint-4

6.PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

| Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Priority
Sprint-1	Data Collection	USN-1	Collect and load the dataset of car damage for training the ML model	High
Sprint-1	Image Pre-Processing	USN-2	Process the image data into form that ML algorithm will solve. It increases accuracy and reduce complexity of ML model	High
Sprint-2	Model Building	USN-3	We train, save and test the ML model over a set of data so the images uploaded by the user can be analyzed accurately	High
Sprint-3	Cloudant DB	USN-4	To perform training and testing of ML model Register & Login to IBM cloud, Create service credentials, Launch cloudant DB, Create Database	High
Sprint-4	Registration	USN-5	As a user, I can register for the application by entering my email ID, password, and confirming my password.	High
Sprint-4	Confirmation	USN-6	As a user, I will receive confirmation email once I have registered for the application	High

| Sprint-4 | Login | USN-7 | As a user, I can log into application by entering email ID & password | Low |
| Sprint-4 | Dashboard | USN-8 | As a user, I can view my profile with the details entered during registration on the dashboard | Medium |

6.2 Sprint Delivery Schedule

| Sprint	Description
Sprint 1	1. First step is to load the dataset of car damage which contains separate folders for training and testing the ML model. 2. Then import image data generator libraries and apply image data generator functionality to train the dataset. 3. Next it Process the image data into form that ML algorithm will solve. 4. It will increase accuracy and reduce complexity of ML model
Sprint 2	1. Import the model building libraries 2. Initialize the model, adding convolution layer and flatten layer then compute the model 3. We train, save and test the ML model so the images uploaded by the user can be analyzed accurately

Sprint 3	To perform training and testing of ML model 1. Register & Login to IBM cloud 2. Create service credentials 3. Launch cloudant DB 4. Create Database
Sprint 4	1. User can create a new account by providing user information such as name, email ID and mobile number. 2. User will get a confirmation message through E-mail. 3. Upon confirmation message through E-mail. 4. User login portal will be developed. 5. User can login and logout whenever required

6.3 Reports from JIRA
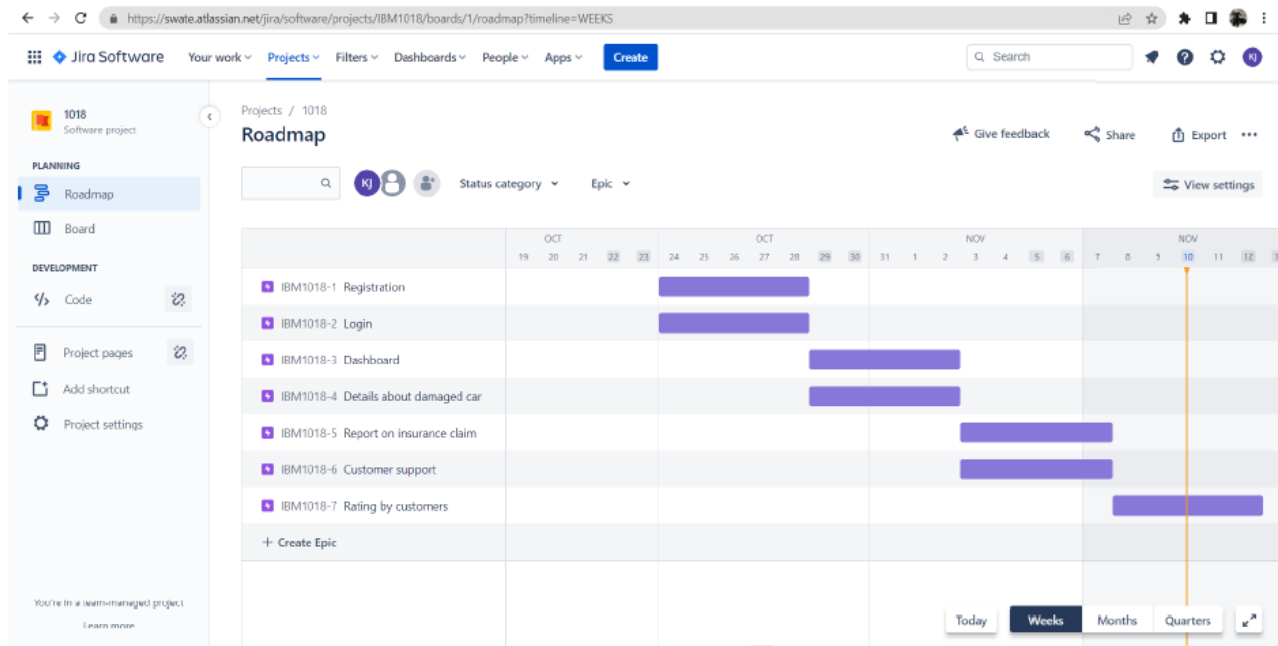
Burn down Chart:

A burn down 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.
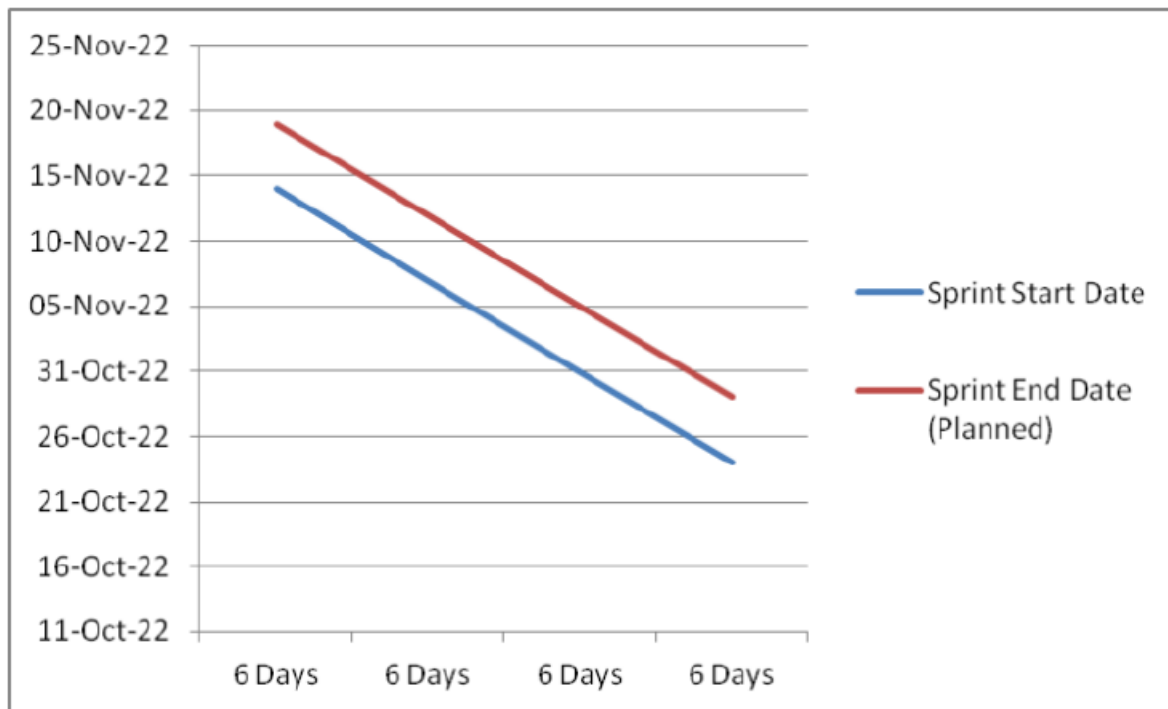
7.CODING & SOLUTIONING (Explain the features added in the project along with code)

code.py

```python
from cloudant.client import Cloudant
import os
import tensorflow
from keras.utils import load_img, img_to_array
from werkzeug.utils import secure_filename
import numpy as np
from keras.models import load_model
from tensorflow.python.ops.gen_array_ops import concat
from keras.applications.inception_v3 import preprocess_input


#creating the Cloudant Database
```

```python
client = Cloudant.iam("e7daf895-e20c-411d-96a9-138ab4207f12-
bluemix","ZhX5GTl87jt_HNoJ1OPFgldlCv6m088oFsSzM6wKYq7K",connect=True)
database = client.create_database("my_database")

#load model
model1 = load_model('Model\body.h5')
model2 = load_model('Model\level.h5')

from flask import Flask,render_template,request,redirect,url_for

app = Flask(__name__)

@app.route('/')
def home():
    return render_template('index.html')

#login page setting
@app.route('/login')
def login():
    return render_template('login.html')

@app.route('/afterLogin',methods=['POST','GET'])
def afterlogin():
    user = request.form['_id']
    passw = request.form['psw']
    print(user,passw)

    query = {'_id':{'$eq':user}}

    docs = database.get_query_result(query)
    print(docs)
    print(len(docs.all()))

    if(len(docs.all())==0):
        return render_template('login.html',message='The username is not found')
    else:
        if((user==docs[0][0]['_id'] and passw==docs[0][0]['psw'])):
```

```python
            return redirect(url_for('prediction'))
        else:
            return render_template("login.html",message="Invalid User Details")



#Register page setting
@app.route('/register')
def register():
    return render_template('register.html')


@app.route('/afterRegister',methods=['POST'])
def afterregister():
    x = [x for x in request.form.values()]
    print(x)
    data = {
        '_id':x[1],
        'name':x[0],
        'psw' : x[2]
    }
    print(data)


    query = {'_id':{'$eq' : data['_id']}}
    docs = database.get_query_result(query)

    if(len(docs.all())==0):
        url = database.create_document(data)
        return render_template('register.html', message="Registration is Successfully
Completed")
    else:
        return render_template("register.html", message="You are already a member!")


#prediction
@app.route('/prediction')
def prediction():
    return render_template('prediction.html')

#logout page
```

```python
@app.route('/logout')
def logout():
    return render_template('logout.html')


#results
@app.route('/result', methods = ['GET', 'POST'])
def upload_file():
    if request.method == 'POST':
        f = request.files['_file']
        basepath = os.path.dirname(__name__)
        filepath = os.path.join(basepath,'uploads',f.filename)
        f.save(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.predict(img_data))
        prediction2 = np.argmax(model2.predict(img_data))

        index1 = ['front','near','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=="near" and result2=="minor"):
            value="4000 to 6000 Inr"
        elif(result1=="near" and result2=="moderate"):
            value="7000 - 9000 Inr"
```
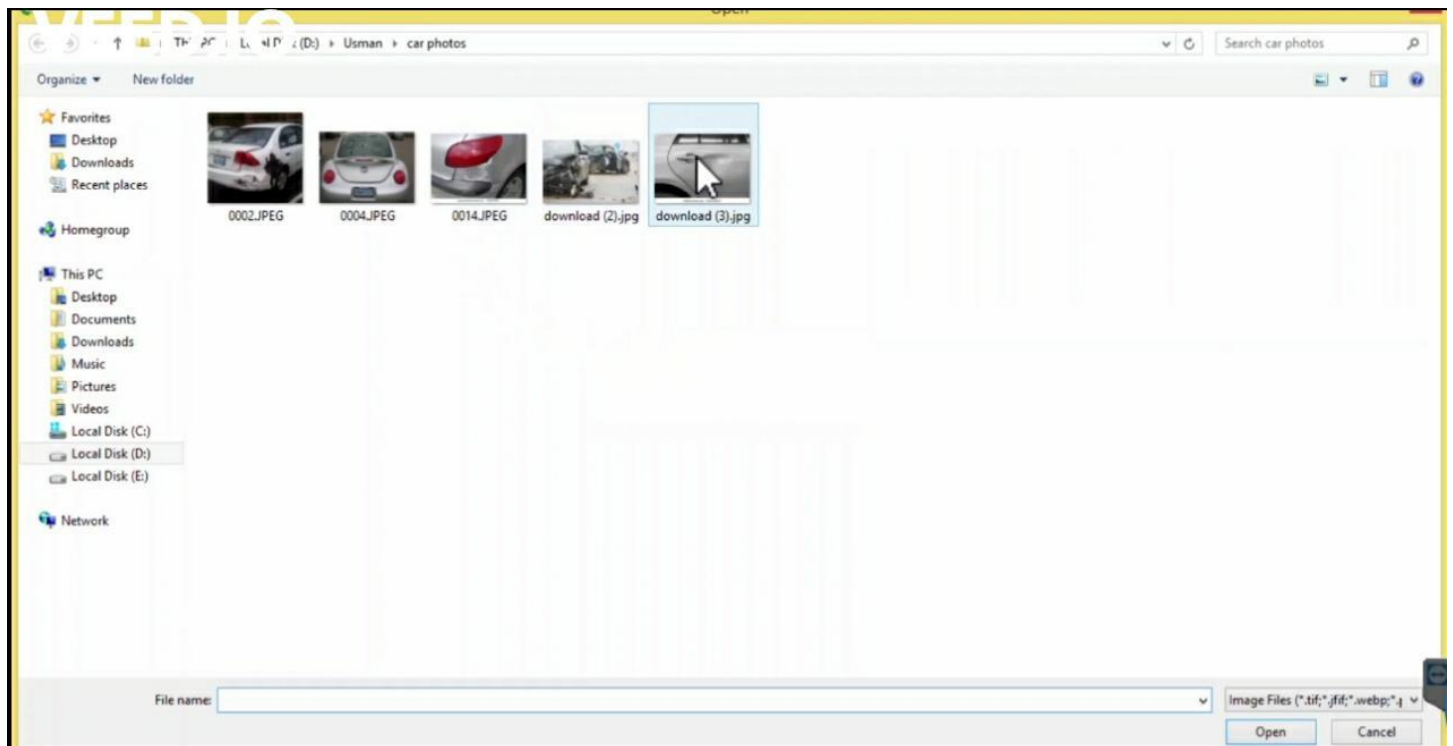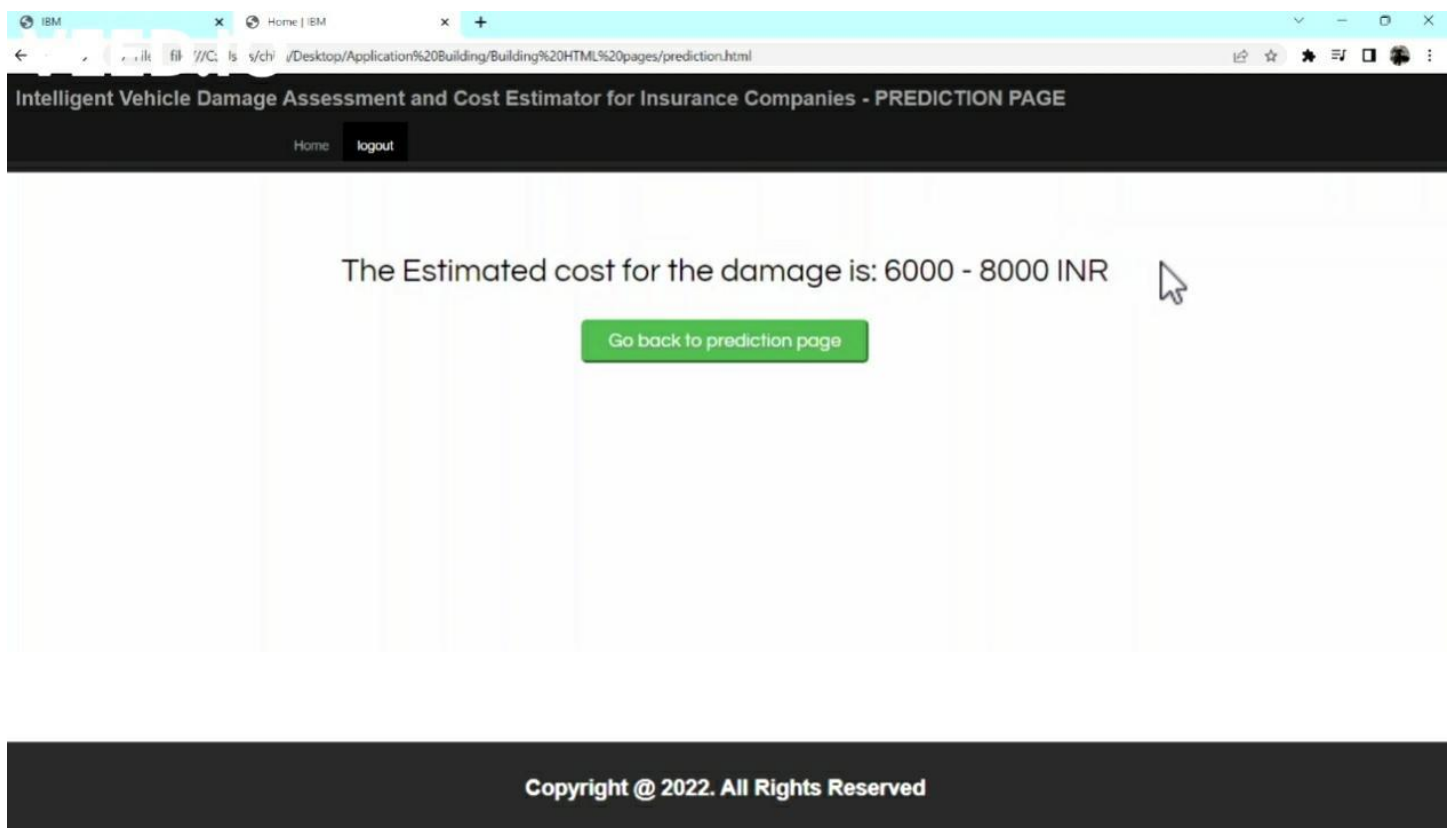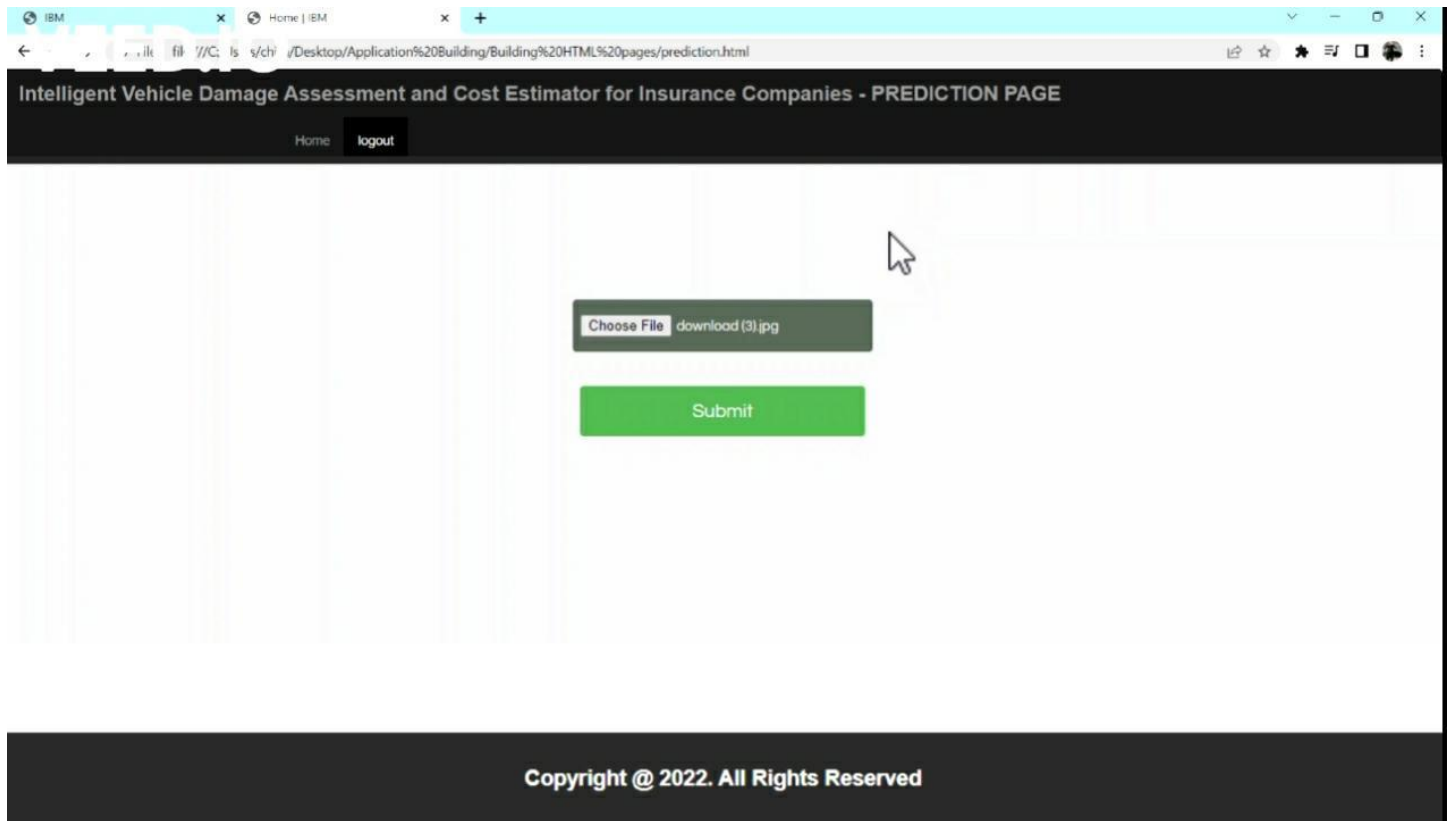
```python
        elif(result1=="near" and result2=="severe"):
            value="11000 - 13000 Inr"
        elif(result1=="side" and result2=="minor"):
            value="6000 - 8000 Inr"
        elif(result1=="side" and result2=="moderate"):
            value="9000 - 11000Inr"
        elif(result1=="side" and result2=="severe"):
            value="12000 - 15000 Inr"
        else:
            value = "16000 - 50000 Inr"


    return render_template("prediction.html",prediction=value)
if (__name__ == '__main__'):
    app.run(debug=True)
```

Choose File   download (3).jpg

Submit

The Estimated cost for the damage is: 6000 - 8000 INR

Go back to prediction page

8.TESTING

8.1 Test Cases

Test case ID	Component	Test Scenario	Steps To Execute	Expected Result	Status
LoginPage _TC_OO1	Home Page	Verify user is able to see the Login / Signup popup when user clicked on My account button	1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Signup popup displayed or not	Login/Signup popup should display	Pass
LoginPage _TC_OO2	Home Page	Verify the UI elements in Login/Signup popup	1. Enter URL and click go 2. Click on My Account dropdown button 3. Verify login/Signup popup with below UI elements: a. email text box b. password text box c. Login button d. New customer? Create account link e. Last password? Recovery password link	Website should show below UI elements: a. email text box b. password text box c. Login button with orange color d. New customer? Create account link e. Last password? Recovery password link	Fail
LoginPage _TC_OO3	Home Page	Verify user is able to log into website with Valid credentials	1. Enter URL and click go 2. Click on My Account dropdown button 3. Enter Valid username/email in Email text box 4. Enter valid password in password text box 5. Click on login button	User should navigate to user account homepage	Pass
LoginPage _TC_OO4	Login page	Verify user is able to log into application with Invalid credentials	1. Enter URL and click go 2. Click on My Account dropdown button 3. Enter Invalid username /email in Email text box	Website should show 'Incorrect email or password ' validation message.	Pass

			4. Enter valid password in password text box 5. Click on login button		
LoginPage_TC_OO5	Dash Board	Verify user is able to select options for image uploading	1.Select upload image option 2. Upload the image of damaged car 3. Click next	Website should show option for uploading the images	Pass
LoginPage_TC_OO6	Dash Board	Verify user is able to select options for image uploading	1. Select upload image option 2. Upload the image of damaged car 3. Click next	Website page doesn't navigate to upload the images from the system	Fail
LoginPage_TC_OO7	Report page	Verify user is able to view the final report of estimated cost for car damage	1. After uploading image select the required options 2. Click submit 3. Click view report	Website page should view the final report of car damage	Pass
LoginPage_TC_OO8	Report page	Verify user is able to view the final report of estimated cost for car damage	1. After uploading image select the required options 2. Click submit 3. Click view report	Website page should view the final report of car damage	Fail

8.2 User Acceptance Testing

1. 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	10	3	2	3	18
Duplicate	3	2	3	0	8
External	2	3	1	1	7

|					
Fixed	9	2	4	18	33
Not Reproduced	0	0	1	0	1
Skipped	0	1	1	1	3
Won't Fix	1	4	2	1	8
Totals	25	15	14	24	78

2. 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	4	0	0	4
Client Application	40	0	0	40
Security	2	0	0	2
Outsource Shipping	3	0	0	3
Exception Reporting	5	0	0	5
Final Report Output	4	0	0	4
Version Control	2	0	0	2

9.RESULTS

9.1 Performance Metrics
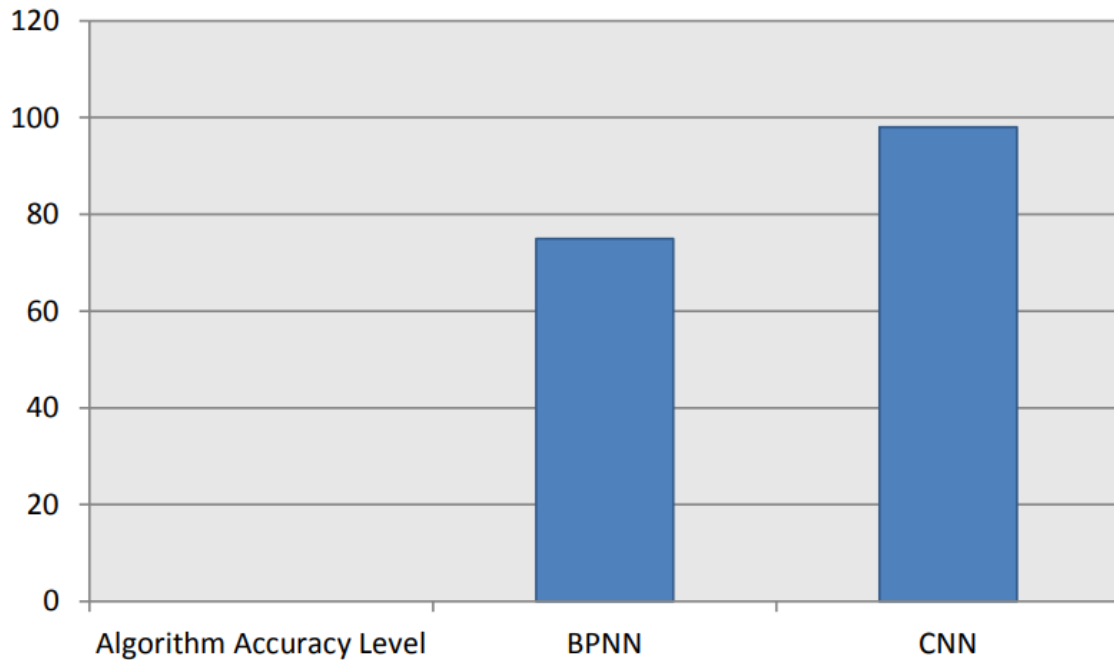
10. ADVANTAGES & DISADVANTAGES

ADVANTAGES -

- 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 and estimates the cost of damage.
- The automobile insurance fraud of intelligent damage determination system is mainly embodied in the following three aspects.
- It realizes the fraud recognition in the whole process of damage determination and can effectively control the cost expenditure of insurance companies.
- Provide exact vehicle damage detection and assessment.

DISADVANTAGES -

- When processing photos for damage estimation and sharing between parties, it is critical to ensure that the privacy of car owners remains intact.
- In most cases, it is possible to encounter images containing vehicle license plates, which may be used to identify individual car owners. This may cause privacy concerns.

- Car insurers need to perform many daily operations, including validation, inspection, data processing, management, and storing of huge volumes of data generated by different parties.
- Moreover, the variety of cars increases as well as the number of insurance claims, and car rental services have to adjust their calculations accordingly.
- Processing of big volumes of data they need to be able to quickly assess and analyze data from various sources and provide exact estimations.
- In case of delayed estimates, it will spoil the relations with customers and the company's reputation.

11. CONCLUSION

As advancements in AI, ML and computer vision continue, conducting car damage visual assessment and recognition will be a thing of the past. Insurance companies stand to benefit significantly when it comes to using AI and ML for car damage detection. Not only does the technology fasten the underwriting process, but it also prevents fraud. Car damage detection also benefits the likes of car repair and rental services since it brings much-required transparency to the process of calculating costs for repairs and making repairs, as well as bringing transparency between customers and rental car companies during the car rental process.

12. FUTURE SCOPE

- In the future, we will continue to explore the innovation of insurance technology of 'AI + Vehicle Insurance'. We hope that we can use the power of intelligent damage determination system.
- On the one hand, the owner can take photos by one click to achieve rapid loss determination, price estimation and immediate compensation. On the other hand, it assists insurance companies to achieve rapid and accurate pricing in the process of fixing losses and claims.
- Finally, by combining the rapid compensation of accident vehicles to relieve traffic pressure, to avoid more serious personal and property losses caused by secondary accidents.

13. APPENDIX

Source Code

HTML Pages :-

1) index.html

```html
<!DOCTYPE html>
<html lang="en">
<head>
<title>Home | IBM</title>

<meta charset="utf-8">
<meta name="viewport" content="width=device-width, initial-scale=1">

<link rel="stylesheet"
href="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/css/bootstrap.min.css">
<link rel="stylesheet"
href="https://cdnjs.cloudflare.com/ajax/libs/fontawesome/4.7.0/css/font-awesome.min.css">

<script src="https://ajax.googleapis.com/ajax/libs/jquery/3.6.0/jquery.min.js"></script>
<script
src="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/js/bootstrap.min.js"></script>

<style>
.nav.navbar-nav{
margin-left: 75px;
}
.navbar-brand{
font-size: 22px;
}
.footer{
overflow: hidden;
background-color: #333;
position: fixed;
bottom: 0;
height: 65px;
width: 100%;
```

```html
}
</style>


</head>
<body style="background-image: url('background.jpg')">
<nav class="navbar navbar-inverse">
<div class="container-fluid">
<div class="navbar-header">
<a class="navbar-brand" href="#"><b>Intelligent Vehicle Damage Assessment and Cost
Estimator for Insurance Companies</b></a>
</div>
<ul class="nav navbar-nav">
<li class="active"><a href="#">Home</a></li>
<li><a href="login.html">Login</a></li>
<li><a href="register.html">Register</a></li>
<li><a href="prediction.html">Prediction</a></li>
</ul>
</div>
</nav><br><br><br><br>
<div class="container">
<center>
<h2 style="font-family:'Franklin Gothic Medium', 'Arial Narrow', Arial, sans-serif;
color: black;">PROJECT DESCRIPTION</h2>
<br>
<p style="font-size:20px;font-family: 'Times New Roman', Times, serif;">
Vehicle damage detection is used to reduce claims leakage during insurance
processing.<br>
Vehicle inspection and validation are usually done. As it takes a long time, because a
person needs to come and inspect the damage.<br>
Here we are trying to automate the procedure. Using this automation, we can avoid time
consumption for insurance claim procedure.</p>
<br>
<link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-
awesome/4.7.0/css/font-awesome.min.css">
<a style="color: white;
padding: 22px;
background-color: black;
```

```html
opacity: 85%;
border-radius: 12px;
margin-left: 25px;
margin-bottom: -20px;" href="https://www.facebook.com"
class="fa fa-facebook"></a>
<a style="color:white;
padding: 20px;
background-color: black;
opacity: 85%;
border-radius: 12px;
margin-left: 25px;
margin-bottom: -20px;" href="https://www.twitter.com"
class="fa fa-twitter"></a>
<a style="color:white;
padding: 20px;
background-color: black;
opacity: 85%;
border-radius: 12px;
margin-left: 25px;
margin-bottom: -20px;" href="https://www.linkedin.com"
class="fa fa-linkedin"></a>
<a style="color:white;
padding: 20px;
background-color: black;
opacity: 85%;
border-radius: 12px;
margin-left: 25px;
margin-bottom: -20px;" href="https://www.instagram.com"
class="fa fa-instagram"></a>
</center>
</div>
<div class="footer">
<p style="color:white; margin-top: 20px; text-align: center;">
<b>Copyright @ 2022. All Rights Reserved</b>
</p>
</div>
</body>
```

```
</html>
```

2) register.html

```
<!DOCTYPE html>
<html lang="en">
<head>
 <title>Home | IBM</title>
 <meta charset="utf-8">
 <meta name="viewport" content="width=device-width, initial-scale=1">
 <link rel="stylesheet"
href="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/css/bootstrap.min.css">
 <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-
awesome/4.7.0/css/font-awesome.min.css">
 <script
src="https://ajax.googleapis.com/ajax/libs/jquery/3.6.0/jquery.min.js"></script>
<script
src="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/js/bootstrap.min.js"></script>
 <style>

 .nav.navbar-nav{
 margin-left: 180px;
 }

 .navbar-brand{
 font-size: 22px;
 }

 .footer{
 overflow: hidden;
 background-color: #333;
 position: fixed;
 bottom: 0;
 height: 65px;
 width: 100%;
 }
```

```css
input[type=text], input[type=password] {
width:500px;
padding: 12px 20px;
margin: 8px 0;
display: inline-block;
background-color: black;
opacity: 65%;
color: white;
border: 1px solid #ccc;
box-sizing: border-box;
border-radius: 10px;
}

button {
background-color: #04AA6D;
color: white;
padding: 14px 20px;
margin: 8px 0;
border: none;
border-radius: 10px;
cursor: pointer;
width: 250px;
}

button:hover {
opacity: 0.8;
}
.imgcontainer {
text-align: center;
}
img.avatar {
border-radius: 50%;
}
.ayya {
padding: 16px;
}
label{
```

```html
    margin-left:-400px;
    }
  </style>
</head>
<body style="background-image: linear-gradient(to right, #ffffff, #ffffff);">
<nav class="navbar navbar-inverse">
  <div class="container-fluid">
    <div class="navbar-header">
      <a class="navbar-brand" href="#"><b>Intelligent Vehicle Damage Assessment and Cost
Estimator for Insurance Companies - REGISTER PAGE</b></a>
    </div>
    <ul class="nav navbar-nav">
      <li><a href="index.html">Home</a></li>
      <li><a href="login.html">Login</a></li>
      <li class="active"><a href="register.html">Register</a></li>
    </ul>
  </div>
</nav><br><br><br><br>
<div style="margin-top:-55px;" class="container">
  <form action="index.html" method="post">
    <div class="imgcontainer">
      <img src="profile.png" width="200px" height="200px">
    </div>
    <center>
    <div class="ayya">
      <label for="uname"><b>NAME</b></label><br>
      <input type="text" placeholder="Enter Username" name="uname" required><br>

      <label for="psw"><b>EMAIL ID</b></label><br>
      <input type="text" placeholder="Enter registered email ID" name="mail" required><br>
      <label for="psw"><b>PASSWORD</b></label><br>
      <input type="password" placeholder="Enter Password" name="psw" required><br><br>

      <button type="submit">REGISTER</button><br><br>
    </div>
    </center>
  </form>
```

```html
</div>
<div class="footer">
 <p style="color:white;
 margin-top: 20px;
 text-align: center;">
 <b>Copyright @ 2022. All Rights Reserved</b>
 </p>
 </div>


</body>
</html>
```

3) login.html

```html
<!DOCTYPE html>
<html lang="en">
<head>
 <title>Home | IBM</title>
 <meta charset="utf-8">
 <meta name="viewport" content="width=device-width, initial-scale=1">
 <link rel="stylesheet"
href="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/css/bootstrap.min.css">
 <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-
awesome/4.7.0/css/font-awesome.min.css">
 <script src="https://ajax.googleapis.com/ajax/libs/jquery/3.6.0/jquery.min.js"></script>
 <script
src="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/js/bootstrap.min.js"></script>
 <style>
 .nav.navbar-nav{
 margin-left: 180px;
 }

 .navbar-brand{
 font-size: 22px;
 }

 .footer{
```

```css
overflow: hidden;
background-color: #333;
position: fixed;
bottom: 0;
height: 65px;
width: 100%;
}

input[type=text], input[type=password] {
width:500px;
padding: 12px 20px;
margin: 8px 0;
display: inline-block;
background-color: black;
opacity: 65%;
color: white;
border: 1px solid #ccc;
box-sizing: border-box;
border-radius: 10px;
}

button {
background-color: #04AA6D;
color: white;
padding: 14px 20px;
margin: 8px 0;
border: none;
cursor: pointer;
width: 250px;
border-radius: 10px;
}

button:hover {
opacity: 0.8;
}

.imgcontainer {
```

```css
    text-align: center;
  }

  img.avatar {
  border-radius: 50%;
  }

  .ayya {
  padding: 16px;
  }
  label{
  margin-left:-400px;

  }
```

```html
</style>
</head>
<body style="background-image: linear-gradient(to right, #ffffff, #ffffff);">
<nav class="navbar navbar-inverse">
 <div class="container-fluid">
 <div class="navbar-header">
 <a class="navbar-brand" href="#"><b>Intelligent Vehicle Damage Assessment and Cost
Estimator for Insurance Companies - LOGIN PAGE</b></a>
 </div>
 <ul class="nav navbar-nav">
 <li><a href="index.html">Home</a></li>
 <li class="active"><a href="login.html">Login</a></li>
 <li><a href="register.html">Register</a></li>
 </ul>
 </div>
</nav><br><br><br><br>
<div style="margin-top:-55px;" class="container">
 <form action="index.html" method="post">
 <div class="imgcontainer">
 <img src="profile.png" height="250px" weight="250px">
 </div>
 <center>
```

```html
<div class="ayya">
<label for="email"><b>EMAIL ID</b></label><br>
<input type="text" placeholder="Enter registered email ID" name="uname" required><br>


<label for="psw"><b>PASSWORD</b></label><br>
<input type="password" placeholder="Enter password" name="psw" required><br><br>


<button type="submit">LOGIN</button><br><br>
</div>
</center>
</form>
</div>
<div class="footer">
<p style="color:white; margin-top: 20px; text-align: center;">
    <b>Copyright @ 2022. All Rights Reserved</b>
</p>
</div>
</body>
</html>
```

4) prediction.html

```html
<!DOCTYPE html>
<html lang="en">
<head>
<title>Home | IBM</title>
<meta charset="utf-8">
<meta name="viewport" content="width=device-width, initial-scale=1">
<link rel="stylesheet"
href="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/css/bootstrap.min.css">
<link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-
awesome/4.7.0/css/font-awesome.min.css">
<script src="https://ajax.googleapis.com/ajax/libs/jquery/3.6.0/jquery.min.js"></script>
<script
src="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/js/bootstrap.min.js"></script>
<style>
.nav.navbar-nav{
```

```html
  margin-left: 280px;
 }
 .navbar-brand{
 font-size: 22px;
 }
 .footer{
 overflow: hidden;
 background-color: #333;
 position: fixed;
 bottom: 0;
 height: 65px;
 width: 100%;
 }
 </style>
</head>
<body style="background-image: linear-gradient(to right, #ffffff, #ffffff);">
<nav class="navbar navbar-inverse">
 <div class="container-fluid">
 <div class="navbar-header">
 <a class="navbar-brand" href="#">
    <b>Intelligent Vehicle Damage Assessment and Cost Estimator for Insurance Companies -
PREDICTION PAGE</b>
</a>
 </div>
 <ul class="nav navbar-nav">
 <li><a href="index.html">Home</a></li>
 <li class="active"><a href="logout.html">logout</a></li>
 </ul>
 </div>
</nav><br><br><br><br>
<div style="margin-top: -45px;" class="container">
 <center>
 <h2 style="font-family:'Franklin Gothic Medium', 'Arial Narrow', Arial, sans-serif;">
    <b>UPLOAD IMAGE TO PREDICT</b>
</h2><br>
 <form action="prediction.html">
 <input style="background-color:black;
```

```
 opacity: 78%;

 color: white;

 font-size: 18px;

 width: 250px;"

 type="file" id="myFile" name="filename">

 <br><br>

 <input style="background-color:black;

 opacity: 78%;

 color: white;

 font-size: 18px;

 border-radius: 18px;

 width: 150px;" type="submit">

 </form>

 <br>

 <h2 style="font-family:'Franklin Gothic Medium', 'Arial Narrow', Arial, sans-serif;" >

    <b> The Estimated cost for the Damage is ...COMING SOON......</b></h2>

 </center>

</div>

<div class="footer">

 <p style="color:white;

 margin-top: 20px;

 text-align: center;">

 <b>Copyright @ 2022. All Rights Reserved</b>

 </p>

 </div>

</body>

</html>
```

5) logout.html

```
<!DOCTYPE html>

<html lang="en">

<head>

 <title>Home | IBM</title>

 <meta charset="utf-8">

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

```html
 <link rel="stylesheet"
href="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/css/bootstrap.min.css">
 <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-
awesome/4.7.0/css/font-awesome.min.css">
 <script src="https://ajax.googleapis.com/ajax/libs/jquery/3.6.0/jquery.min.js"></script>
 <script
src="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/js/bootstrap.min.js"></script>

 <style>
 .nav.navbar-nav{
 margin-left: 180px;
 }
 .navbar-brand{
 font-size: 22px;
 }
 .footer{
 overflow: hidden;
 background-color: #333;
 position: fixed;
 bottom: 0;
 height: 65px;
 width: 100%;
 }
 button{
 background-color: black;
 width: 150px;
 border-radius: 10px;
 }
 </style>

</head>
<body style="background-image: linear-gradient(to right, #ffffff, #ffffff);">
<nav class="navbar navbar-inverse">
 <div class="container-fluid">
 <div class="navbar-header">
 <a class="navbar-brand" href="#"><b>Intelligent Vehicle Damage Assessment and Cost
Estimator for Insurance Companies - LOGOUT PAGE</b></a>
```

```html
    </div>
    <ul class="nav navbar-nav">
    <li class="active"><a href="#">Home</a></li>
    <li><a href="login.html">Login</a></li>
    <li><a href="register.html">Register</a></li>
    </ul>
    </div>
</nav><br><br>
<div style="margin-top: 80px;" class="container">
    <center>
    <h3 style="font-size: 42px;font-family: 'Franklin Gothic Medium', 'Arial Narrow', Arial,
sans-serif;">Successfully Logged Out !</h3><br>
    <b style="font-size:25px; color: rgb(72, 196, 72);">Login for More
Information</b><br><br><br><br>
    <button><a style="color:white;" href="login.html">Login</a></button>
    </center>
</div>
<div class="footer">
    <p style="color:white;
    margin-top: 20px;
    text-align: center;">
    <b>Copyright @ 2022. All Rights Reserved</b>
</p>


    </div>


</body>
</html>
```

6) code.py

```python
from cloudant.client import Cloudant
import os
import tensorflow
from keras.utils import load_img, img_to_array
from werkzeug.utils import secure_filename
import numpy as np
```

```python
from keras.models import load_model
from tensorflow.python.ops.gen_array_ops import concat
from keras.applications.inception_v3 import preprocess_input


#creating the Cloudant Database
client = Cloudant.iam("e7daf895-e20c-411d-96a9-138ab4207f12-
bluemix","ZhX5GTl87jt_HNoJ1OPFgldlCv6m088oFsSzM6wKYq7K",connect=True)
database = client.create_database("my_database")


#load model
model1 = load_model('Model\body.h5')
model2 = load_model('Model\level.h5')


from flask import Flask,render_template,request,redirect,url_for


app = Flask(__name__)


@app.route('/')
def home():
    return render_template('index.html')


#login page setting
@app.route('/login')
def login():
    return render_template('login.html')


@app.route('/afterLogin',methods=['POST','GET'])
def afterlogin():
    user = request.form['_id']
    passw = request.form['psw']
    print(user,passw)


    query = {'_id':{'$eq':user}}


    docs = database.get_query_result(query)
    print(docs)
    print(len(docs.all()))
```

```python
    if(len(docs.all())==0):
        return render_template('login.html',message='The username is not found')
    else:
        if((user==docs[0][0]['_id'] and passw==docs[0][0]['psw'])):
            return redirect(url_for('prediction'))
        else:
            return render_template("login.html",message="Invalid User Details")


#Register page setting
@app.route('/register')
def register():
    return render_template('register.html')


@app.route('/afterRegister',methods=['POST'])
def afterregister():
    x = [x for x in request.form.values()]
    print(x)
    data = {
        '_id':x[1],
        'name':x[0],
        'psw' : x[2]
    }
    print(data)

    query = {'_id':{'$eq' : data['_id']}}
    docs = database.get_query_result(query)

    if(len(docs.all())==0):
        url = database.create_document(data)
        return render_template('register.html', message="Registration is Successfully
Completed")
    else:
        return render_template("register.html", message="You are already a member!")


#prediction
```

```python
@app.route('/prediction')
def prediction():
    return render_template('prediction.html')


#logout page
@app.route('/logout')
def logout():
    return render_template('logout.html')


#results
@app.route('/result', methods = ['GET', 'POST'])
def upload_file():
    if request.method == 'POST':
        f = request.files['_file']
        basepath = os.path.dirname(__name__)
        filepath = os.path.join(basepath,'uploads',f.filename)
        f.save(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.predict(img_data))
        prediction2 = np.argmax(model2.predict(img_data))

        index1 = ['front','near','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"):
```

```python
                value="9000 - 11000 Inr"
            elif(result1=="near" and result2=="minor"):
                value="4000 to 6000 Inr"
            elif(result1=="near" and result2=="moderate"):
                value="7000 - 9000 Inr"
            elif(result1=="near" 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 - 11000Inr"
            elif(result1=="side" and result2=="severe"):
                value="12000 - 15000 Inr"
            else:
                value = "16000 - 50000 Inr"


        return render_template("prediction.html",prediction=value)
if (__name__ == '__main__'):
    app.run(debug=True)
```

GitHub Link –

https://github.com/IBM-EPBL/IBM-Project-7520-1658887086

Project Demo Link –

https://youtu.be/1QE-IHIfus4