INTELLIGENT VEHICLE DAMAGE ASSESSMENT & COST ESTIMATOR FOR INSURANCE COMPANIES.

TEAM ID:PNT2022TMID00736

Submitted by

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In partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

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PANIMALAR ENGINEERING COLLEGE
(An Autonomous Institution)

Guided by

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Department of Computer Science and Engineering,

PANIMALAR ENGINEERING COLLEGE

PANIMALAR ENGINEERING COLLEGE

(AN AUTONOMOUS INSTITUTION)

BONAFIDE CERTIFICATE

Certified that this Project Phase-I report on "**INTELLIGENT VEHICLE DAMAGE ASSESSMENT & COST ESTIMATOR FOR INSURANCE COMPANIES**" is a bonafide work of "SHARATH KUMAR.M,VINOTH KUMAR,RAMKUMAR,RAAGUL.S" who carried out the project work under my supervision.

SUPERVISOR **HEAD OF THE DEPARTMENT**

The project phase-1 report submitted for the viva voice held on ………….

INTERNAL EXAMINER **EXTERNAL EXAMINER**

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CHAPTER-1

INTRODUCTION

1.1 PROJECT OVERVIEW

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

1.2 PURPOSE OF THE PROJECT

In today’s world, Vehicles are increasing heavily. Because of increasing the vehicles, accidents are very common because the peoples are driving a car very fastly on the road. The people claim the money for repair the car through vehicle insurance when the accident happens. Because of incorrect claims, the company behaves badly and doesn’t make payments currently. This happens due to claims leakage, the claims leakage refers to the difference between the amounts secured by the company to the amount that company should have secured based on the claims.

CHAPTER-2

LITERATURE SURVEY

In this literature survey several methods have been proposed for detection of car damage. Srimal et al. [4] proposed a solution which uses 3D Computer Aided Design for the discernment of car damage from the picture, the system only detect damage at edge portion only. Detection of the car damage through CAD software requires some knowledge about the software. S Gontscharov et al [5] ,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. Phyu Mar Kyu et al [3], the proposed system uses deep learning based algorithm are VGG16 and VGG19 damaged car detection in the real world. This algorithm notice the severity of the damaged car based on the location. Finally the author concludes that L2 regularization work greater. Girish N et al [2], the proposed system uses vehicle damage detection technique depends on transfer learning and mask RCNN, The mask regional convolution neural network determines a damaged car by its position and estimate the depth of the damage. A Neela Madheswari et al [1], the proposed system uses convolution neural network is use to accept that image contains a car damage or not. It take as great opportunities to attempt by classifying the car damage into different classes.

2.1 EXISTING SYSTEM

□ In existing they uses 3D Computer Aided Design for the discernment of car damage from the picture, the system only detect damage at edge portion only. Detection of the car damage through CAD software requires some knowledge about the software.

□ Used YOLO algorithm to detect the 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.This algorithm notice the severity of the damaged car based on the location.

□ Used vehicle damage detection technique depends on transfer learning and mask RCNN, The mask regional convolution neural network determines a damaged car by its position and estimate the depth of the damage.

2.2 Problem Statement

Nowadays, a lot of money is being wasted in the car insurance business due to leakage claims. Claims leakage Underwriting leakage is characterized as the discrepancy between the actual payment of claims made and the sum that should have been paid if all of the industry's leading practices were applied. Visual examination and testing have been used to may these results. However, they impose delays in the processing of claims.

Reference: https://miro.com/templates/customer-problem-statement/

CHAPTER-3

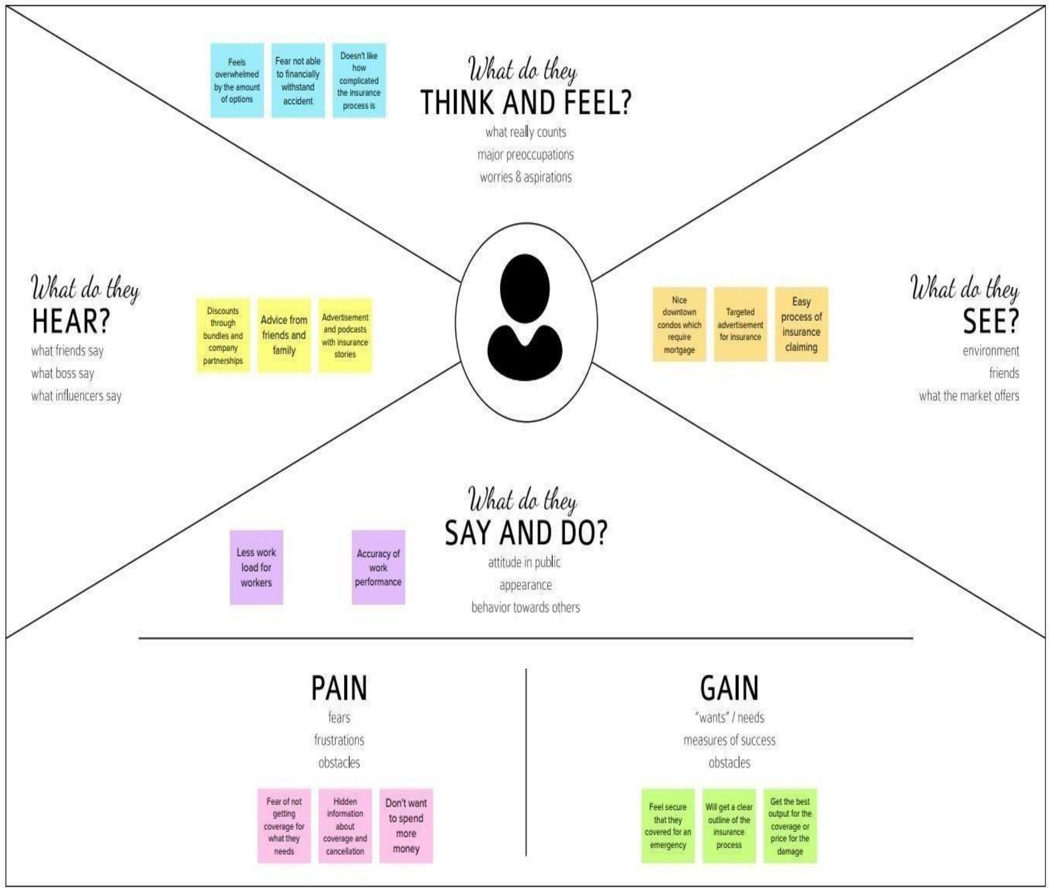
IDEATION AND PROPOSED SOLUTION

3.1 Empathy Map Curve

An Empathy map is a simple, easy to digest visual that captures knowledge about a user behaviours and attitudes.

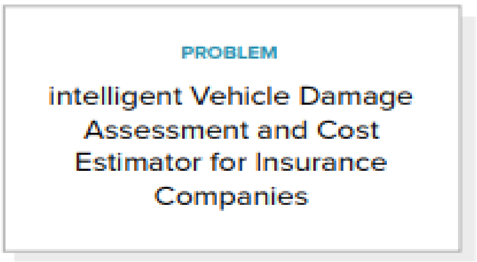
It is a useful tool to helps teams better understand their users.

Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the users perspective along with his or her goals and challenges.


Feels overwhelmed by the amount of options
Fear not able to financially withstand accident
Doesn't like how complicated the insurance process is
What do they
THINK AND FEEL?
what really counts
major preoccupations
worries & aspirations
What do they
HEAR?
what friends say
what boss say
what influencers say
Discounts through bundles and company partnerships
Advice from friends and family
Advertisement and podcasts with insurance stories
Nice downtown condos which require mortgage
Targeted advertisement for insurance
Easy process of insurance claiming
What do they
SEE?
environment
friends
what the market offers
Less work load for workers
Accuracy of work performance
What do they
SAY AND DO?
attitude in public
appearance
behavior towards others
PAIN
fears
frustrations
obstacles
Fear of not getting coverage for what they needs
Hidden information about coverage and cancellation
Don't want to spend more money
GAIN
"wants" / needs
measures of success
obstacles
Feel secure that they covered for an emergency
Will get a clear outline of the insurance process
Get the best output for the coverage or price for the damage

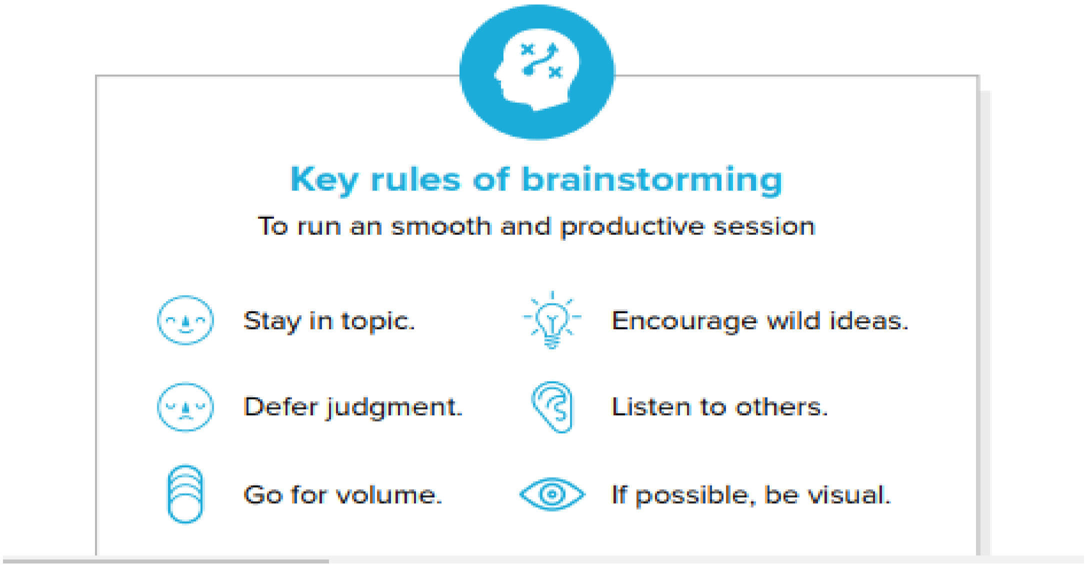
3.2 Brainstorming and ideation

Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions.



PROBLEM

intelligent Vehicle Damage Assessment and Cost Estimator for Insurance Companies



Key rules of brainstorming

To run an smooth and productive session

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

3.3 PROPOSED SOLUTION

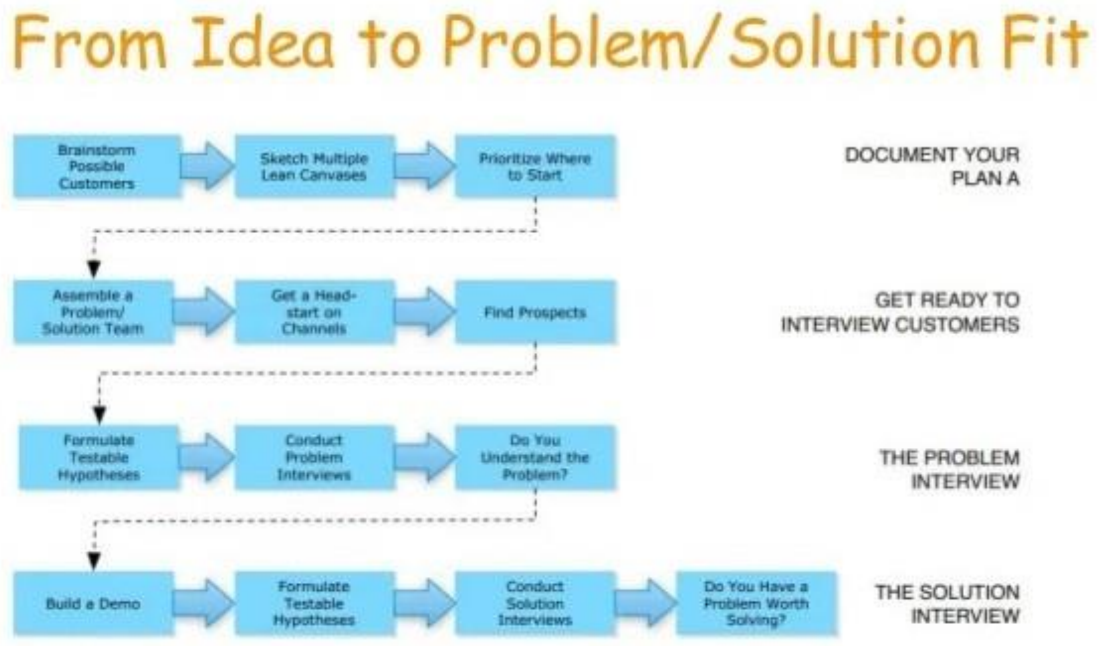
Proposed Solution Template:

Project team shall fill the following information in proposed solution template.

S. No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Insurance firms frequently losses because they are unable to accurately estimate the cost of damaged automobiles and they are unable to calculate the cost of damaged cars precisely, insurance companies regularly incurred losses.
2.	Idea / Solution description	Car damage is automatically identified and classified using Deep Learning and pattern recognition technology.
3.	Novelty / Uniqueness	Automated calculator for the cost of filing an insurance claim.
4.	Social Impact / Customer	Vehicle's damage analysis used to get compensation, submit the created report

	Satisfaction	and Process that saves time and money.
5.	Business Model (Revenue Model)	The Proposed method was implemented using the Convolutional Neural Network feature extraction and damage detection / localization than pre-trained model VGG16.
6.	Scalability of the Solution	It can be used by insurance companies for faster processing of claims and can also be used to underwriting a car loan, especially for a used car.

3.4 PROBLEM SOLUTION FIT



From Idea to Problem/Solution Fit

Brainstorm Possible Customers → Sketch Multiple Lean Canvases → Prioritize Where to Start

DOCUMENT YOUR PLAN A

Assemble a Problem/ Solution Team → Get a Head-start on Channels → Find Prospects

GET READY TO INTERVIEW CUSTOMERS

Formulate Testable Hypotheses → Conduct Problem Interviews → Do You Understand the Problem?

THE PROBLEM INTERVIEW

Build a Demo → Formulate Testable Hypotheses → Conduct Solution Interviews → Do You Have a Problem Worth Solving?

THE SOLUTION INTERVIEW

CHAPTER-4

REQUIREMENT ANALYSIS

4.1 Functional Requirements:

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User details	Users are required to register their personal details. like name, age, date of birth, driving license, car number etc.
FR-4	User requirements	The user simply inputs vehicle damage images. The software will instantly generate an accurate reading of the based on the image detection analysis in a readable format familiar to the customer. It compares the information already given and states the defect percentage and cost in that vehicle damage image.

4.2 Non-functional Requirements

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	More efficient for the frequent users. users can easily understand what the application does and feel satisfied with the system.
NFR-2	Security	• AI powered vehicle damage assessment and cost estimator for insurance company should contain more security in which our data which entered or maintained should be more 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 .
NFR-3	Reliability	This application must perform without failure in 90 percent of use cases during a month.it is more reliable.
NFR-4	Performance	This application supporting 1,050 users per hour must provide 5 seconds or less response time in a desktop browser, including the rendering of text and images, over an LTE connection. The performance of this application is effective and efficient.

NFR-5

Availability

The web dashboard must be available to user’s 99.9 percent of the time every month during business hours EST. Users can access anytime and anywhere.

NFR-6

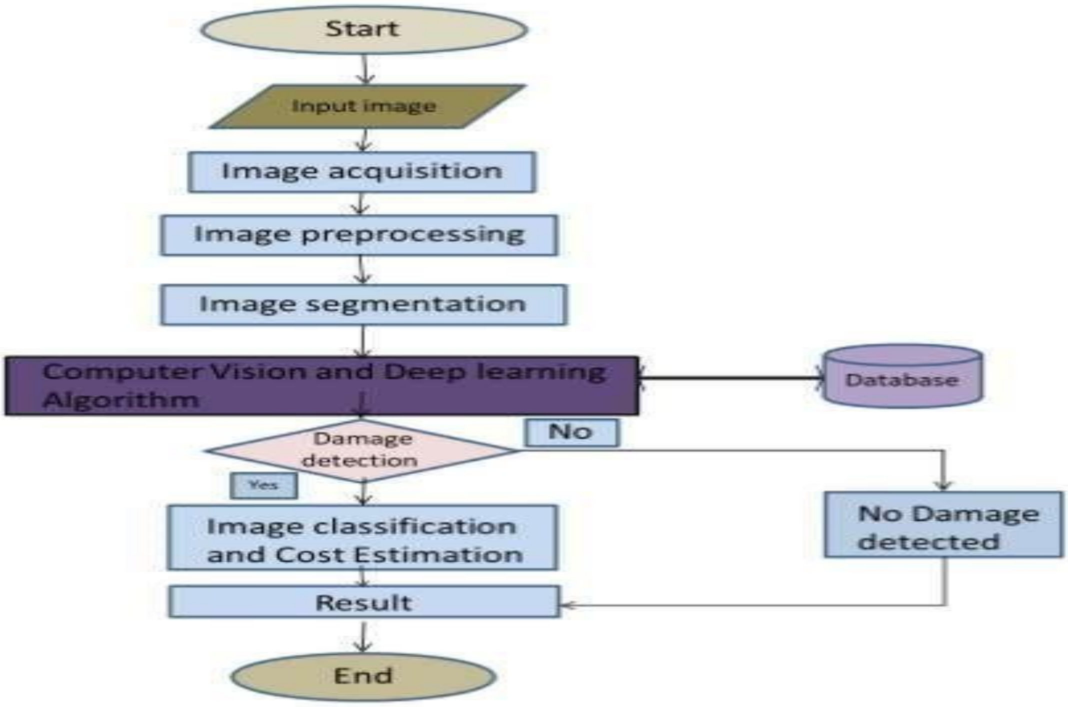
Scalability

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

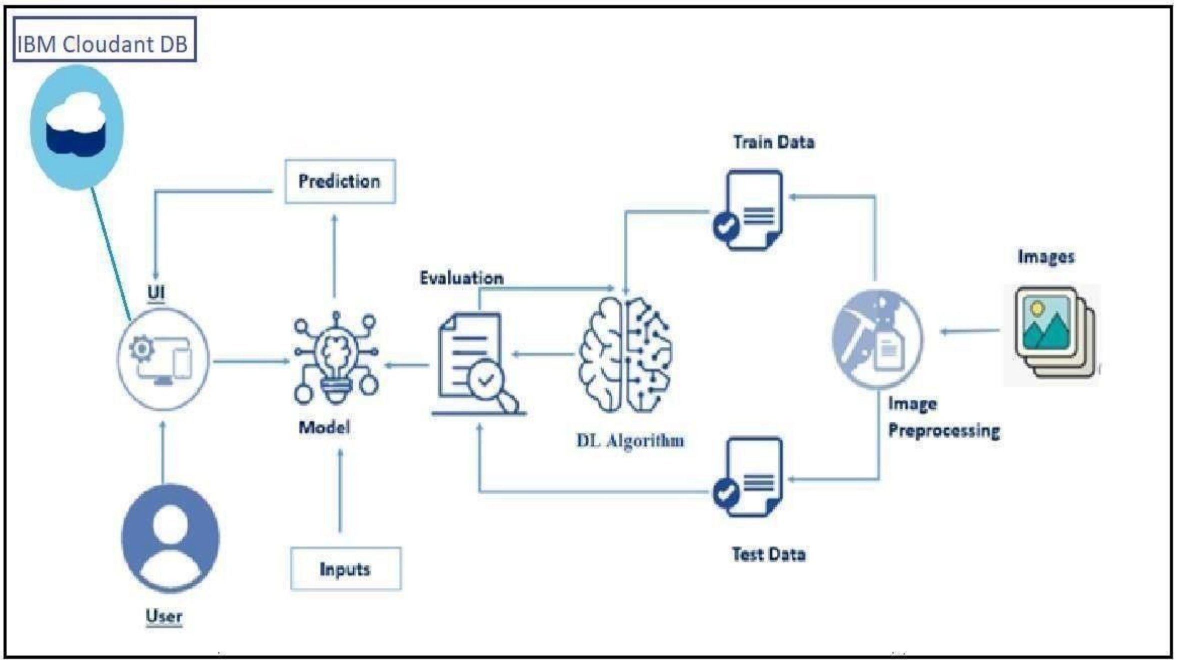
CHAPTER-5

PROJECT DESIGN

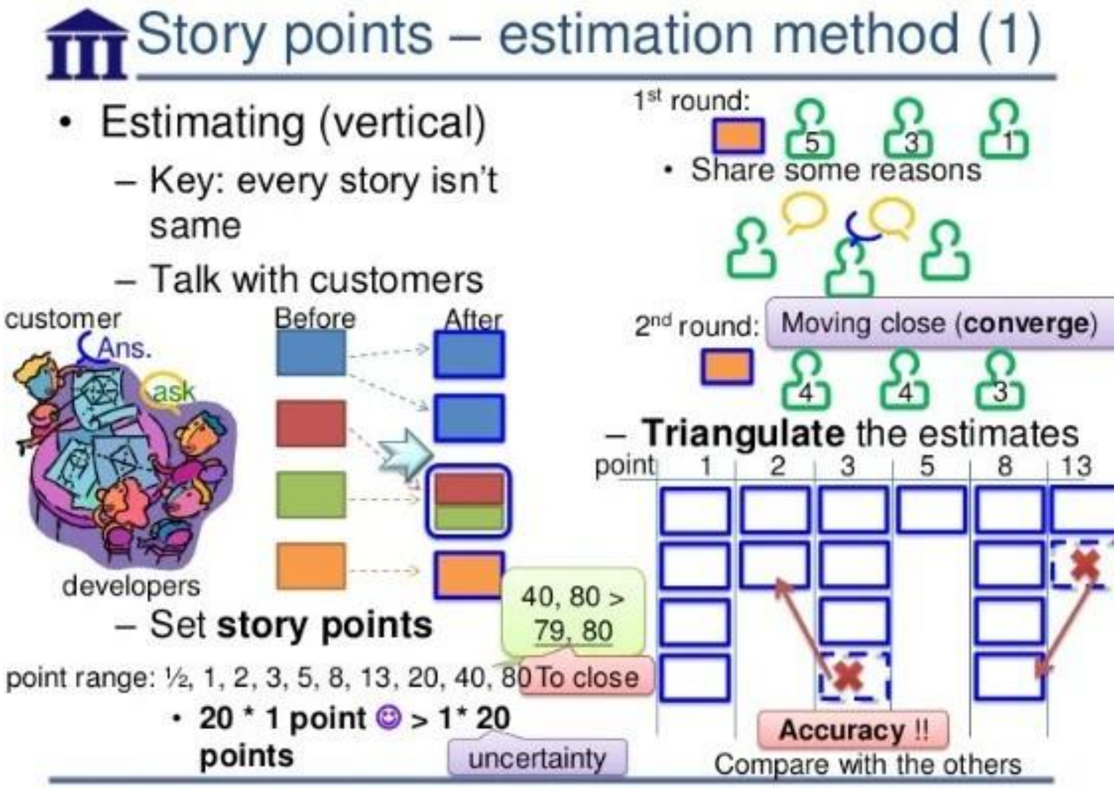
5.1 DATA FLOW DIAGRAMS



5.2 SOLUTION AND TECHNICAL ARCHITECTURE



5.3 USER STORIES



Story points – estimation method (1)

- Estimating (vertical)
  - Key: every story isn't same
  - Talk with customers
  - Set **story points**

point range: ½, 1, 2, 3, 5, 8, 13, 20, 40, 80

- **20 * 1 point** ☺ > **1* 20 points**

1st round:

- Share some reasons

2nd round: Moving close (**converge**)

- **Triangulate** the estimates

Compare with the others

CHAPTER-6

PROJECT PLANNING & DELIVERY SCHEDULE

6.1 Sprint Planning & Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Priority
Sprint-1	Views Prediction	USN-2	VGG16 Model to train and test dataset of car views like rear,side,front view.	High
Sprint-2	Damage Level Prediction	USN-3	Damage level Image dataset of which severe,mild,high damage.	Low
Sprint-3	Damage Amount Calculation	USN-4	Calculating insurance cost for damaged vehicle	Medium

6.2 Sprint delivery & schedule

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Sprint Release Date (Actual)
Sprint-1	20	2 Days	2 Nov 2022	02 Nov 2022	4 Nov 2022
Sprint-2	20	2 Days	4 Nov 2022	05 Nov 2022	6 Nov 2022
Sprint-3	20	2 Days	6 Nov 2022	12 Nov 2022	8 Nov 2022
Sprint-4	20	4 Days	8 Nov 2022	19 Nov 2022	13 Nov 2022

6.3 MODULES

The dataset folder contains two folders one is for car views and another is for damage level prediction which in turn contains folders for test and train . Each folder has the images for different views and damage level of the car.

The Flask folder has all the files necessary to build the flask application

The static folder has the images, style sheets, and scripts that are needed in building the web page.

- Templates folder has the HTML pages.
- Uploads folder has the uploads made by the user.
- Application.py is the python script for server-side computing.
- .h5 files are the model files that are to be saved after model building.
- Five car companies with their famous model’s price and other details are include to find the premium amount.

- The below mentioned are the training and testing notebook.
- Sprint1.ipynb - training and testing of VGG16 model for the car view prediction.
- Sprint2.ipynb- The training and testing of the VGG16 model for the damage level prediction.

IBM folder contains IBM deployment files.

Data Collection:

Create Train and Test folders, each folder having subfolders with car images of different views. We have make use of the image dataset that were posted by Nalaiya Thiran executed by IBM.You can collect datasets from our git hub repository. Two datasets will be used, we will be creating two models one to predict the views of the car image like front, rear and side and second model is to predict the damage level of the car like low, mild and severe.

Image Preprocessing:

Now that we have all the data collected, let us use this data to train the model. Before training the model you have to preprocess the images and then feed them on to the model for training. We make use of Keras Image Data Generator class for image preprocessing.

CHAPTER 7

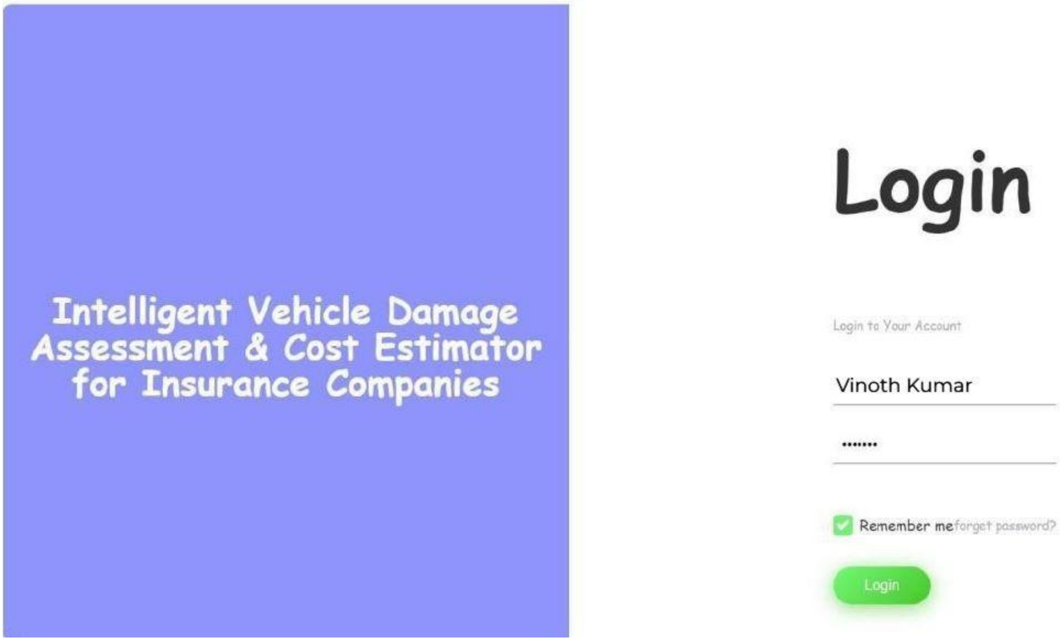
TESTING

7.1 TEST CASES

Test Case Type	Description	Test Step	Expected Result	Status
Functionality	Engine capacity and car model should belongs to the respected company	Input valid model numbers	Model and capacity in the request should be appropriate	Pass
Security	Verify mobile is valid or not	Enter a 10 digit password in accordance with rule	The user's mobile number will be accepted if it address to the rules	Pass
Usability	Ensure that all links are working properly	Have users click on various links on the page	Links will take users to another web page according to the on-page URL	Pass

CHAPTER 8

RESULTS



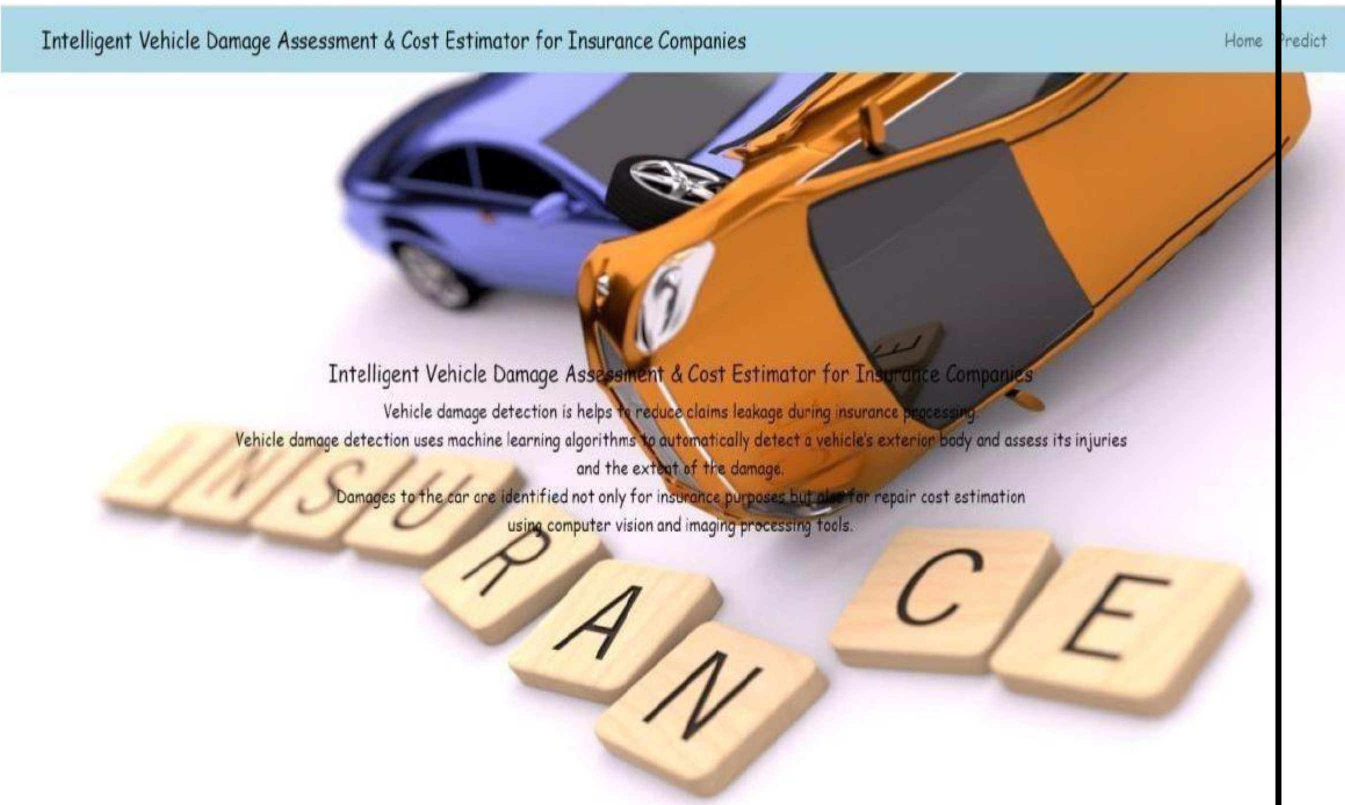
Intelligent Vehicle Damage Assessment & Cost Estimator for Insurance Companies

Login

Login to Your Account

Vinoth Kumar

•••••••



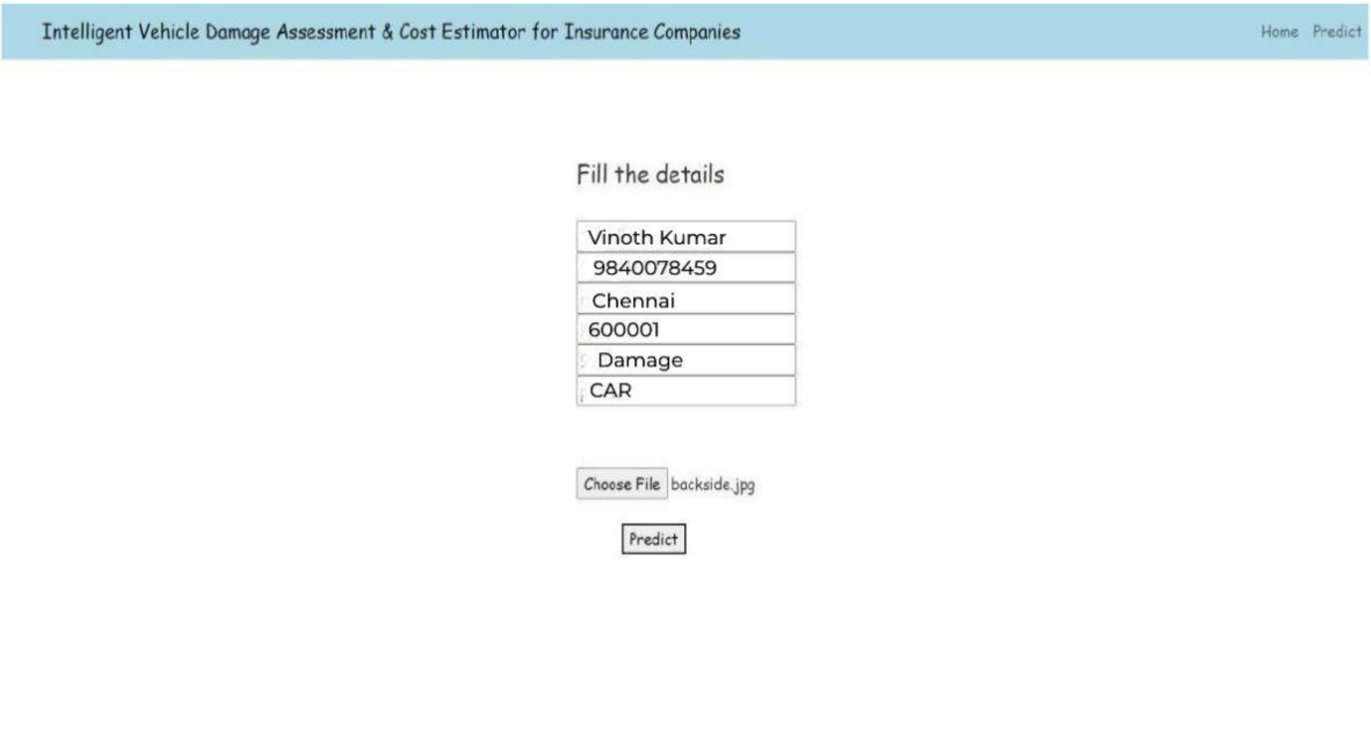
Intelligent Vehicle Damage Assessment & Cost Estimator for Insurance Companies

Intelligent Vehicle Damage Assessment & Cost Estimator for Insurance Companies

Vehicle damage detection is helps to reduce claims leakage during insurance processing.

Vehicle damage detection uses machine learning algorithms to automatically detect a vehicle's exterior body and assess its injuries and the extent of the damage.

Damages to the car are identified not only for insurance purposes but also for repair cost estimation using computer vision and imaging processing tools.



Intelligent Vehicle Damage Assessment & Cost Estimator for Insurance Companies

Fill the details

Vinoth Kumar

9840078459

Chennai

600001

Damage

CAR

backside.jpg

CHAPTER 9

ADVANTAGES &DISADVANTAGES

9.1 Advantages

- Intelligent damage determination system can be used to determine the appearance damage of vehicles in small cases.
- Photographs of target vehicles and multiple trio vehicles were taken and uploaded, intelligent recognition, information input, intelligent recognition and event finalization are completed in accident investigation.
- Damage results including maintenance scheme recommendation and maintenance price recommendation are automatically given according to damage recognition results.

9.2 Disadvantages

- **Coverage failures:** The primary and major disadvantage of car insurance is that your policy does not cover the entire vehicle. Only the specific parts of the car are under damage coverage, the policyholder needs to verify hidden clauses in the document keenly before buying the policy.
- **Time taking Process:** Most insurance companies take a time frame to settle the claim amount, this is the problem most the policyholders are facing.

CHAPTER 10

CONCLUSION

In this project, based on the demand of automobile insurance claims and intelligent transportation, combined with abundant basic data and advanced machine vision algorithm, an intelligent damage determination system of 'Artificial Intelligence + Vehicle Insurance' is constructed. The rapid accumulation of data, the continuous improvement of computing power, the continuous optimization of algorithm models, and the rapid rise of multi-scene applications have made profound changes in the development environment of artificial intelligence. Thus, created a login page to enter the damage vehicle and the model show the result of how much insurance cost want to pay. This help the user to check the amount accurately. This model useful in insurance providing companies.

10.2 FUTURE SCOPE

In 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.

CHAPTER 11

APPENDIX

Building a Model

```
import tensorflow as tf
import os import
numpy as np
from tensorflow.keras.layers import
Input,Flatten,Dense from
tensorflow.keras.models import Model
   from tensorflow.keras.applications.vgg16
         importVGG16
   from tensorflow.keras.models import
         Sequential import
   matplotlib.pyplot as plt import
   gradio as gd from
   tensorflow.keras.utils import
   array_to_img
   from tensorflow.keras.utils import load_img from
   tensorflow.keras.utils import img_to_array
```

2.Image data generator - data preprocessing

```
In[ ]:IMAGE_SIZE=224 BATCH_SIZE=64
train_datagen=tf.keras.preprocessing.image.Image
DataGenerator(rescale=1./255, zoom_range=0.2,
horizontal_flip=True,
validation_split=0.1)validation_datagen=tf.keras.p
```

```
reprocessing.image.ImageDataGenerator(rescale=
1./255, validation_split=0.1)In[ ]:



train="training"
train_genarator=train_datagen.flow_from_director
y(train,
target_size=(IMAGE_SIZE,IMAGE_SIZ
E),
batch_size=BATCH_SIZE) test="validation"
validation_generator=validation_datagen.flo
w_from_directory(test,target_size=(IMAGE_SI
ZE,IMAGE_SIZE),
batch_size=BATCH_SIZE)print("Integer
values of classes:")
train_genarator.class_indicesIMAGE_SIZE=[2
24,224]
vgg=VGG16(input_shape=IMAGE_SIZE+[3],
weights='imagenet',include_top=False)
vgg.output for layer in
vgg.layers:layer.trainable=Falsex=Flatten()(vgg.
output)
prediction=Dense(3,activation='softmax')(x)
model=Model(inputs=vgg.input,outputs=pre
diction)model.summary() # # 4.Train the model
model.compile(loss='categorical_crossentrop y',
optimizer='adam', metrics=['accuracy']) #
```

```
    In[ ]:model.save("train1.h5") fn11='log3.csv'
    history_logger=tf.keras.callbacks.CSVLogge
    r(fn11,separator=",",append=True) # In[91]:
    epoch=10



history=model.fit(train_genarator,
            steps_per_epoch=len(train_genarator),
            epochs=epoch,
            callbacks=[history_logger],
  validation_data=validation_generator,

validation_steps=len(validation_generator)
  plt.plot(history.history["accuracy"])
  plt.plot(history.history['val_accuracy'])
  plt.plot(history.history['loss'])
  plt.plot(history.history['val_loss'])
  plt.title("model accuracy")
  plt.ylabel("Accuracy") plt.xlabel("Epoch")
  plt.legend(["Accuracy","Validation
      Accuracy","loss","Validation Loss"])
  plt.show()
```

5.Test the model

```
from tensorflow.keras.utils import load_img from
tensorflow.keras.utils import img_to_array import
numpy as np from tensorflow import keras
model1=keras.models.load_model("train1.h5")
img_pred=load_img("test/frontside.jpg",targe
t_size=(224,224))plt.imshow(img_pred,
cmap=plt.get_cmap('gray'))
```

```
img_pred=img_to_array(img_pred)img_pred=np.e
xpand_dims(img_pred, axis=0)rslt=
model1.predict(img_pred)print(rslt) print() if
rslt[0][0]>rslt[0][1]:if rslt[0][2]>rslt[0]
[0]:prediction="side image" else:prediction="front
image"else:prediction="rear image"print("VIEW
OF THE CAR IMAGE:")print(prediction)
```

(B)Damage_level_Image_dataset

1.Preprocessing

```
IMAGE_SIZE_damage=224
BATCH_SIZE_damage=32
   train_datagen_damage=tf.keras.preprocessin
        g.image.ImageDataGenerator(
      rescale=1./255, zoom_range=0.2,
      horizontal_flip=True,
      validation_split=0.1)
```

```
validation_datagen_damage=tf.keras.preproc
essing.image.ImageDataGenerator(
    rescale=1./255, validation_split=0.1
)



train_damage="training_damage"
train_generator_damage=train_datagen_damage.fl
ow_from_directory(train_damage,target_size=(IM
AGE_SIZE_damage,IMAGE_SIZE_damage),
batch_size=BATCH_SIZE_damage)test_damage=
"validation_damage"
validation_generator_damage=validation_datagen
_damage.flow_from_directory( test_damage,
target_size=(IMAGE_SIZE_damage,IMAGE_SIZ
E_damage),
batch_size=BATCH_SIZE_damage)print("Integer
values of classes:")
train_generator_damage.class_indices
```

2.VGG16 model

```
IMAGE_SIZE_damage=[224,224]
vgg_damage=VGG16(input_shape=IMAGE_
SIZE_damage+[3],weights='imagenet',in
clude_top=False) vgg_damage.outputfor layer_d
in vgg_damage.layers: layer_d.trainable=False
x_d=Flatten()(vgg_damage.output)
prediction_damage=Dense(3,activation='soft
max')(x_d)model_damage=Model(inputs=vgg_da
mage.input,outputs=prediction_damage)
model_damage.summary()
model_damage.compile(loss='categorical_cr
ossentropy', optimizer='adam',
metrics=['accuracy'])model_damage.save("train2.h
5") fn12='log1.csv'
logger=tf.keras.callbacks.CSVLogger
(fn12,separator=",",append=True)
```

3.Train the model

```
epoch_d=7
history_damage=model_damage.fit(train_gen
erator_damage,steps_per_epoch=len(train_generat
or_da mage), epochs=epoch_d,
callbacks=[logger],validation_data=validation_ge
nerator_da
mage,validation_steps=len(validation_generator_d
a image))
plt.plot(history_damage.history["accuracy"])
plt.plot(history_damage.history['val_accurac
y'])plt.plot(history_damage.history['loss'])
plt.plot(history_damage.history['val_loss'])
plt.title("model accuracy") plt.ylabel("Accuracy")
plt.xlabel("Epoch")
plt.legend(["Accuracy","ValidationAccuracy","los
s","Validation Loss"]) plt.show() from
tensorflow.keras.utils importarray_to_imgfrom
tensorflow.keras.utils import load_img from
tensorflow.keras.utils importimg_to_array from
```

```
tensorflow import keras from tensorflow import
keras model2=keras.models.load_model("train2.h")
import numpy as np
img_pred_1=load_img("test/damage2.jpg",ta
rget_size=(224,224))
plt.imshow(img_pred_1,cmap=plt.get_cmap('gray')



img_pred_1=img_to_array(img_pred_1)
img_pred_1=np.expand_dims(img_pred_1,
      axis=0)
print()
rst=model2.predict(img_pred_1) if
rst[0][0]>rst[0][1]:
    if rst[0][2]>rst[0][0]:
        predicts="low damage" else:
        predicts="mild damage" else:
    predicts="severe damage”
print(rst)
print()
print("DAMAGE LEVEL:")
print() print(predicts)
# # New section --- Test both views and damage
      level of the car
#class_view{0:front,1:rear,2:side}
```

```
#class_damage(0:low,1:mild,2:high) #function---
depreciation and IDV def calcidv(r,v,d):
    if(d==0):
        if(v==0):
            d_dep=0.5*r
        elif(v==1):
            d_dep=0.07*r else:
            d_dep=0.06*r
    elif(d==1):
        if(v==0):
            d_dep=0.12*r
        elif(v==0):
            d_dep=0.14*r else:
            d_dep=0.15*r
    elif(d==2):
        if(v==0):
            d_dep=0.17*r
        elif(v==1):
            d_dep=0.18*r else:
            d_dep=0.20*r
    print("DEPRECIATION_RATE ",d_dep)
    idv_idv=r-d_dep
```

```
print("IDV ",idv_idv) return
idv_idv
#funtion------price def
calculate(c,m,e,f):if(model=
="tata" and
m=="tiago")price=649000
return price
else:
if(f=="cng"): price=296661
return price


   else:
      price=292667
      return price
if(c=="renault" and m=="triber"):
   price=559000
   return price
else:
   if(e==999):
      price=470990
      return price
   else:
      price=413290
      return price
if(c=="dutsan" and m=="go"):
        price=528464
        return price
    else:
        if(e==999):
            price=43765
            return price
        else:
            price=351832
            return price
    if(c=="hyndai" and f=="cng"):
        price=547990
        return price
    else:
        price=503990
        return price

#function ---- premium amount calculator def
calculator(i):
    print("TOTAL PREMIUM AMOUNT:")
    own_damage=0.01970*i
    ncb_discount=0.2*own_damage
    od_premium=own_damage-ncb_discount
    net_premium=od_premium+100+50+1110
    gst=0.16*net_premium
    premium=gst+net_premium print("premium
    amount",premium) return premium
    class_names=["front","rear","side","high","lo
    w","severe"]                    def
    predict_model(img):#load model from
    tensorflow import keras
    model3=keras.models.load_model("train1.h5")
    from tensorflow import keras
    model4=keras.models.load_model("train2.h5")
    img=img_to_array(img)
    img=np.expand_dims(img, axis=0) result1=
    model3.predict(img) return{class_namwe}
    print("__________________") print()
    result2=model4.predict(img)



    if result2[0][0]>result2[0][1]:
      if result2[0][2]>result2[0][0]:
      predict="severe damage"
      class_damage=2 else:
        predict="mild damage" class_damage=1

    else:
      predict="low damage" class_damage=0

return class_views,class_damage
# Premium amount calculation
models=["tiago","nano_genx","triber","
kwid","go","redi_go","santro"]
```

```
dictc={"tata":("tiago","nano
genx"),"renault":("triber","kwid"),"dats
un":("go","redi_go"),"hyndai":("santro")
}
dengine={"tiago":("1199"),"nano":("64
"),"kwid": ("999","799"),
"triber":("999"), "go":("1198"),"redi":
("999","799"),"san
tr o":("1086")} #fuel type
cng={"nano_genx","santro",""} #------
getting input from user--------


  def premium(img,cmp_name,model,engine,f
       uel_type):
  #-----------verfication--entered company and other
  details were real----------------#----------function
  calling --------------------- if cmp_name in
  dictc.keys(): l=list(dictc[cmp_name]) verify+=1 if
  model in l:
            if(dengine[model]=="kwid"):
l_eng=list(dengine[model])
            else:
l_eng=str(dengine[model])
```

```
        verify+=1 if engine in
        l_eng: verify+=1 if
        fuel_type=="cng":
                if model in cng: verify+=1
                    print("verified")

  rate=calculate(cmp_name,model,engine,f
  uel_type)
                    print("PRICE OF THE
  CAR:",rate)

  idv=calcidv(rate,class_view,class_damag e)
  premium=calculator(idv)
            else:

                verify+=1 print("")

  rate=calculate(cmp_name,model,engine,f
  uel_type)
                print("PRICE OF THE CAR:",rate)

  idv=calcidv(rate,class_views,class_dama ge)
  premium=calculator(idv)
        else: p#----------mainfunction---------

#______variables_________
```

```
          models=["tiago","nano_genx","triber","k
          wid","go","redi_go","santro"]
        dictc={"tata":("tiago","nano
          genx"),"renault":("triber","kwid"),"datsun
          ":("go","redi_go"),"hyndai":("santro")}
        dengine={"tiago":("1199"),"nano":("624"),
          "kwid": ("999","799"), "triber":("999"),
          "go":("1198"),"redi":("999","799"),"santr
          o":("1086")} #fuel type
          cng={"nano_genx","santro",""}

        #------getting input from user-------
        print("Enter car details:")
        cmp_name=input() model=input()
        engine=str(input()) fuel_type=input()
        verify=0

        #-----------verfication--entered company and
        other details were real----------------#----------
        function calling________________
          --
        if cmp_name in dictc.keys():
            l=list(dictc[cmp_name])
            verify+=1 if model in l:
                if(dengine[model]=="kwid"):
l_eng=list(dengine[model])
```

```
        else:
l_eng=str(dengine[model])
        verify+=1 if engine in
        l_eng: verify+=1 if
        fuel_type=="cng":
            if model in cng: verify+=1
              msg="verified"

     rate=calculate(cmp_name,model,engine,f
     uel_type)

     idv=calcidv(rate,class_view,class_damag e)
     premium=calculator(idv) msg = "verified"
     return msg

          else:
            verify+=1

     rate=calculate(cmp_name,model,engine,f
     uel_type)

     idv=calcidv(rate,class_views,class_dama ge)
            premium=calculator(idv)
            msg="verified" return
            msg

        else:
```

```
msg="please enter the valid engine

          capacity" return
            msg else:
msg="please enter the valid model

          name" return
                msg


        else:

            msg="sorry!! <<<your car comany

          detail is not available>>>"

            return msg
```

FRONT END-PREDICT THE MODEL:

```
<!DOCTYPE html>

<head>

    <!-- CSS only -->

<link
href="https://cdn.jsdelivr.net/npm/bootstrap@5.2.2/dist/css/bootstrap.min.css"
rel="stylesheet" integrity="sha384-
Zenh87qX5JnK2Jl0vWa8Ck2rdkQ2Bzep5IDxbcnCeuOxjzrPF/et3URy9Bv1W
TRi" crossorigin="anonymous">

<!-- JavaScript Bundle with Popper -->

<script
src="https://cdn.jsdelivr.net/npm/bootstrap@5.2.2/dist/js/bootstrap.bundle.min.j
s" integrity="sha384-
OERcA2EqjJCMA+/3y+gxIOqMEjwtxJY7qPCqsdltbNJuaOe923+mo//f6V8Qb
sw3" crossorigin="anonymous"></script>

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

</head>
```

```
<body style="background-color: white;">
    <div>
    <nav class="navbar navbar-expand-lg navbar-light" style="background-color: lightblue;">
        <a class="navbar-brand" href="#" style="margin-left: 60px; color:black; ">Intelligent Vehicle Damage Assessment & Cost Estimator for Insurance Companies</a>
        <button class="navbar-toggler" type="button" data-toggle="collapse" datatarget="#navbarNavAltMarkup" aria-controls="navbarNavAltMarkup" ariaexpanded="false" aria-label="Toggle navigation">
          <span class="navbar-toggler-icon"></span>
        </button>
        <div class="collapse navbar-collapse" id="navbarNavAltMarkup">
          <div class="navbar-nav">
            <a class="nav-item nav-link" href="login.html" style="margin-left: 350px;">Home <span class="sr-only"></span></a>
            <a class="nav-item nav-link" href="predict.html">Predict</a>


          </div>
        </div>
      </nav>
    </div>


<br><br><br><br>
    <head>
    <link class="jsbin" href="http://ajax.googleapis.com/ajax/libs/jqueryui/1/themes/base/jquery-ui.css" rel="stylesheet" type="text/css" />
    <script class="jsbin" src="http://ajax.googleapis.com/ajax/libs/jquery/1/jquery.min.js"></script>
    <script class="jsbin"
src="http://ajax.googleapis.com/ajax/libs/jqueryui/1.8.0/jqueryui.min.js"></scri
pt>
    <meta charset=utf-8 />
    <script src="predict.js"></script>
    <title>Predict</title>
    <!--[if IE]>
     <script src="http://html5shiv.googlecode.com/svn/trunk/html5.js"></script>
    <![endif]-->
    <style> article, aside, figure, footer, header,
      hgroup, menu, nav, section { display:
      block; }


    </style>
    </head>
    <div>
    <body class="one">


        <div style="margin-left: 450px; background-image:
'images/backg.jpg' ;width: 600px; height: 500px;" >


            <h4 style="margin-left:200px">Fill the details </h4>
        </br>
            <div class="inputs">
              <input type="text" style="margin-left: 200px;" placeholder="user
name">
              </br>
              <input type="text" style="margin-left: 200px;" placeholder="comtact number">
              </br>
              <input type="text" style="margin-left: 200px;"" placeholder="Car company">
              </br>
              <input type="text" style="margin-left: 200px;"" placeholder="Car model">
              </br>
              <input type="text" style="margin-left: 200px;"" placeholder="Engine capacity">
              </br>
              <input type="text" style="margin-left: 200px;" placeholder="Fuel type">
              <input type='file' onchange="readURL(this);" style="margin-left: 200px; margin-top: 60px;">
              </br>
</br><a href="predicte.html"><button style="margin-left: 250px;">Predict</button></a></div>
</body></body> </html>
```