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Insurance Management with Premium Prediction

Preet Jayendrakumar Modi[1], Vraj Jatin Naik[2],
[1, 2]*Dharmsinh Desai University*

Abstract: ***Insurance Management with Premium Prediction system is a web application which is developed for tracking the details of the insurance policy, customer details and company details. This web site is an online insurance Analysis and information management system that provides easy access to information regarding the people and resources of insurance.***
Users can view their own personal details when login into the Policy Holder module. This project is useful for any kind of insurance company to manage the insurance details, to sanction the insurance for customers, process the insurance policy details and all kinds of insurance processes online. The Insurance management system is a complete solution for organizations, which need to manage insurance for their vehicles, equipment, buildings, and other resources. This insurance management website has facilities like search tools for insurance awareness articles, guidelines, illustrations through images for visitors.
This insurance management system can efficiently manage the company, records, provides instant access and one that improves productivity. In this online process the user enters into the website it will show details about insurance and its types, also it will show the details about different duration schemes to the corresponding insurance type or insurance policy. The main objective of the developed system is to allow admin users to register insured persons with their name, date of birth, residence address, medical history and also policy details.

I. BACKGROUND AND MOTIVATION

A. Current System

The Insurance Management System is used to efficiently manage policies of different clients along with their data. From the types of policies to the premium of individual one all of these are managed by this system.
The current System is a little bit complicated as per user perspective because customers have to contact the client for any information related to the policy.Also insurance company employee used to retrieve information by manually checking all the policy of all the customers even if required for the particular one.

B. Objectives Of The Proposed System

1) Automate and facilitate the process of managing the Policies and effectively retrieve data from the system.
2) Reduce Data Redundancy.
3) To reduce the Cumbersome job of maintaining several Documents.
4) Faster Searching of Information
5) To Give Assurance to the policyholder about maintaining Data Privacy and Security.
6) Making System User Friendly by reducing complexity of current one.
7) Also information for agents like how many policies are sold by them by writing just one line query.

C. Advantages Of The Proposed System

1) The proposed system is to computerize the agent and the client department for various purposes.
2) In the existing system end users have to remember some complex process for retrieving data from the database. So most of the customers preferred to contact agents for that. In the current system we make the system user friendly so clients can easily retrieve data without help of an agent and also agents can focus more on selling policies rather than helping clients for retrieving some basic information.
3) We also add privacy and security to the data of customers.
4) It also protects the insurance company against false claims.
5) This system also helps management for decision making.

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D. Core Functional Requirements

R.1 CUSTOMER
R.1.1 REGISTER
Description : Customers have to register first if they are new to the system for online libraries.
Input : Personal Details (Eg: Name , Address , Mobile No, Email Id)
Output :Confirmation Mail.

R.1.2. LOGIN
Description : The user needs to first login in the application.
Input : Username and Password.
Output : Home screen.

R.1.3 FORGOT PASSWORD
Description : If a Customer forgets his/her password then he/she can also recover it.
Input : Opens link in registered email and then enters new password.
Output : Password changed successfully.

R.1.4 SEARCH POLICY
Description : Customers will search policy according to different criteria.
Input : Customer will select category for searching policy.
Output : Shows policy according to category selected.

R.1.4.1 SEARCH POLICY BY AGE:
Description : Customers will search books by author name.
Input : Customers need to write the age.
Output : Shows all policy according to age.

R.1.4.2 SEARCH POLICY BY POLICY NUMBER.
Description : Customers will search POLICY by POLICY number
Input : Customers need to write POLICY numbers of policy.
Output : Shows the books having that POLICY number.

R.1.4.3 SEARCH POLICY BY NAME
Description : Customers will search policy by name..
Input : Customers need to write policy name.
Output : Shows all policies having that name.

R.1.4.4 SEARCH POLICY BY PREMIUM
Description : Customers will search policy by premium .
Input : Customers need to write the expected premium amount of the policy.
Output : Shows the policy fixed in that range.

R.1.5 PAYMENT
Description : Customers can do premium payment which will be auto generated by System .
Input : Customers will select a type payment of choice and can pay the amount.
Output : directed to the page of the payment broker site(Here:Paytm).

R.1.6 POLICY COMPARATOR:
Description : Customers can compare policy.
Input : Customers will compare policies .Policy Comparator can compare imp details within two policies.
Output : Comparison Of Two Policies entered by Customer.

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R.1.7 DOWNLOAD FORM:
Description : Customers can download different forms .
Input : select the form to be downloaded
Output : Form will be downloaded.

R.1.8 VIEW ABOUT US :
Description : Customers can view company stakeholders.
Input : Visit About us Page.
Output : Company Details will be generated.

R.1.8 NEW POLICY :
Description : Customers can apply for a new policy.
Input : Customer details like age,income,etc along with filled soft copy of form to be uploaded.
Output :Application status will be shown.

R.1.10 PREMIUM PREDICTOR (USING MACHINE LEARNING) :
Description : Customers can predict their premiums.
Input : Customers will enter their details(age,sex,smoker,no.of children, etc)
Output : Premium will be predicted as per input details entered by the Customer using ML.

R.1.11 LOGOUT
Description : Customers can log out of the system.
Input : Log Out.
Output : Customers will be logged out of the system.

R.3 ADMIN

R.3.1. LOGIN
Description : The Admin needs to login in the application.
Input : Username and Password.
Output : Home screen.

R.3.2. PROVIDE AUTHENTICATION
Description : The Admin authenticate the details entered by the Customer(username and password) as well as Agent(username and password).

R.3.3. ADD/REMOVE POLICY
Description : The Admin can add or remove policies from the system.

R.3.4. ADD/REMOVE CUSTOMER
Description : The Admin can add or remove Customers from the System.

R.3.5. GENERATE PREMIUM PAYMENT
Description : The Admin can generate premium payment for Customers from the System.

R.3.6. LOGOUT
Description : Admin can log out of the system.
Input : Log Out.
Output : Admin will be logged out of the system.

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E. Non Functional Requirements

1) Performance Requirement

a) All Pages Load within few seconds
b) A Few Operations System can take more time if required.
c) System shall handle expected and unexpected errors.
d) Should be able to handle large amount of data
e) The Quality of the database is maintained in such a way so that it can be
f) very user friendly to all the users of the database
g) Responses to view information shall take no longer time to appear on the screen.

2) Safety Requirement

a) Must be two servers, one main server and one backup server.
b) The database may get crashed at any certain time due to virus or operating system failure. Therefore it is required to take the database backup.
c) System use shall not cause any harm to any users

3) Security Requirement

a) User authentication and validation of Customers using their unique Customer ID.
b) Proper accountability which includes not allowing a Customer to see other Customers' accounts.
c) Only the administrator will see and manage all Customers' accounts.
d) CAPTCHA words will be used for user login.
e) Proper user authentication should be provided.

4) Application Quality Attributes:

Maintainability

a) Maintainability is the ability of the application to go through changes with a fair degree of effortlessness.
b) This attribute is the flexibility with which the application can be modified, for fixing issues, or to add new functionality with a degree of ease.
c) These changes could impact components, services, functionality, and interfaces when modifying for fixing issues, or to meet future demands.
d) All code artefacts should have proper documentation. All code components should be thoroughly tested.

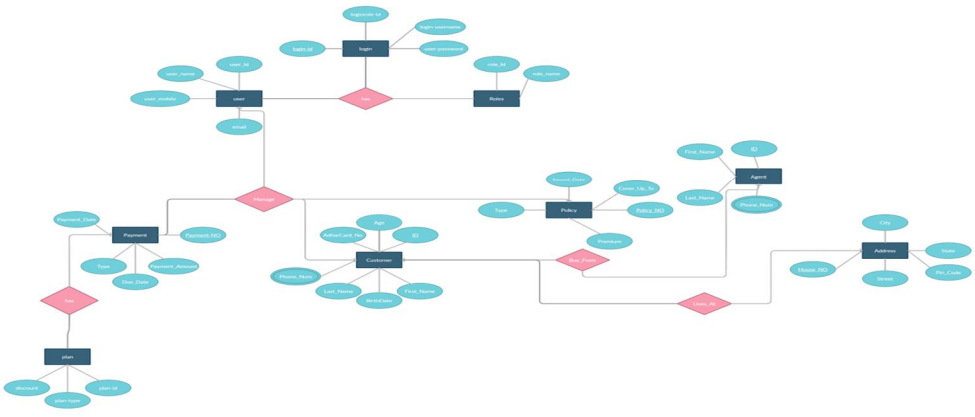
5) Efficiency Requirement: Even if the system fails, the system will be recovered back up within an hour or less.

6) Reliability Requirement: The system has to be 100% reliable due to the importance of data and the damages that can be caused by incorrect or incomplete data.

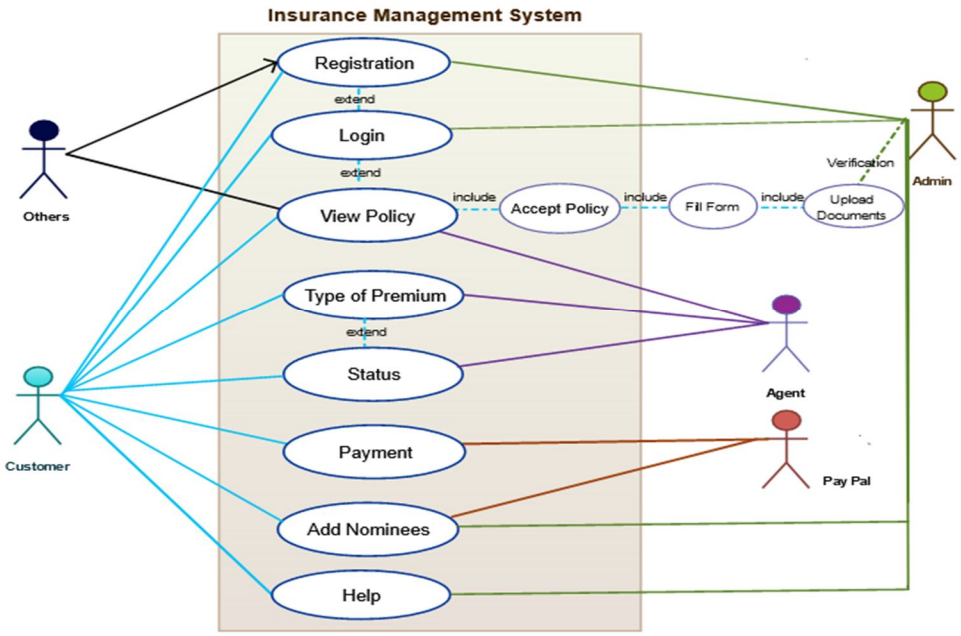
7) Usability: The system is user friendly which makes the system easy.

II. SYSTEM ANALYSIS

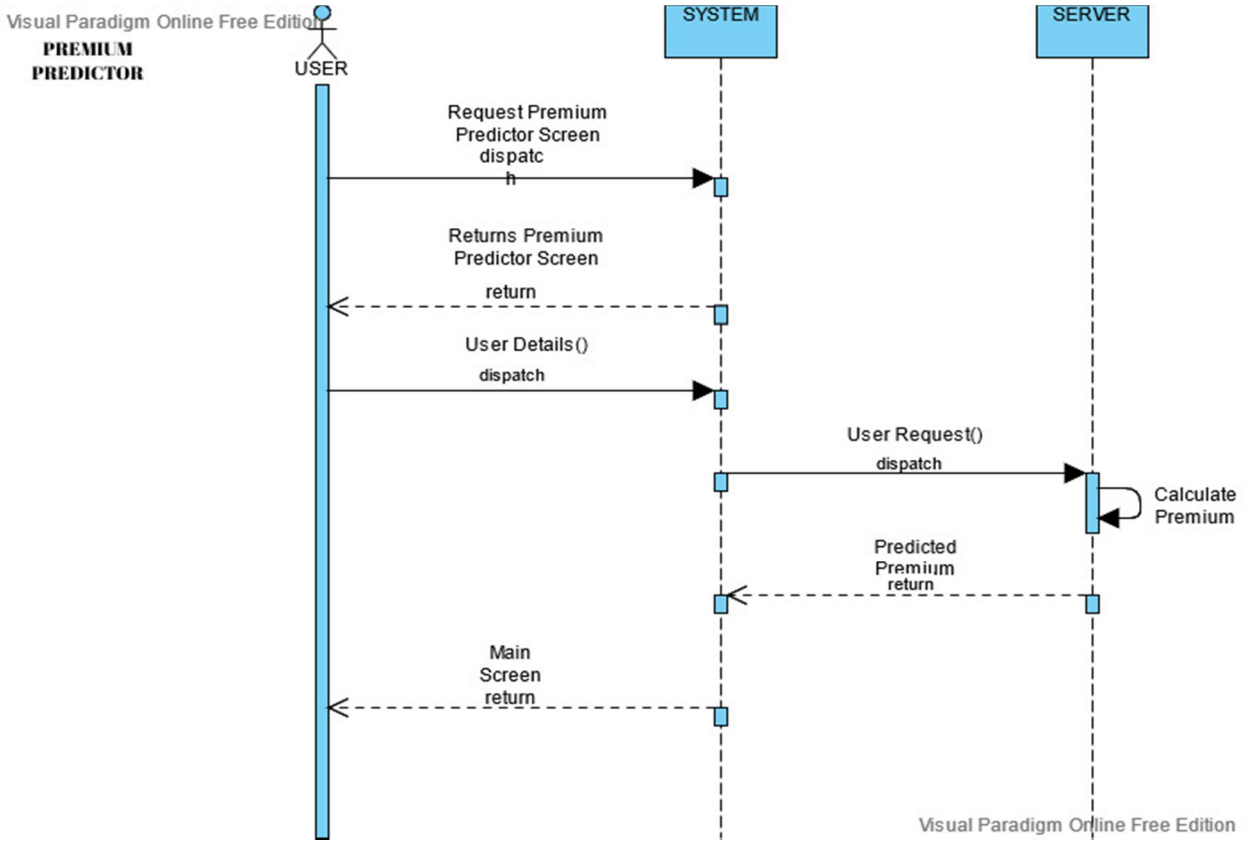
A. ER Model



B. Use Case Diagram



C. Sequence Diagram



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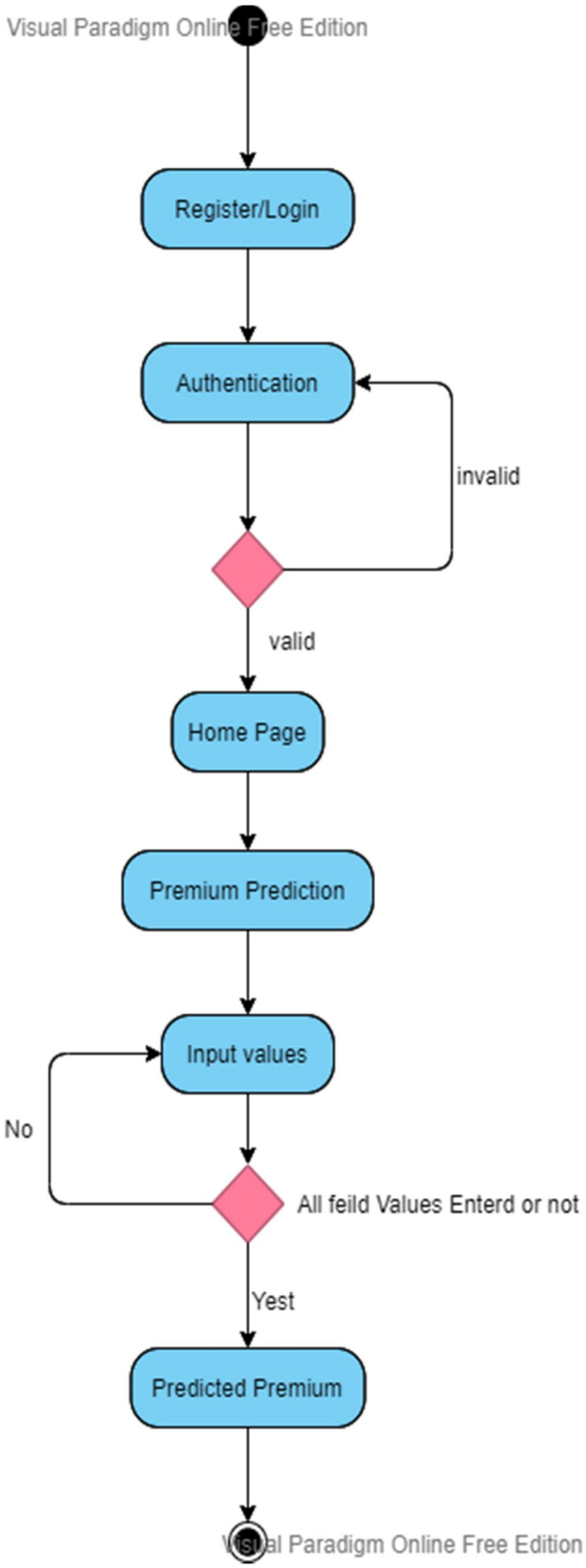
D. Activity Diagram

1) To Predict Premium



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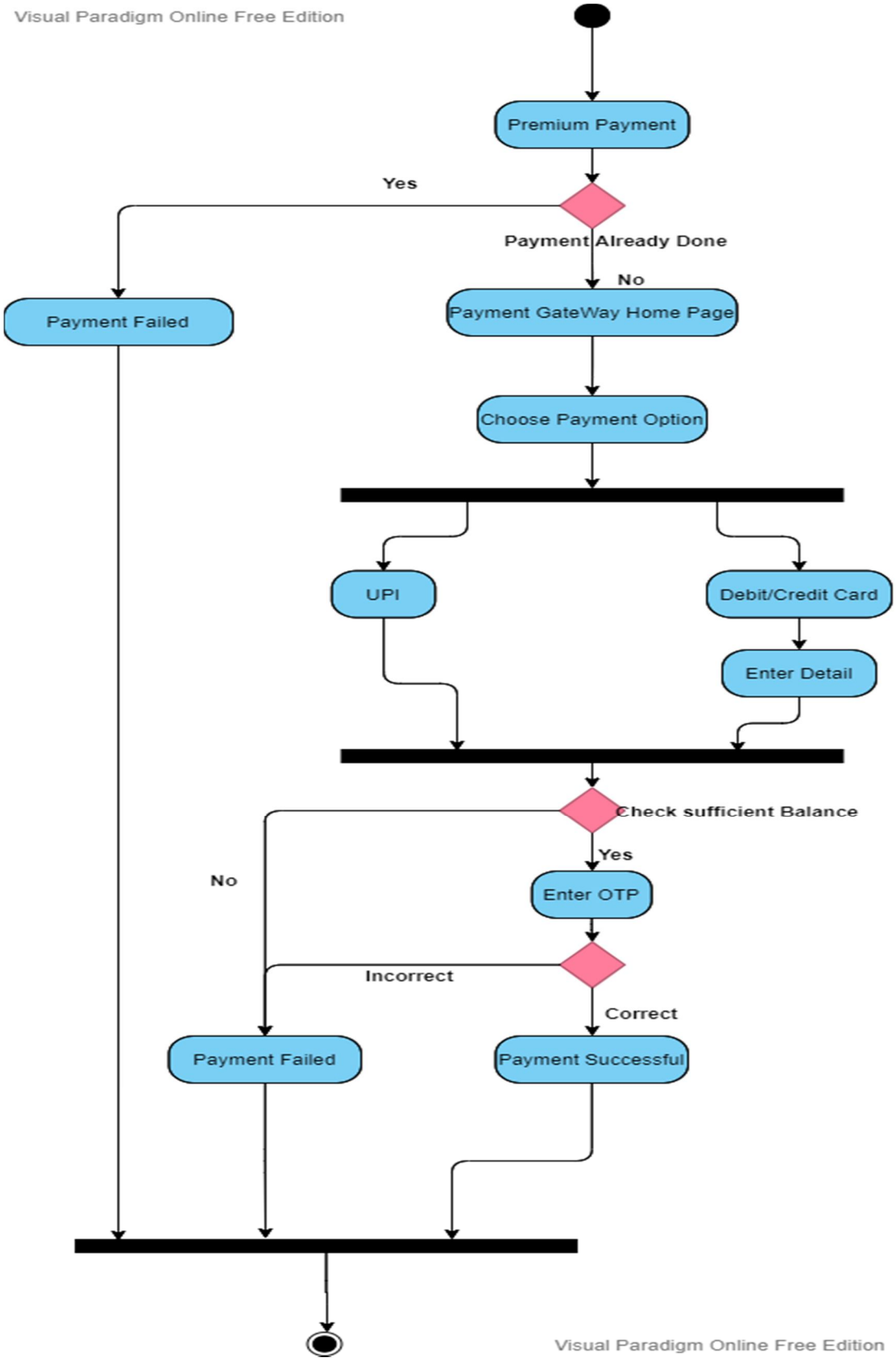
2) Premium Payment



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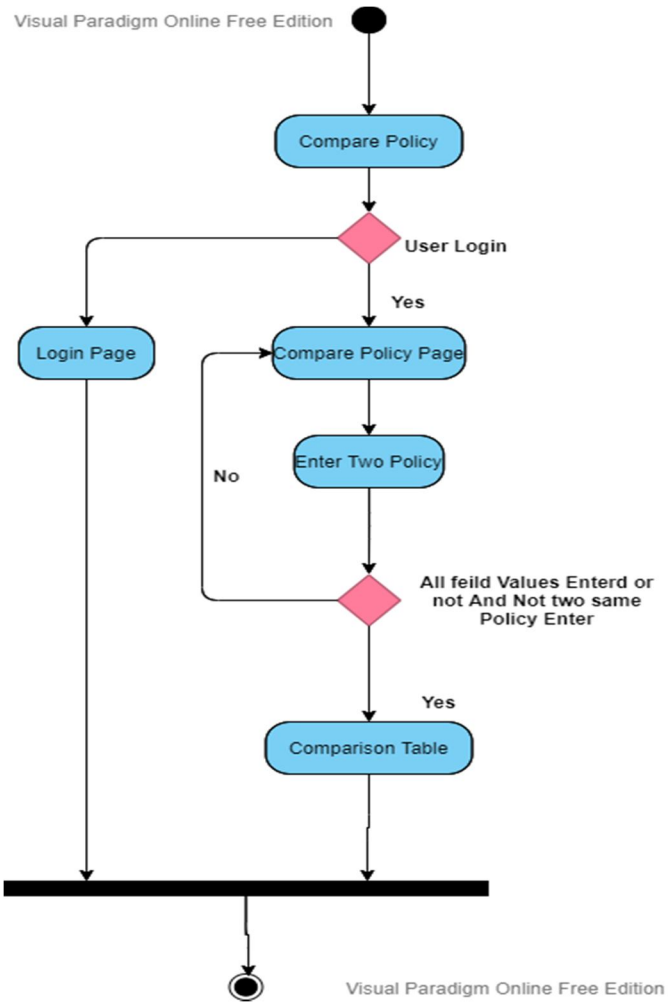
3) Policy Comparison



III. MACHINE LEARNING MODEL ANALYSIS

A. Data Analysis

1) First we will look at our data i.e first 10 rows of data.

```
df = pd.read_csv("insurance1.csv")
df.head(10)
```

	age	sex	bmi	children	smoker	region	premium
0	19	0	27.9	0	1	rajkot	16884.92
1	18	1	33.8	1	0	surat	1725.55
2	28	1	33.0	3	0	surat	4449.46
3	33	1	22.7	0	0	ahmedabad	21984.47
4	32	1	28.9	0	0	ahmedabad	3866.86
5	31	0	25.7	0	0	surat	3756.62
6	46	0	33.4	1	0	surat	8240.59
7	37	0	27.7	3	0	ahmedabad	7281.51
8	37	1	29.8	2	0	vadodara	6406.41
9	60	0	25.8	0	0	ahmedabad	28923.14

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2) We will find out important structure of data i.e mean,count,max_value,min_value,etc.

```
df.describe()
```

	age	sex	bmi	children	smoker	premium
count	1338.000000	1338.000000	1338.000000	1338.000000	1338.000000	1338.000000
mean	39.207025	0.505232	30.665471	1.094918	0.204783	13270.422414
std	14.049960	0.500160	6.098382	1.205493	0.403694	12110.011240
min	18.000000	0.000000	16.000000	0.000000	0.000000	1121.870000
25%	27.000000	0.000000	26.300000	0.000000	0.000000	4740.287500
50%	39.000000	1.000000	30.400000	1.000000	0.000000	9382.030000
75%	51.000000	1.000000	34.700000	2.000000	0.000000	16639.915000
max	64.000000	1.000000	53.100000	5.000000	1.000000	63770.430000

3) We will find out correlation among data.

```
df.corr()
```

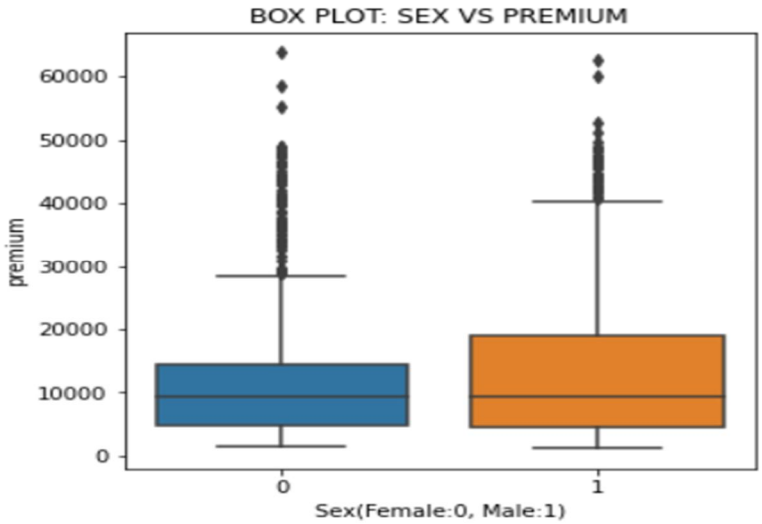
	age	sex	bmi	children	smoker	premium
age	1.000000	-0.020856	0.109341	0.042469	-0.025019	0.299008
sex	-0.020856	1.000000	0.046380	0.017163	0.076185	0.057292
bmi	0.109341	0.046380	1.000000	0.012645	0.003968	0.198576
children	0.042469	0.017163	0.012645	1.000000	0.007673	0.067998
smoker	-0.025019	0.076185	0.003968	0.007673	1.000000	0.787251
premium	0.299008	0.057292	0.198576	0.067998	0.787251	1.000000

➔ corr() will give us Pearson Correlation and We can see smokers are the best predictor for Premium.

B. Data Visualization

Relationship between target variable (Premium) and predictor variables(age,sex,bmi,children,smoker) through various graphs.

1) Sex Vs Premium



➔ On average premiums from male and female are the same with slightly bigger proportions of higher amounts for male.

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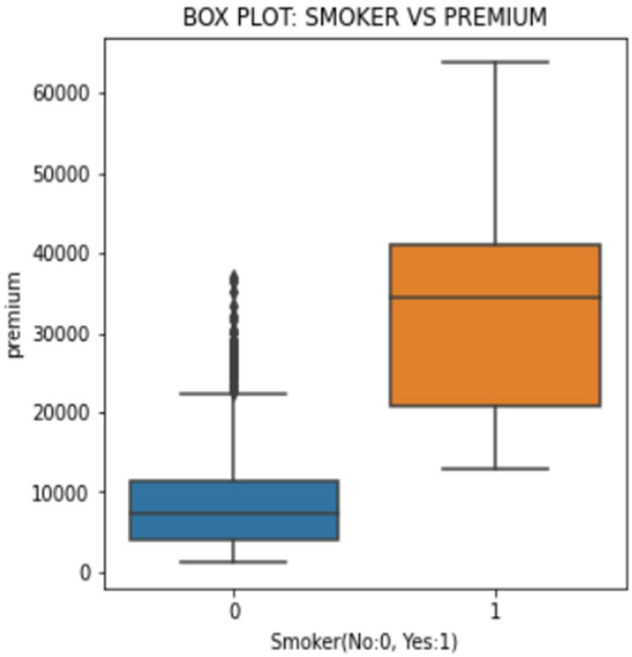
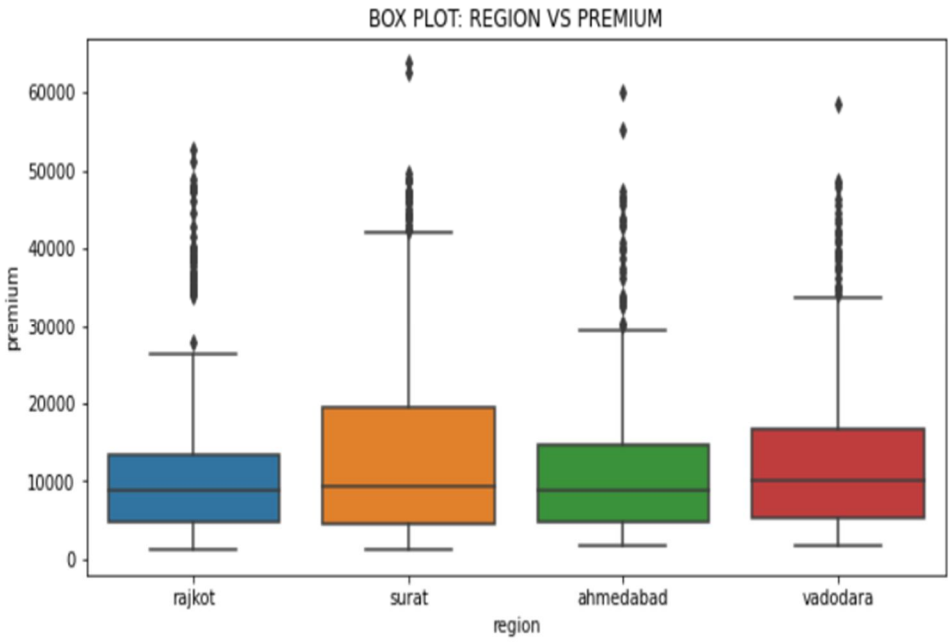
2) Smoker Vs Premium



➔ There is a strong relationship between smokers and non-smokers with claims from smokers being much higher.

3) Region Vs Premium



➔ On average claims from regions are the same with slightly bigger proportions of higher amounts from Surat.
➔ So,we will ignore the region column for predicting premiums as no big change is observed.

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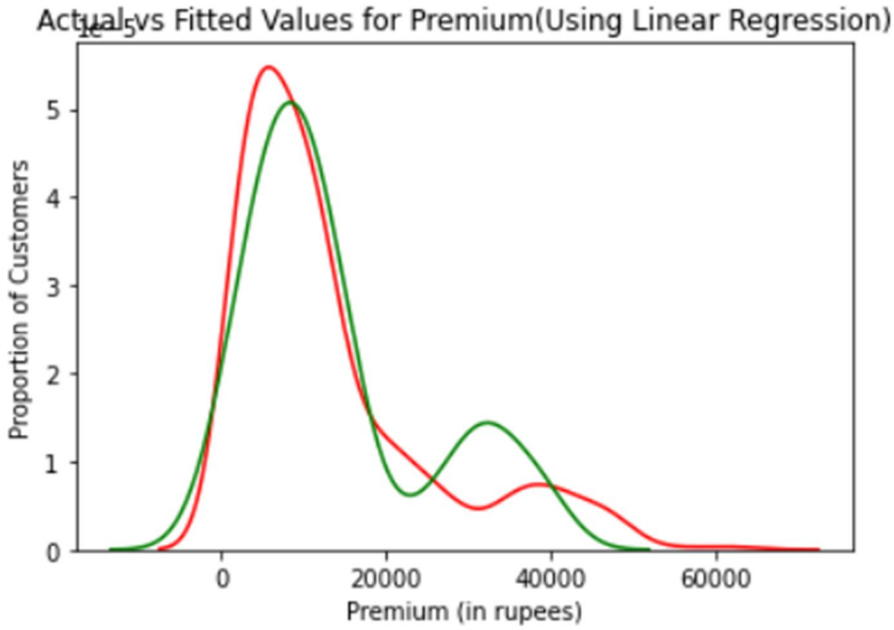
IV. RELATIONSHIP OF ACTUAL DATA VS PREDICTED OUTPUT

(2 Models: Linear Regression And Polynomial Regression)

A. Using Linear Regression



B. Using Polynomial Regression

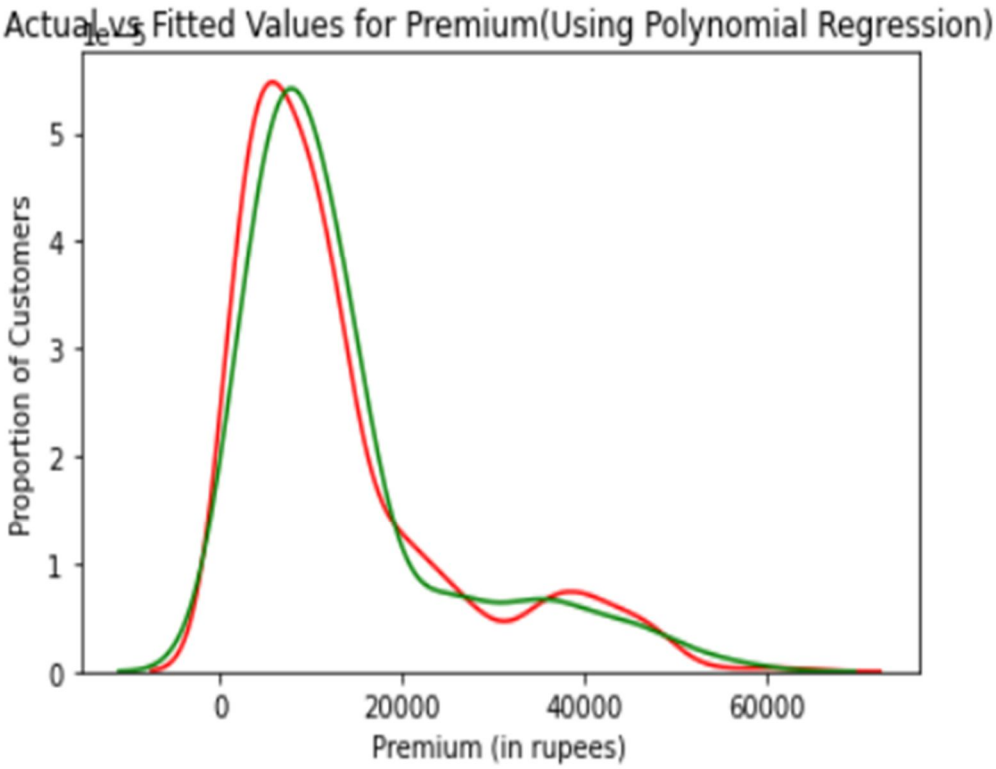


Figure i.2

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Comparing Both we can see we get better predicted output by using Polynomial Regression.

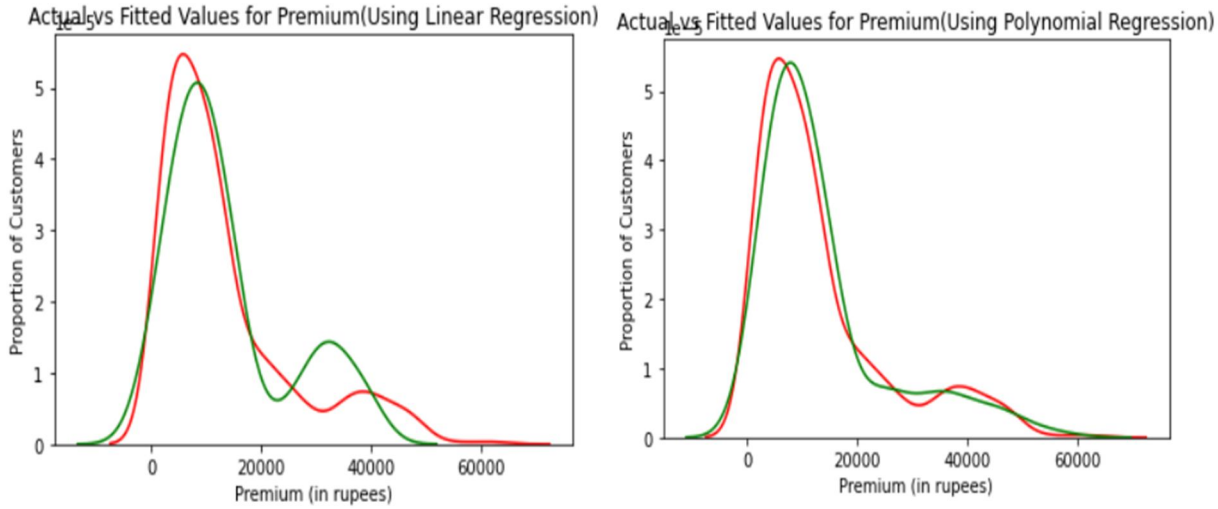

Figure i.2

By looking at figure i.2 we can see that the premium gets more precise if we use polynomial regression rather than linear regression. Therefore, the premium amount is found out using polynomial regression. We can observe that as the premium gets increased there is more irregularity in predicted amount in case of linear regression. The predicted premium in range 20000 to 40000 is inaccurate for linear regression while that was solved by polynomial regression.

Test Cases

Functional Test Cases	Expected Output Positive / Negative
Verify Predictable output accuracy is more than 90% for Smoker People	Positive
Verify Predictable output accuracy is more than 90% for Old Age	Positive
Verify Predictable output accuracy is more than 90% for people with higher BMI	Positive
Verify Predictable output accuracy is more than 90% for Female	Positive

Test Cases

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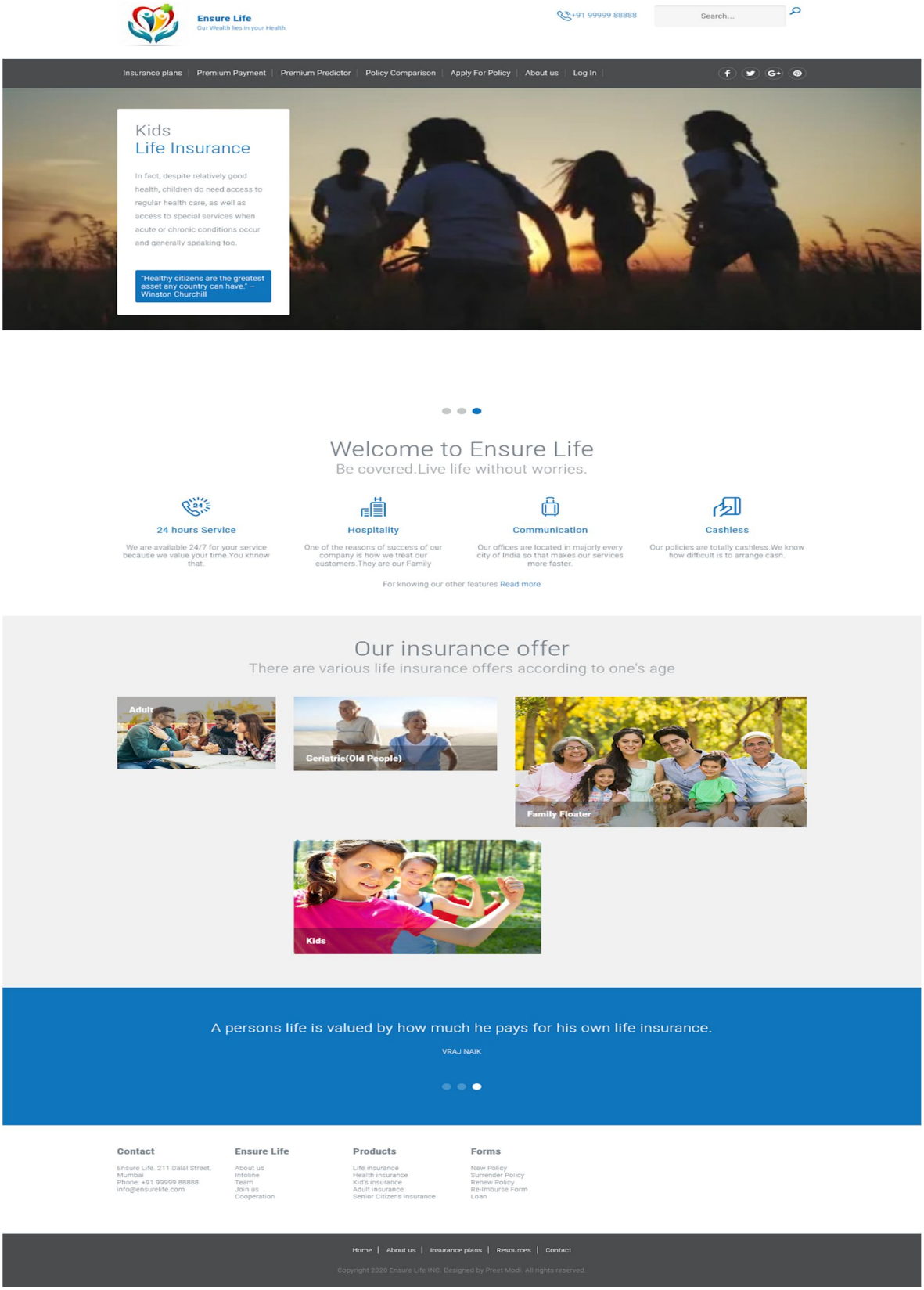
V. USER MANUAL (SCREENSHOTS)

A. Home Page



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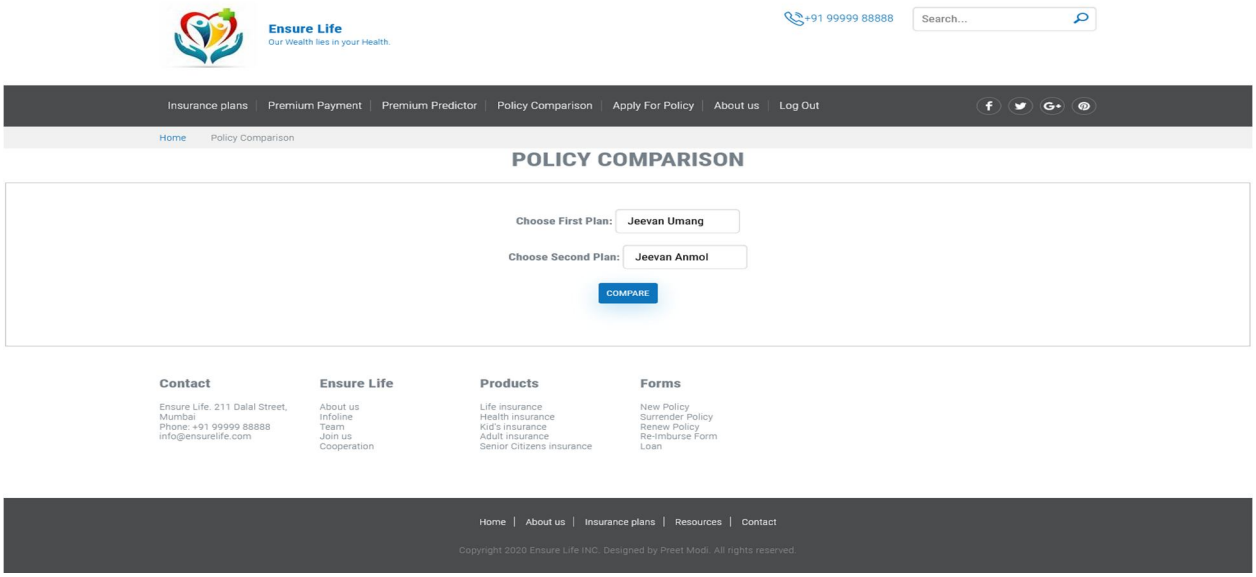
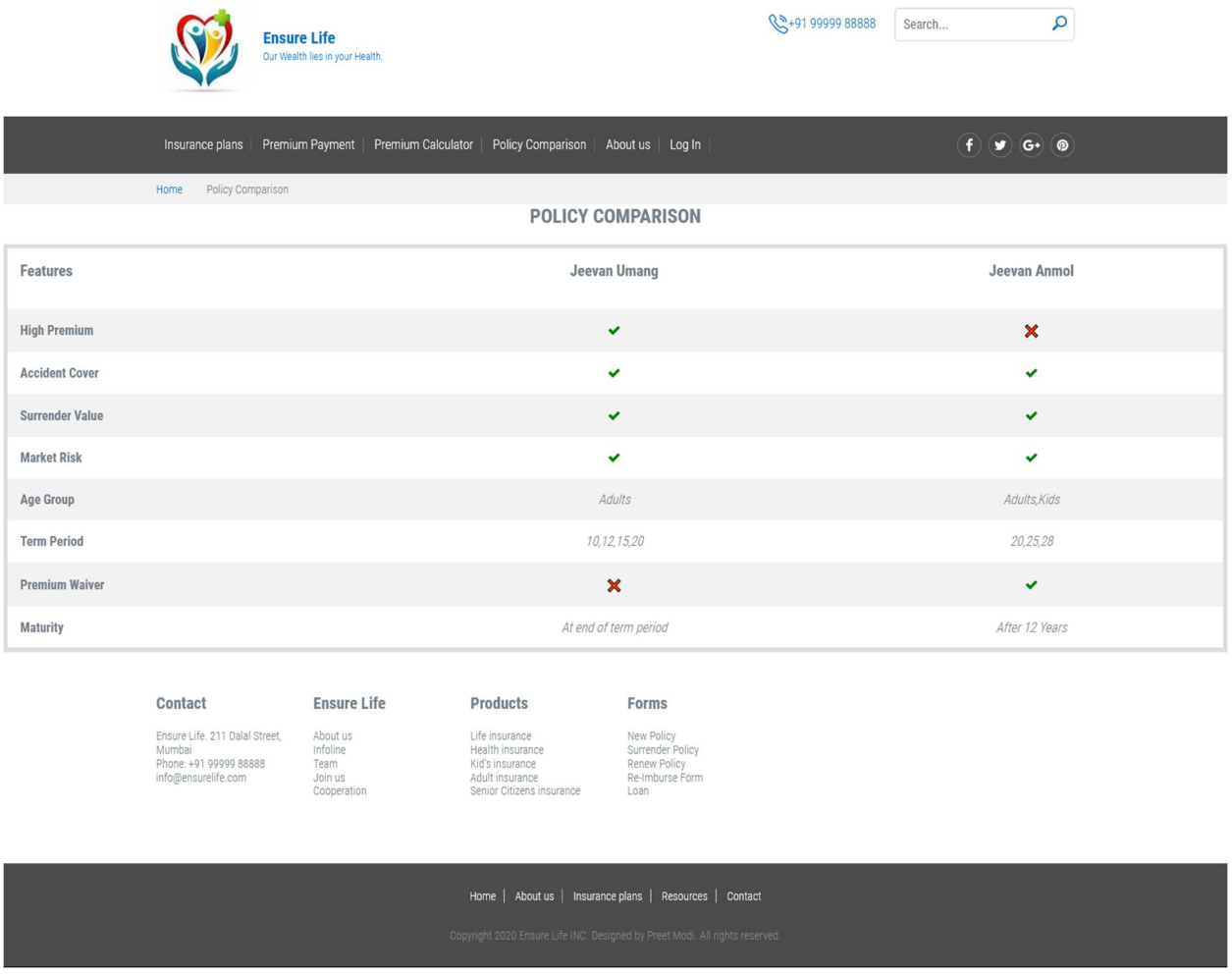
B. Premium Comparator



After clicking on Compare Button redirected to :



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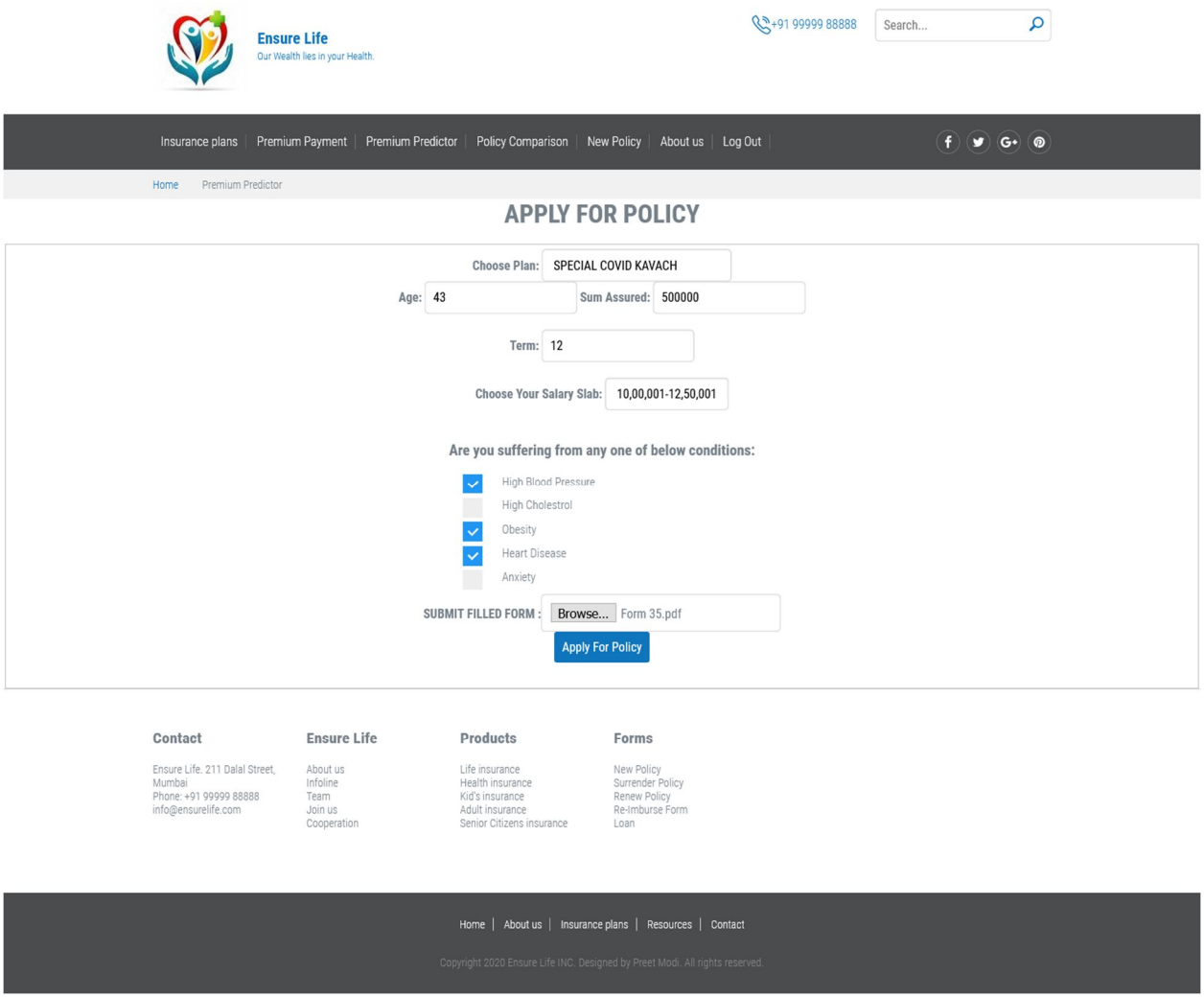
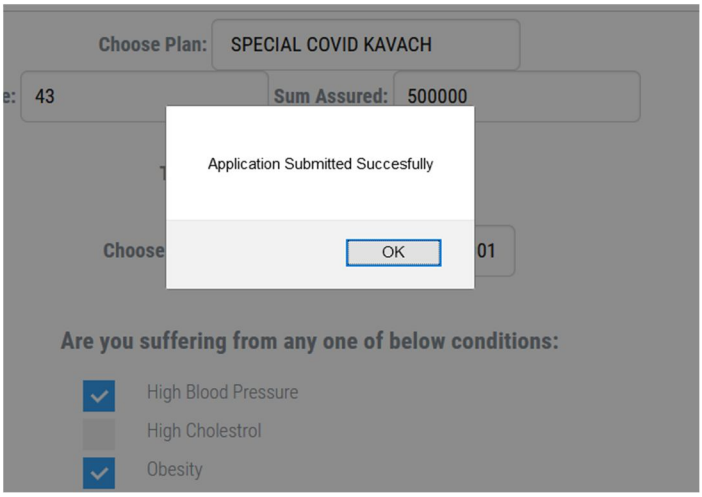
C. New Policy

You need to submit scan copy of your form



After Clicking Apply for Policy Form is submitted:



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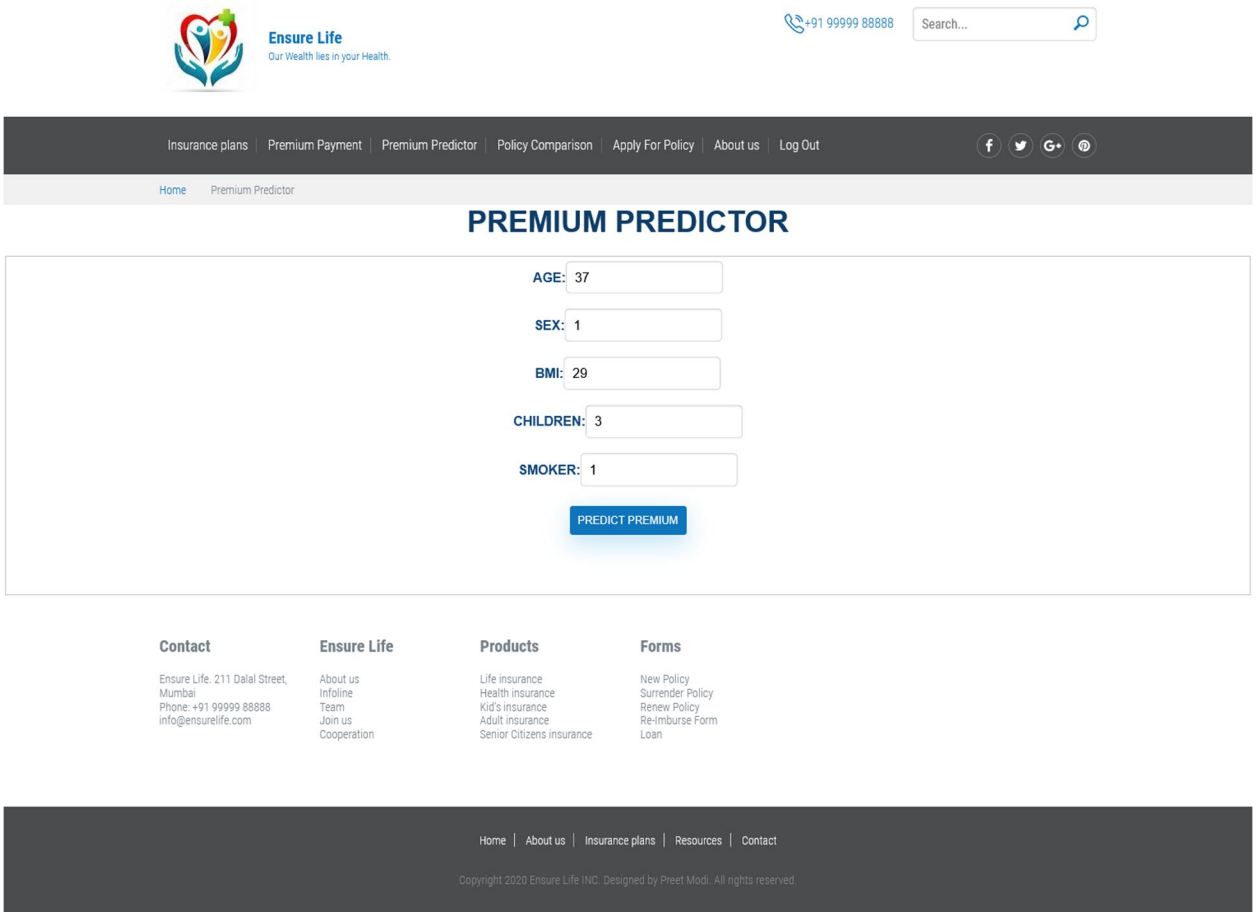
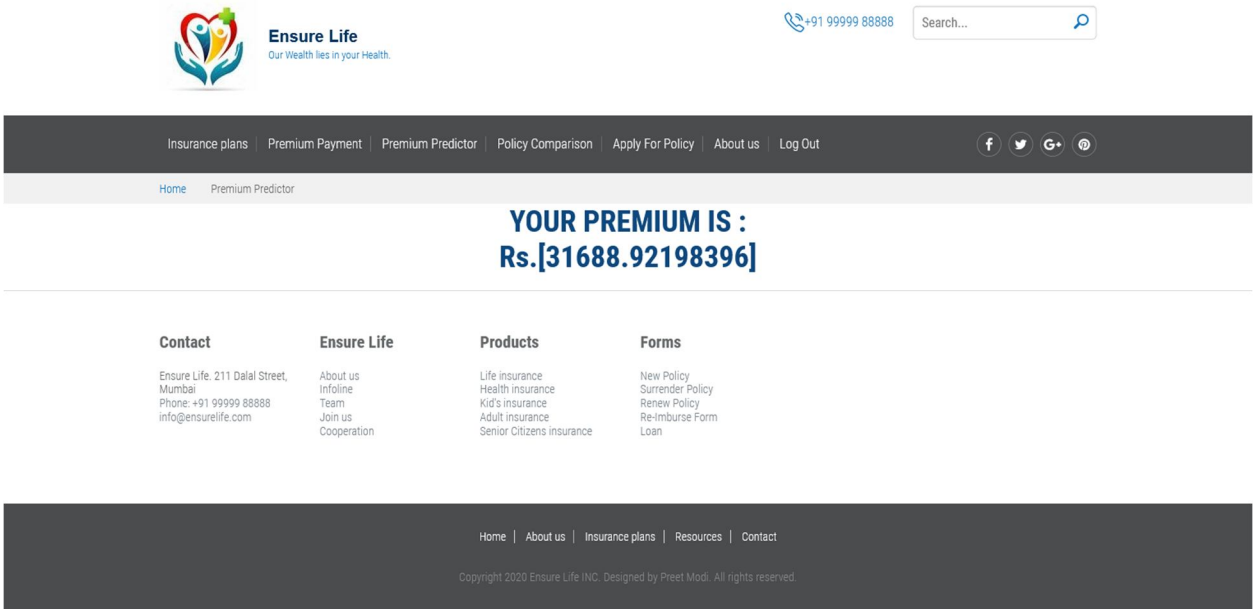
D. Premium Prediction (Main Functionality)



After clicking on Predict Premium Button redirected to :



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VI. CONCLUSION

At least it can be included that the "INSURANCE MANAGEMENT WITH PREMIUM PREDICTION "system project was a real learning experience. Design principle of software production well implemented throughout the system. In Short, our System gives us a predicted value of premium by looking at your data and our system also has other functionalities like policy comparison, premium payment, etc.

Working on the project was actually a learning environment. We come a long way in building our concept of Machine Learning.

VII. FUTURE ENCHANTMENT

In this future we are providing predictable premium value by including more parameters like a person's income, family size, property, etc.

For New Policy, only customers have to submit a form but in future online verification might be included. Also, we increase a security level so no one can corrupt our model.

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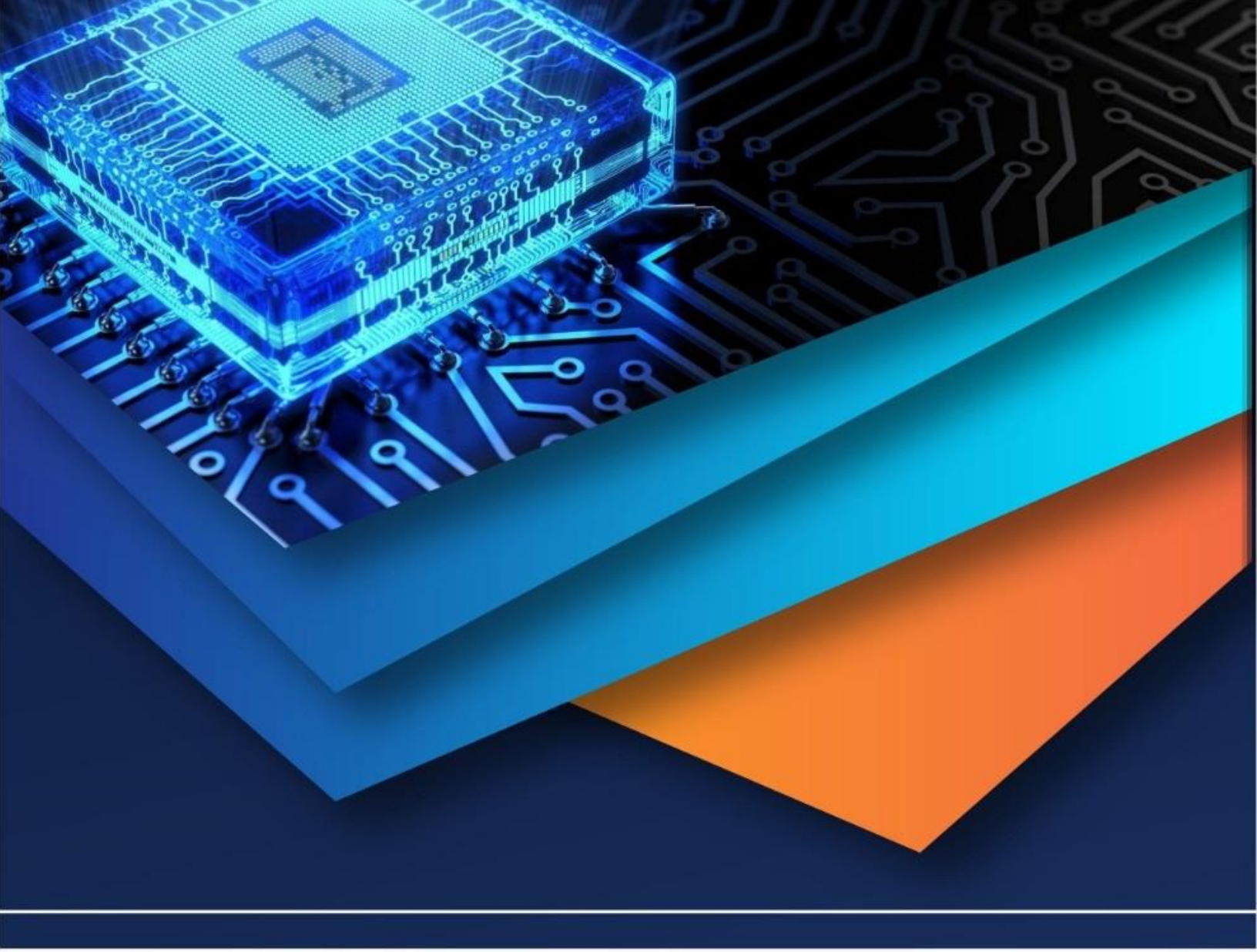

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