

# Intelligent Vehicle Damage Assessment & Cost Estimator For Insurance Companies

Category: Artificial Intelligence

## A PROJECT REPORT

*Submitted by*

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Of

## UDAYA SCHOOL OF ENGINEERING KANYAKUMARI Dist

*In fulfillment of project in IBM-NALAYATHIRAN 2022*

*Team Id : PNT2022TMID52056*

### PROJECT GUIDES

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**Faculty Mentor : MICHAEL REVINA I**

## ACKNOWLEDGEMENT

A successful man is one who can lay a firm foundation with the bricks others have thrown at him.—*David Brinkley*

We are indebted to our Head of the Department Mrs.D.K.KALAIVANI for her support during the entire course of this project work. We express our gratitude and sincere thanks to our guide Dr.I.MICHAEL REVINA for her valuable suggestions and constant encouragement for successful completion of this project. Our sincere thanks to our project industrial mentor **Swathi** for her kind support in bringing out this project.

## **ABSTRACT**

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

The aim of this project is to build a VGG16 model that can detect the area of damage on a car. The rationale for such a model is that it can be used by insurance companies for faster processing of claims if users can upload pics and the model can assess damage( be it dent from scratch) from and estimate the cost of damage. This model can also be used by lenders if they are underwriting a car loan, especially for a used car.

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## **1. INTRODUCTION**

The project "Intelligent Vehicle Damage Assessment and Cost Estimator for Insurance Companies" is a responsive web application powered by artificial Intelligence and IBM Watson Cloud. Vehicle damage detection is used to reduce claims leakage during insurance processing. Visual inception and validation are usually done. As it takes a long time, because a person needs to come and inspect, Here we are trying to automate the procedure. Using this automation, we can avoid time conception for the insurance claim. An attractive front end can be developed using HTML and CSS. The pages such as Index.html , login.html, logout.html, register.html and prediction.html are created and embedded with the IBM cloud database using a python framework called flask.

The web application takes the image input and estimates the cost for the insurance companies based on the damages in the car. The user can register and the data of the user is saved in the database of the IBM cloud, during the time of login, the login ID is compared with the ID in the database and allows the user to the next page. The Deep Learning model is built using the VGG16 which is present in the keras library and the model is trained with the images of multiple cars with various level cum types of damages. The model is deployed in the back-end using the flask and the prediction.html page is setted to collect the image from the user. The rationale for such a model is that it can be used by insurance companies for faster processing of claims if users can upload pics and the model can assess damage( be it dent from scratch) from and estimate the cost of damage. This model can also be used by lenders if they are underwriting a car loan, especially for a used car.

## **2. LITERATURE SURVEY**

<b>TITLE</b>	<b>AUTHOR</b>	<b>TECHNIQUES</b>	<b>MERITS</b>	<b>DEMERITS</b>
Car Damage Detection using Machine Learning	Girish N , Mohammed Aqeel Arshad	Transfer learning and a mask regional convolutional neural network (Mask RCNN)	The results were quite accurate even though a small dataset was used	the picture object regional mismatch problem
Image Based Automatic Vehicle Damage Detection	Srimal Jayawardena A thesis submitted for the degree of Doctor of Philosophy at The Australian National University	Monocular 2D/3D pose estimation 3D model-assisted segmentation Reflection detection	The project explores the problem of automatically detecting mild damage in vehicles using photographs taken at the scene of the accident.	This thesis proposes a solution which uses 3D Computer Aided Design for the discernment of car damage from the picture, the system only detects damage at the edge portion only. Detection of car damage through CAD software requires some knowledge about the software.
Damage Assessment of a vehicle and Insurance Reclaim	Vaibhav Agarwal , Utsav Khandelwal, Shivam Kumar , Raja Kumar , Shilpa M	Convolution Neural Network, Deep Learning, Image classification, RCNN and object detection.	It can categorize the proportion of damaged parts and determine whether they need to be replaced or repaired.	It only identifies the physical visible damage and not of the internal or the interior damage.

Car Damage Assessment Based on VGG Models	Phyu Mar Kyu, Kuntpong Worartpanya	Deep Learning, Transfer Learning, Pre-Trained VGG models	It uses very small receptive fields instead of massive fields.	It is a huge network, which means that it takes more time to train its parameters.
Assessing Car Damage with Convolutional Neural Networks	Harit Bandi, Suyash Joshi, Siddhant Bhagat, Amol Deshpande	Image recognition, Image Net, Transfer learning, Convolution Neural Network	The epoch number for the best performance of validation accuracy	Large training data needed

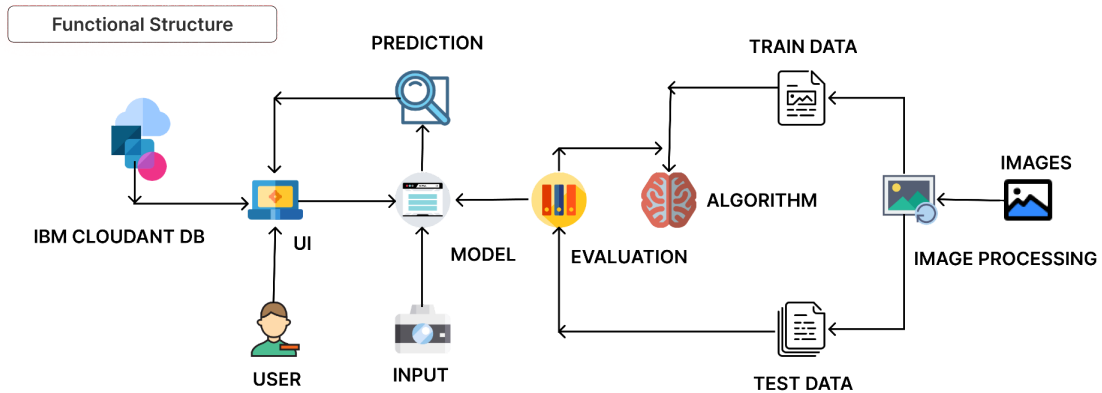
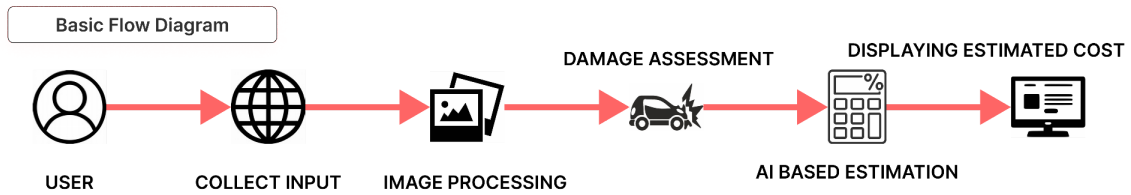
### **3. PROPOSED SOLUTION**

<b>S.No.</b>	<b>Parameter</b>	<b>Description</b>
1.	<b>Problem Statement (Problem to be solved)</b>	<p>There is always a risk of these assets being destroyed due to incidents beyond human control. 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. They also may not work due to such events. Depending on the asset class, the type and weight of risk also vary. This is where insurance policies are useful. The problem that might arise is that the claimant may not know the amount of coverage that he/she has.</p>
2.	<b>Idea / Solution description</b>	<ul style="list-style-type: none"><li>● To develop an optimized and accurate deep learning architecture to detect the damage percentage and location of the damage with respect to the vehicle</li><li>● Implementing classification algorithms to classify damaged regions and implementing the model in web based application</li><li>● Create a user accessible portal and securely store the data provided by the user</li><li>● Compare the obtained damage percentage with the statistical cost estimation value to predict the cost.</li></ul>
3.	<b>Novelty / Uniqueness</b>	<p>Intelligent damage determination systems can be used to determine the appearance damage of vehicles in small cases. The system completes the whole process of survey and damage determination through four functions. They are Accident investigation, Intelligent image damage assessment, Damage result output and Vehicle insurance anti-fraud</p>



4.	<b>Social Impact / Customer Satisfaction</b>	Then at last it generates a detailed report on analysis of the automobile and use this to claim one's reimbursement with the insurance company
5.	<b>Business Model (Revenue Model)</b>	<ul style="list-style-type: none"> <li>• The business model will be a freemium model providing the prediction of damage intensity which will be useful for the vehicle owners to keep track of their vehicle damage and the credentials to access the webpage can be provided on the purchase of the vehicle insurance.</li> <li>• The add-on subscription model can be initiated for the user where the damage cost is evaluated and provided to the users.</li> </ul>
6.	<b>Scalability of the Solution</b>	It segregates the pictures based on 2 factors which are replace and repair. i.e. if the damage percentage exceeds say 80% then the damaged part has to be replaced, whereas in the other case "Replace" even in this case it calculates the reimbursement amount based on its damaged percentage

## 4. TECHNOLOGY ARCHITECTURE & STACK



### Components & Technologies:

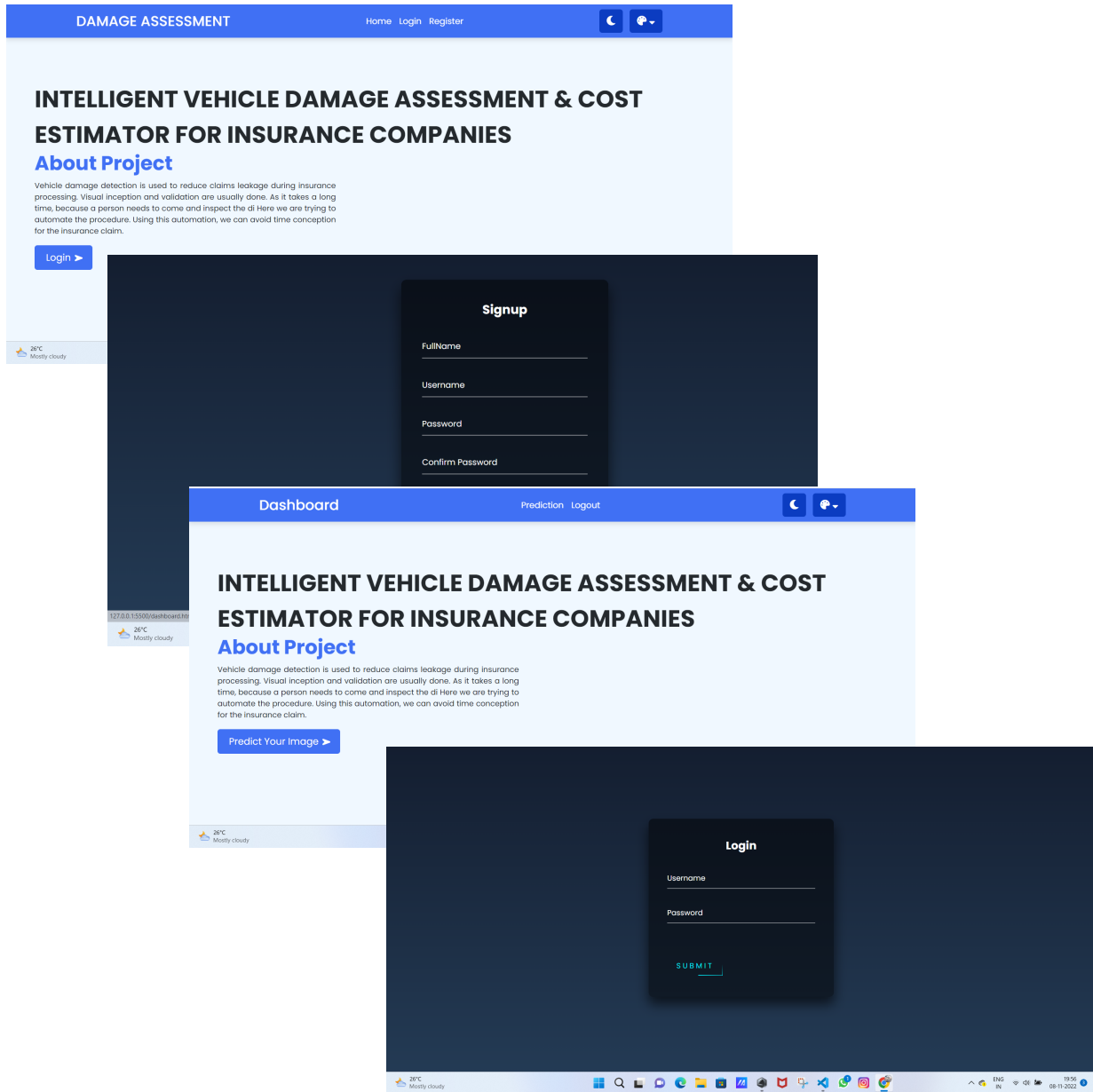
S. No	Component	Description	Technology
1.	<b>User Interface</b>	The user interacts with the web application	HTML, CSS, Python
2.	<b>Application Logic-1</b>	Gets the user input image	Python
3.	<b>Application Logic-2</b>	Obtaining model output for damage prediction	IBM Watson , Python
4.	<b>Application Logic-3</b>	Obtaining model output for cost estimation	IBM Watson , Python
5.	<b>Database</b>	Data Type – Details of images and user inputs is stored	MySQL, Js, IBM DB2
6.	<b>Cloud Database</b>	A database service in the cloud	IBM DB2, IBM Cloudant etc.
7.	<b>File Storage</b>	User details and user input received The images of the vehicle are stored in the cloud	IBM Block Storage or Other Storage Service or Local Filesystem
8.	<b>Machine Learning Model</b>	The purpose of the AI model is to estimate the cost of the damaged vehicle.	Object Recognition Model, CNN Based model, etc.
9.	<b>Infrastructure (Server / Cloud)</b>	Let's use the AI model on the cloud server Using Flask on a Web Page	Local, Cloud Foundry, Kubernetes, Python Flask etc.

### Application Characteristics:

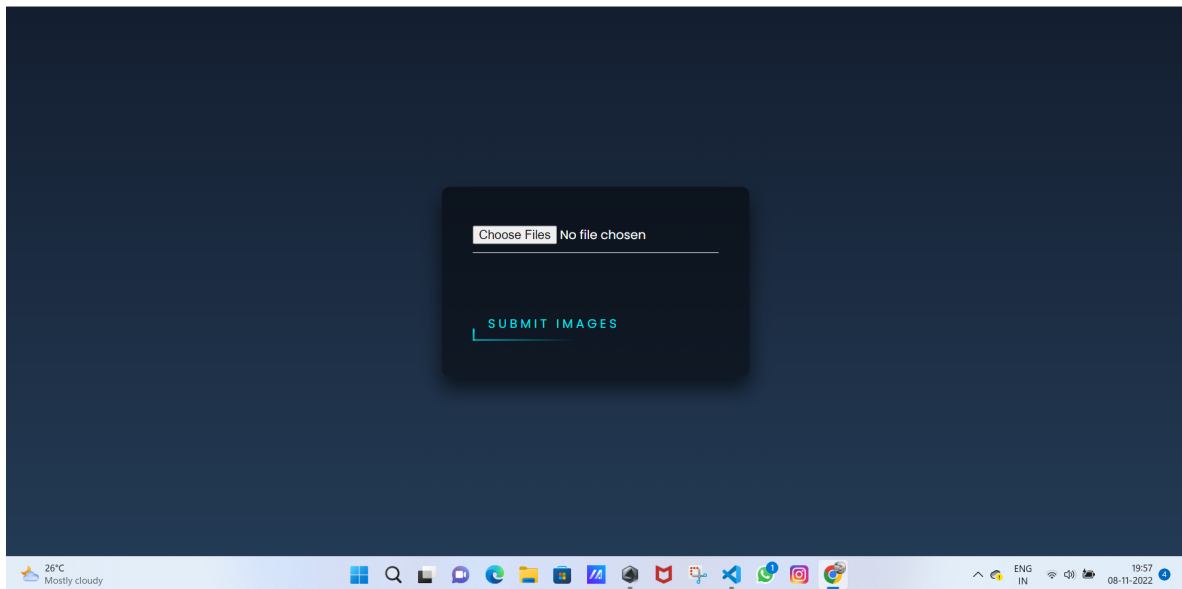
S.No	Characteristics	Description	Technology
1.	<b>Open-Source Frameworks</b>	IBM Watson open source frameworks are used	Open source architecture technology IBM Watson
2.	<b>Security Implementations</b>	IBM Cloud	certified Watson Assistant Encrypted file systems are encrypted Storage systems, key management systems.
3.	<b>Scalable Architecture</b>	Web Server - Static and dynamic website content Existing on the website will be updated accordingly User requests and suggestions Application Server - Basic Upgrade Integrating website functionality and updates The logic in the website can be done	IBM Watson Assistant, Python, MySQL
4.	<b>Availability</b>	The AI model is readily available to users any time	IBM Watson Cloud assistance
5.	<b>Performance</b>	IBM Watson - Automated processes, deep The learning model is trained using IBM Watson Studio For better performance and faster access.	IBM Watson Assistant

## 5. RESULT AND CONCLUSION

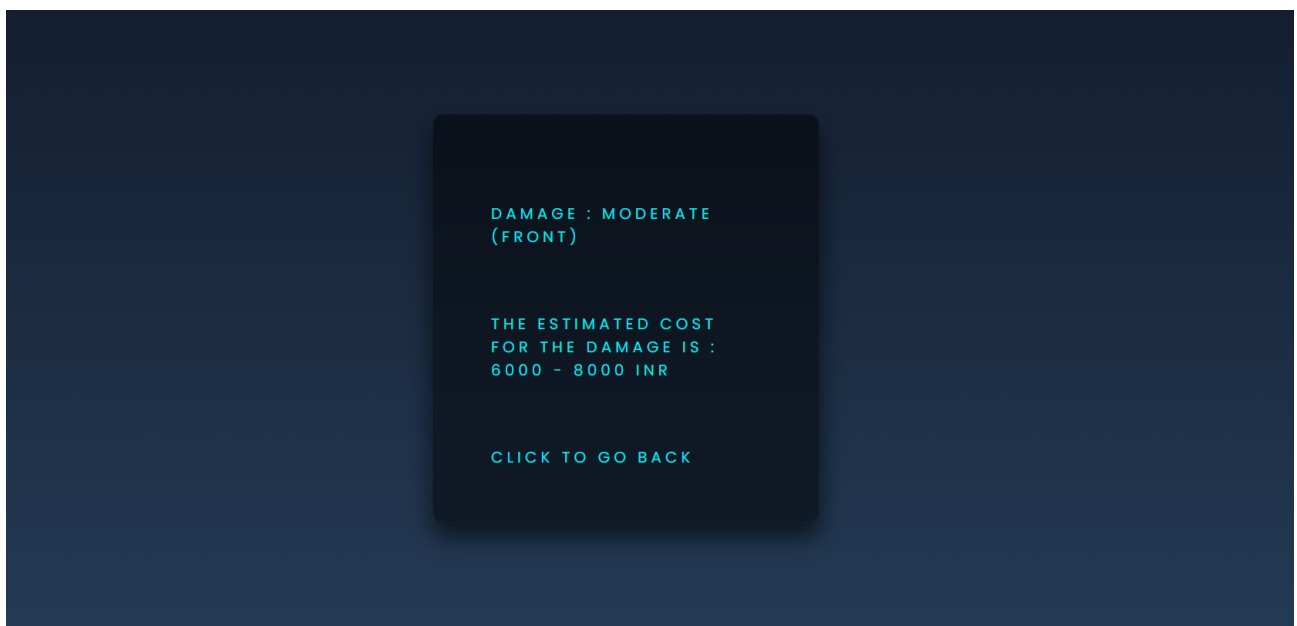
### Website templates :



## Prediction :



## Result after prediction of Vehicle damage :



**Conclusion :**

**We conclude with our report by suggesting this application since it has high accuracy in analysis and responsiveness. It is also accurate in estimating the insurance cost of the damaged vehicle. The model is deployed in the back-end with the high quality User Interface in the front-end to ensure the proper reach to the user. The IBM cloud used here is one of the secured databases and the privacy of the user is maintained. This project can also be used as modules in any other big products.**