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Policy Made Easy: An Intelligent Virtual Assistant for Life Insurance

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Abstract: In life, unplanned expenses are a harsh reality. Life Insurance policies therefore offer a semblance of support to minimize financial liability from unexpected circumstances like the pandemic era. The Covid-19 pandemic has reshaped the business world and also showed the value of digital operating models. It has not only compelled businesses to speed up their digital innovation and transformation but also accept the changing needs of its customers. Similar is the case for companies offering insurance policies. The world which has faced major multiple lockdowns owing to the pandemic has certainly started thinking of ways to work online and hence reinforce the need to rethink traditional processes. The current process of insurance claimants is conservative, extremely tedious and time consuming. In the era of Artificial Intelligence, an individual prefers the task to be done in an efficient & less dreary manner, so rather than navigating through the website or visiting the Office in person, it prefers an application that provides a unified interactive platform to manage their policies. Hence chatbot is a much optimized solution for automating the traditional life insurance process. By combining the fields of Web technologies like Node js and React js, Natural Language Processing and Facial recognition the chatbot would provide solutions for all policy related queries and operations.

Index Terms- Insurance claim, premium payment, chatbot, react js, natural language processing, facial recognition, electronic signature.

I. Introduction

Due to Covid-19 pandemic, the culture of work from home has come to trend. People prefer to do tasks sitting at home on their desk with just a few clicks. Nowadays people of all ages are getting used to technology. As opposed to standing in a queue for procuring an Aadhar Card or Passport they are looking for automated processes. It is seen that there is an increase in customer satisfaction who are using these automated processes. Even in the field of insurance [1], people tend to use online website services rather than physically paying premiums. To enhance this traditional system of life insurance we are automating the services of paying premiums and claiming insurance through a chatbot [2]. Instead of navigating through the website searching for any service or waiting for an unknown amount of days after they have put in a claim request through their agent, a user can just put his/her query into the chatbot [3] and avail its services hence not only saving time but also getting certainty about their task directly from the insurance company.

We are developing a chatbot using React js and Node js where the user can pay his policy premium, claim maturity and death claim amount, check his capability to get a loan against the policy and surrender the policy. The query put up by the user is processed by using Natural Language Processing algorithms [4]. The users and the policies are stored in the MongoDB database which is connected to the server. As a measure against fraudulent claims [5], there is a personalized desk verification. All the user activities can be seen at the admin website for verifying authenticity of any document or malpractices (if any) thus adding an admin-oriented authentication before the claim amount is actually transferred to the beneficiary's (nominee or policyholder's) bank account.

II. Block Diagram

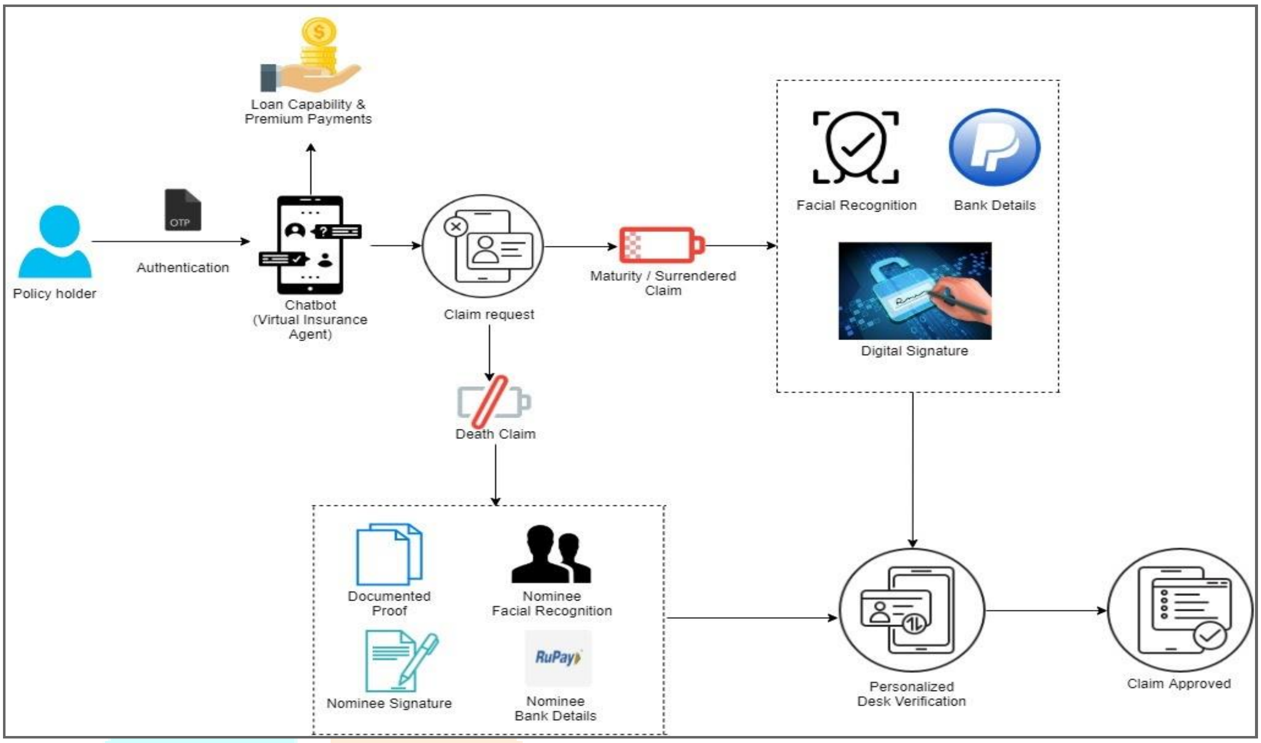


Fig. 1. Block Diagram

The flow of the system is represented in Fig 1. Initially, the Policyholder is authenticated on the Chatbot through an email OTP verifying his/her account linked to the mobile number. After logging into the chatbot the user can choose three major services namely, Claim request, Premium Payments and Loan capability.

2.1 Claim Request

This can be of two major types, one is when the policy has crossed maturity and the person wants to claim the amount. In this case, the person needs to submit necessary documents such as Address proof, Identity proof and the original policy with his/her electronic signatures.

The other one being when a person has died and the nominee in-charge needs to claim the insurance amount. In this case, the nominee needs to be verified by submitting the policy holder's death certificate, providing necessary identity and address proofs of the nominee himself and authenticating himself at the facial recognition step. Lastly, the nominee needs to submit the policy with his/her electronic signature. For that, the nominee just has to sign on the given canvas.

All the submitted documents are directed to the Admin Dashboard where an agent from the insurance company can validate the documents and approve the claim. Once the claim is approved, the Policy Holder/nominee receives an email about the status.

2.2 Premium Payments

The user just needs to select this option and the system does the rest. The system calculates the exact amount of the premium for the defined term (monthly/quarterly/yearly) including the GST. The user just has to pay the premium using the secured payment gateway provided on the chatbot.

2.3 Loan Capability

Once the policy is selected, this module shows the maximum amount of loan which the user can be granted against a specific policy by taking into consideration all the necessary factors like user's past premiums, policy holder history and policy value at that moment.

III. ALGORITHMS USED

3.1 FaceNet

FaceNet is a Google-developed face recognition system that achieved state-of-the-art results on a variety of face recognition benchmark datasets in 2015[6]. In our chatbot, we ask the user to click an image of them while claiming a request. The captured image goes to our flask server where we use the FaceNet model. The model is trained on a single image of all the users registered on the system. The Flask API uses the deployed TensorFlow model. We have stored the images of the users in MongoDB database from which we create a face embeddings NumPy zipped file. The incoming request contains the frame of the user, for which we extract their face and create an embedding using the FaceNet model. Then we use Support Vector Classification model to predict the identity of the user.

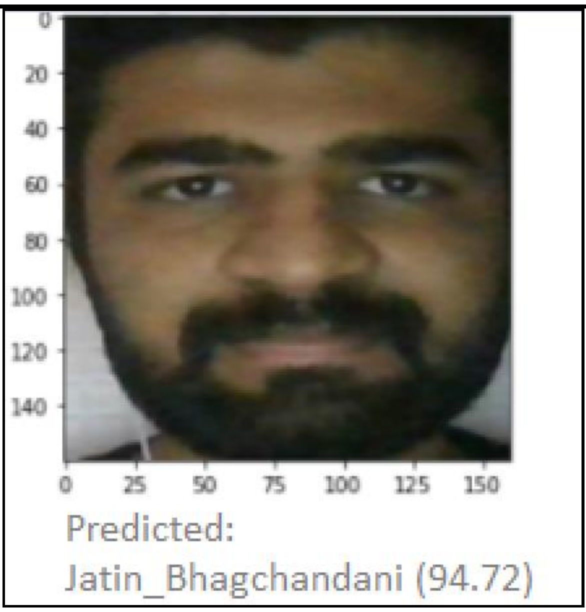
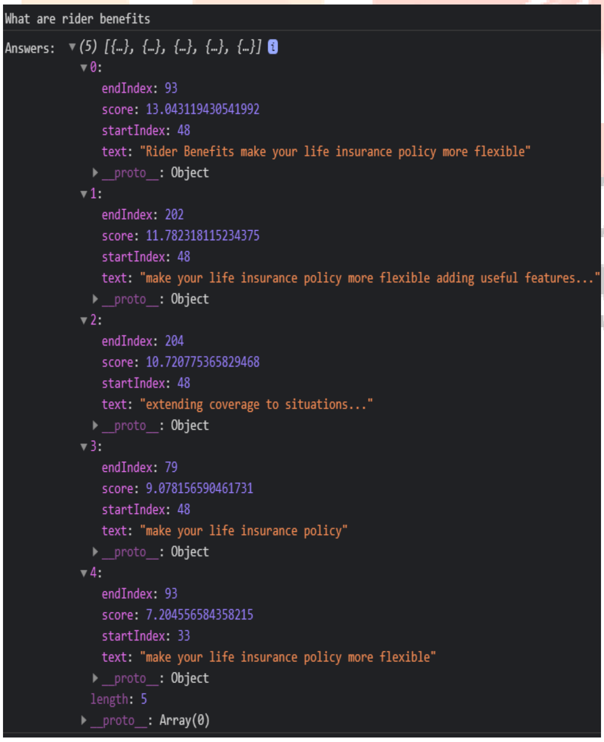


Fig. 2. Accuracy of FaceNet

Fig 2 shows the results for FaceNet Algorithm, accuracy of 94.72% was obtained as the model was trained on a single image of each user.

3.2 BERT

BERT is an abbreviation for Bidirectional Encoder Representations. To deploy the model, we have created a document of frequently asked questions including queries related to different kinds of benefits which the user could ask [7]. We bidirectionally train the transformer using the attention mechanism on this document. We use the deployed model in our front end which works on ReactJS [8]. Before a user asks a query, we run the question through this model and see if an answer is generated. If yes, then we show the most probable answer as the reply, otherwise, the flow goes to server related queries.



```
What are rider benefits
Answers:  ▼(5) [{…}, {…}, {…}, {…}, {…}] i
           ▼0:
              endIndex: 93
              score: 13.043119430541992
              startIndex: 48
              text: "Rider Benefits make your life insurance policy more flexible"
             ▶__proto__: Object
           ▼1:
              endIndex: 202
              score: 11.782318115234375
              startIndex: 48
              text: "make your life insurance policy more flexible adding useful features..."
             ▶__proto__: Object
           ▼2:
              endIndex: 204
              score: 10.720775365829468
              startIndex: 48
              text: "extending coverage to situations..."
             ▶__proto__: Object
           ▼3:
              endIndex: 79
              score: 9.078156590461731
              startIndex: 48
              text: "make your life insurance policy"
             ▶__proto__: Object
           ▼4:
              endIndex: 93
              score: 7.204556584358215
              startIndex: 33
              text: "make your life insurance policy more flexible"
             ▶__proto__: Object
             length: 5
           ▶__proto__: Array(0)
```

Fig. 3. BERT Algorithm Implementation

Fig 3 shows the results for BERT Algorithm, as we get 5 results for each question which is asked to the chatbot each one of which is associated with a score and the result having the best score is chosen to reply to the user, hence making the chatbot robust through Natural Language Processing.

IV. IMPORTANT FORMULAE AND EQUATIONS

The derivation of important formulae related to policies included calculation of premiums, loan capability and the calculation of claim amount including the bonus amount from the insurance company and Goods & Service Tax (GST) to be paid to the government. For e.g. The final additional bonus is calculated to be approximately, *25 per 1000 of BSA,* where Basic Sum Assured (BSA) = The insurance amount and the loyalty bonus from the insurance company equals a fixed amount per 1 Lakh for any life insurance policy. The loan capability against a policy is approximately 85% to 90% of the total premiums paid by the policyholder till date. Finally, the premiums are variable for the first year of the date of purchase for the insurance policy and the subsequent years where the GST (Goods & Service Tax) is 4.5% of the basic premium amount for the first year and 2.5% for the subsequent years.

The equations used for calculating the Triplet loss function [9] in the training of facial recognition module are as follows:

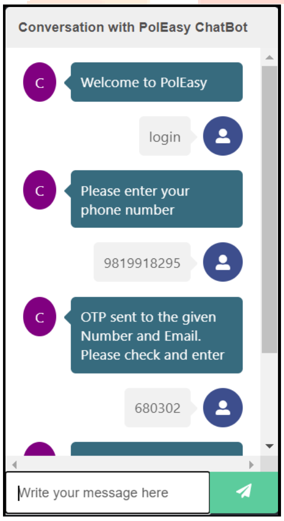
$$(\| F(A) — F(P)\| + \text{margin}) < \| F(A) — F(N)\| \qquad (1)$$

where,
F(A) → Anchor embedding function
F(P) → Positive embedding function
F(N) → Negative embedding function
margin → Hyper-parameter

$$\sum_{I}^{N} [\| f(x^a_i) — f(x^p_i)\|^2_2 - \| f(x^n_i) — f(x^n_i)\|^2_2 + \alpha] \qquad (2)$$

where,
N - no. of triplets
x_i - image representation
α- margin between negative and positive pairs
$f(x_i)$- represents the embedding of an image

IV. IMPLEMENTATION DETAILS



Conversation with PolEasy ChatBot

C: Welcome to PolEasy

login

C: Please enter your phone number

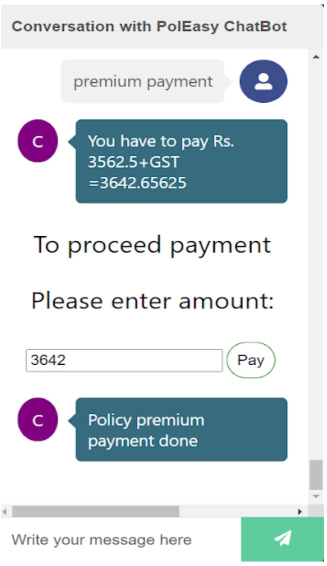
9819918295

C: OTP sent to the given Number and Email. Please check and enter

680302

Fig. 4. OTP Verification

Fig 4 shows the first step to the 3-way authentication system for the Life insurance claimant chatbot.



Conversation with PolEasy ChatBot

premium payment

You have to pay Rs. 3562.5+GST =3642.65625

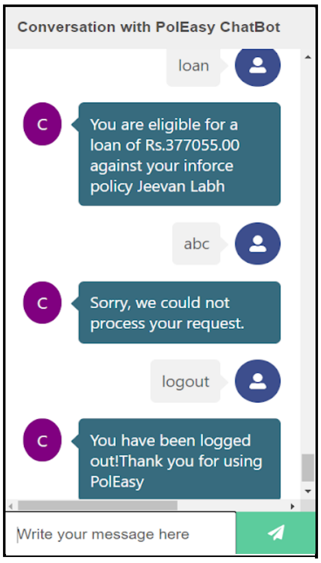
To proceed payment

Please enter amount:

3642

Policy premium payment done

Fig. 5. Premium Payment



Conversation with PolEasy ChatBot

loan

You are eligible for a loan of Rs.377055.00 against your inforce policy Jeevan Labh

abc

Sorry, we could not process your request.

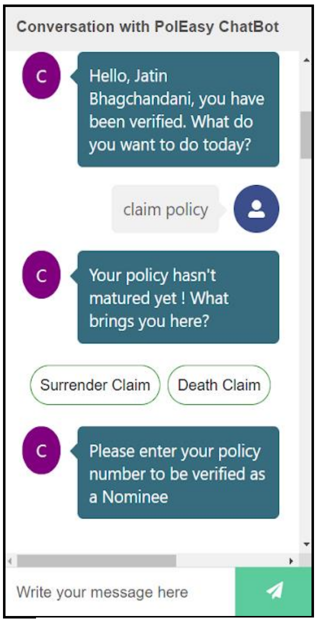
logout

You have been logged out!Thank you for using PolEasy

Fig. 6. Loan Capability

Fig 5 shows the premium payment module which includes the calculation of premium based on the user's policy, age, insurance amount and policy term.

Fig 6 illustrates the loan capability module for the user that is logged into the system, specified by their policy number.



Conversation with PolEasy ChatBot

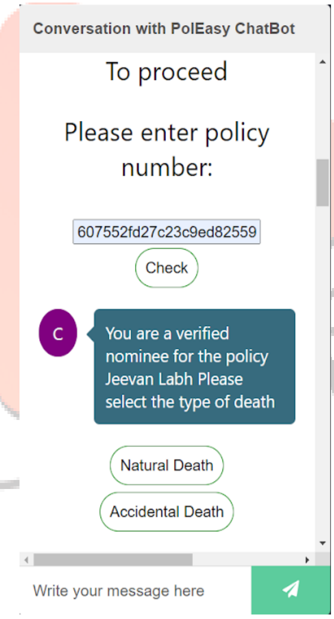
Hello, Jatin Bhagchandani, you have been verified. What do you want to do today?

claim policy

Your policy hasn't matured yet ! What brings you here?

Please enter your policy number to be verified as a Nominee

Fig. 7. Type of Claim



Conversation with PolEasy ChatBot

To proceed

Please enter policy number:

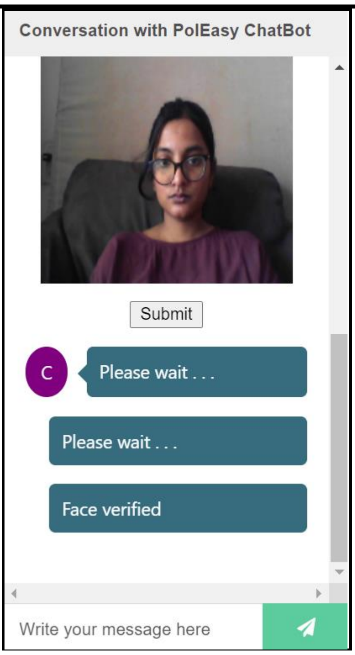
607552fd27c23c9ed82559

You are a verified nominee for the policy Jeevan Labh Please select the type of death

Fig. 8. Death Claim

Fig 7 depicts the claim scenario for life insurance, where the system checks for maturity of the policy and if it doesn't find the date to be near, asks for a surrender/death claim option.

Fig 8 depicts the death claim scenario where the logged in user proves to be a nominee of the policy by entering the policy number for which he/she wishes to put a death claim.



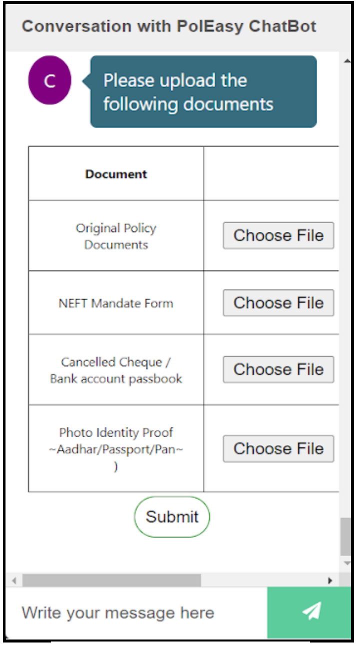
Conversation with PolEasy ChatBot

C Please wait . . .

Please wait . . .

Face verified

Fig. 9. Face Verification



Conversation with PolEasy ChatBot

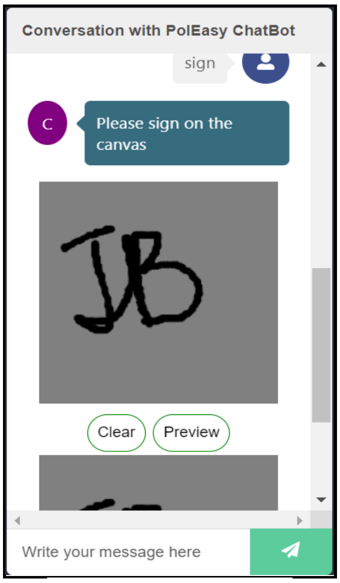
C Please upload the following documents

Document	
Original Policy Documents	Choose File
NEFT Mandate Form	Choose File
Cancelled Cheque / Bank account passbook	Choose File
Photo Identity Proof ~Aadhar/Passport/Pan~)	Choose File

Fig. 10. Document Upload

Fig 9 shows facial recognition of an authorized person which can be policy holder or nominee in the chatbot.

Fig 10 shows the scenario where the policyholder uploads the required documents for initiating the claim request which will be further sent to the admin dashboard for verification.



Conversation with PolEasy ChatBot

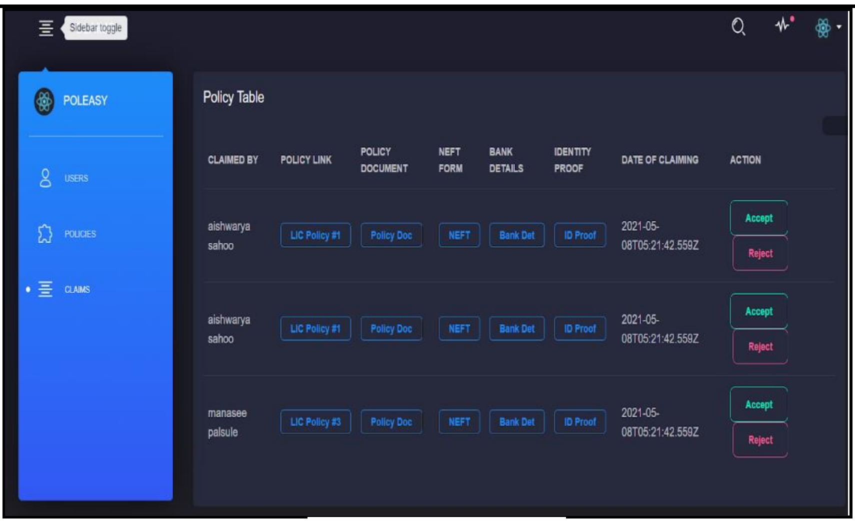
sign

C Please sign on the canvas

Fig. 11. Signature canvas

Fig. 11. shows a signature canvas where the user can electronically sign as it is a legal way to get approval while claiming the policy.

For signature, we have used the react canvas component and Bezier curve to sign with the help of a mouse. The significance of this step is to authenticate the user while submitting the policy at the time of claim. It adds an extra layer of security to the process. The policy related required documents, signature and the image captured during the claim in the chatbot is sent to the admin website.



Policy Table

CLAIMED BY	POLICY LINK	POLICY DOCUMENT	NEFT FORM	BANK DETAILS	IDENTITY PROOF	DATE OF CLAIMING	ACTION
aishwarya sahoo	LIC Policy #1	Policy Doc	NEFT	Bank Det	ID Proof	2021-05-08T05:21:42.559Z	Accept Reject
aishwarya sahoo	LIC Policy #1	Policy Doc	NEFT	Bank Det	ID Proof	2021-05-08T05:21:42.559Z	Accept Reject
manasee palsule	LIC Policy #3	Policy Doc	NEFT	Bank Det	ID Proof	2021-05-08T05:21:42.559Z	Accept Reject

Fig. 12. Admin Dashboard

Fig 12 shows the Admin dashboard which acts like a personalized desk verification where the insurance company agents can verify the claim request after validating all the uploaded documents and signature. An email would be sent later showing the status of claim request.

V. PERFORMANCE MEASURES

Few parameters considered for performance evaluation measures are –

1. Accuracy of facial recognition model: Accuracy of the facial recognition model should be good enough and the user should be correctly identified. Also, the algorithm must identify the user even when there is inconsistency in lighting and positioning.
2. Responsiveness of the system: This refers to how quickly and efficiently the chatbot responds to queries fired by the user.
3. Average chat time: This parameter enables to evaluate user's login sessions for chatbot.
4. Satisfaction rate: Satisfaction rate refers to scores that can be assigned for evaluating the chatbot answers which are obtained using BERT algorithm.

VI. LIMITATIONS

The expected output should be considered in the light of some limitations. Currently, the option to get claim benefits in installment is not available. Moreover, additional variable bonuses are not being considered while calculating the claim amount. This can be included in the scope of the project in future.

VII. CONCLUSION

Our final product is a Chatbot which eases the process of claiming life insurance and paying premiums. Through the chatbot, we make sure that the users can easily interact with the Policy companies and have their policy related queries fulfilled with ease. Being a completely authenticated process, the users won't have to wait for communication or navigate to any websites, just a query in the chatbot can solve all their doubts.

It benefits the user by providing 24/7 accessibility and also responds to user queries efficiently thus making interaction more user friendly and personalized. The chatbot provides claim automation therefore replaces the insurance company representative. The traditional life insurance claiming process of 30 days will be minimized, enabling to complete the entire process in a shorter stretch of time.

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