AI Based Discourse for Banking Chatbot

Contents

c. Reports from JIRA

CODING & SOLUTIONING (Explain the features added in the project along with code)

d. Feature 1

e. Feature 2

f. Database Schema (if Applicable)

7. **TESTING**

a. Test Cases

b. User Acceptance Testing

8. **RESULTS**

a. Performance Metrics

9. **ADVANTAGES & DISADVANTAGES**
10. **CONCLUSION**
11. **FUTURE SCOPE**
12. **APPENDIX**

Source Code

GitHub & Project Demo Link

1. INTRODUCTION

“Digitalisation, the surge of mobile and internet connected devices has revolutionised the way people interact with one another and communicate with businesses” (Eeuwen, M.V. (2017)). Millennials are accepting and supporting new technology into the routine of their everyday life, this is becoming more is becoming more prevalent as technology companies are streamlining Artificial IntelliIntelligence (AI) into the products they offer, such as; Google Assistant, Google Home and Amazon Alexa. The new and upcoming generation are expected to be critical and game changing customers for businesses. “They demand effortless experiences, answers within seconds, not minutes and more intelligent self-service options” (Teller Vision,, . (2017)). The banking and the financial service industry was one of the first industries to adopt technology. This integration has grown massively, helping banks reach a wider customer base enabling them to perform their banking conveniently (Baptista and , G. and Oliveira, , T. (2015)).

a. Project Overview

Banks are becoming ever more competitive with each other to adopt the newest advancements in technology to provide an improved delivery service to satisfy customers. Ulster Bank, Deloitte, AIB and PTSB are wanting to focus on integrating new technology to improve the speed at which transactions are acknowledged (Global Banking News, . (, 2017)). With this in mind the relationship with the customer is always evolving due to the growth of technology. Banks are now enabling the use of technology so customers can perform more tasks online, such as; cheque image clearing to allow the payment of cheques remotely and intelligent chatbots to increase customer service and assist employees.

A chatbot is a “simple software program that can respond to customer prompts i.e. what’s my bank balance?” (Entrepreneur, . (, 2016)). Mastercard has launched Kai an artificial intelligent chatbot and other bots for financial services. They can handle customer queries such as: ‘what is APR?’, requests, look at spending habits and solve problems. This in turn enables financial institutions to provide a new, engaging experience and strengthen their relationship with the customer, with the aid of natural language used by bots to establish a more personal and contextual conversation (Wire, . (, 2016)). The focus of this project is to implement these new technologies to create an intelligent chatbot to enable banks to appeal to millennials and potentially gain a lifelong customer.

b. Purpose

An intelligent chat bot will be used to give information or answers to any question asked by user related to bank. Our Intelligent system will first take input from bank customer. This input will be taken as voice or written format. According to input, intelligent system will processes the query and give response to user. An artificial intelligence is most important and helpful part of our project. Intelligent system is automation of activities associated with human thinking, decision making, and problem solving process. This system will be available on web. Our system will represent the design and development of an intelligent chat bot. It will present a technology demonstrator to verify a proposed framework required to support such a bot (a web service). While a black box approach is used, by controlling the communication structure, to and from the webservice, the web-service allows all types of clients to communicate to the server from any platform.

The service provided will be accessible through a generated interface which allows for seamless XML processing; whereby the extensibility improves the lifespan of such a service. By introducing an artificial brain, the webbased bot generates customiz ed user responses, aligned to the desired character. Questions asked to the bot, which will not be understood, are further processed using a third-party expert system, and the response will be archived, improving the artificial brain capabilities for future generation of responses.

LITERATURE SURVEY

a. Existing problem

The banking industry has multiple electronic delivery channels in use to distribute technology assets and services for the benefit of their customers. Online banking is a commodity of commerce within financial services as well as banking industries (Ajimon and , G. G.S. Gireesh K,.(George and Kumar, 2013)). Advancements in technology has transformed many of our services into the digital era and the banking industry is one of the primary industries to avail of these advancements to improve their services. Currently within the UK two paradigms are available for online banking. One of which is an integrated internet bank which still operates through the branch but has an online presence.

The other, a stand-alone internet bank, that operates completely independently and its only existence is solely through the internet (MarketLine, 2017). Banks implement technology to strengthen their processing capacity, acquire a larger customer base and expand the services they could offer (Consoli, . (, 2005)). The use of internet banking has grown in demand enormously in the last decade. “15% of branch customers use online banking once a day, 59% once a week, 77% at least once a month and 53% were confident in carrying out the best part of their banking online” (Barty, J. and Recketts, T. BBA, (2014)).

Online banking has become more popular as it negates the need for customers to visit their local branch as they can manage their finances on the go to meet the demand of modern life. This is evident as branchless banks are now emerging from the industry such as Atom Bank and many banks now closing some of their branches. This is evident with the recent closure of 11 Ulster Bank Branches in NI due to the increased number of customers performing their banking online (The Belfast Telegraph). HoweverHowever, a recent study by Ling et al., (2016), notes that most internet banking service providers struggle to get many of their customers to use their service.

They identify lack of customer satisfaction when using online banking services to be a major cause. “Service quality, web design and content, security, privacy, speed and convenience” (Ling et al., 2016) are stated identified as the top factors influencing customer satisfaction This suggests that there is a lack of technology in place to enhance the customer online banking experience which could be improved by integrating a chatbot to provide an efficient, convenient and personal service.

b. References

(United kingdom online banking (2002). MarketLine, a Progressive Digital Media business, 2017) (Accessed 10/10/2017)MarketLine, a Progressive Digital Media Business. (2002). ‘United Kingdom online banking’. Available at: http://www.marketlineinfo.com (Accessed 10/10/2017). Ling, G., Fern, Y., Boon, L. and Huat, T. (2016). Understanding Customer Satisfaction of Internet Banking: A Case Study In Malacca. ‘Procedia Economics and Finance’, 37, pp.80-85.n (Accessed 11/10/2017)

Barty, J. and Recketts, T. (2014). 'Promoting Competetion in the UK banking Industry', Promoting Competetion in the UK banking Industry. BBA Competition Report., , pp. 4. Available at: https://www.bba.org.uk/wpcontent/uploads/2014/06/BBA_Competition_Report_23.06_WEB_2.0.pdf (Accessed 10/10/2017). Aburub, F., Odeh, M., & Beeson, I. (2007).

'Modelling non-functional requirements of business Processes’. Information and Software Technology, 49(11–12), 1162-1171. Available at: http://dx.doi.org/10.1016/j.infsof.2006.12.002 (Accessed 10/10/2017).

Cardline. (2010). ‘Half of UK internet users now bank online’, 10(3), pp. 32-32. Availablle at: http://web.b.ebscohost.com/bsi/detail/detail?vid=1&sid=23ade416-2f14-4608-a8a1-3de95541175b%40sessionmgr102&bdata=JnNpdGU9YnNpLWxpdmU%3d#AN=47659678&db=bth (Accessed 10/10/2017).

Half of UK internet users now bank online.(2010). Cardline, 10(3), 32-32, .(Accessed 10/10/2017) HDFC bank, niki.ai tie up for chatbot banking.(2017). FRPT- Finance Snapshot, , 24-25.(Accessed 11/10/2017) FRPT Research- Finance Snapshot. (2017). ‘HDFC Bank, Niki.ai tie up chatbot for banking’, pp 24-25. Available at: http://web.b.ebscohost.com/bsi/pdfviewer/pdfviewer?vid=8&sid=c34ab15e?2256-41a5-8757-f8ef87bd08e8%40sessionmgr104.

(Accessed 11/10/2017) Ling, G. M., Fern, Y. S., Boon, L. K., & Huat, T. S. (2016). Understanding customer satisfaction of internet banking: A case study in malacca. Available at doi:https://doi.org/10.1016/S2212- 5671(16)30096-X EEE521 Final Year Project 2017/18 B00659303 3 Hugh J. Watson, H. J. (2017).

'Preparing for the Cognitive Generation of Decision Support', MIS Quarterly Executive, 16(3), pp. [Online]. Available at: http://www.misqe.org/ojs2/index.php/misqe/article/viewFile/705/465 (Accessed: 10/10/2017). Daniëlle Duijst, D. (2017).

'Can we Improve the User Experience of Chatbots with Personalisation?', University Of Amsterdam, (), pp. 3 [Online]. Available at: 10.13140/RG.2.2.36112.92165 (Accessed: 11/10/2017). United kingdom online banking(2002).

MarketLine, a Progressive Digital Media business. Watson, A. (2010). How to succeed with NLP: Go from good to great at work using the power of neuro-linguistic programming.

Oxford: Capstone .(Accessed 11/10/2017) KingING, W. B. (2017). Year of the chatbot: Credit unions gearing up for artificial intelligence. Credit Union Journal, 21(4), 18-18 . (Acccessed 11/10/2017).

Dole, A., Sansare, H., Harekar, R. and Athalye, S. (2015). [online] www.ijettcs.org. Available at: http://www.ijettca.org/Volume4Issue5(2)/IJETTCS-2015-10-09-16.pdf [Accessed 11 Oct. 2017]. Intelligent chatbot for banking system. (2017).

[ebook] Available :http://www.ijettcs.org/Volume4Issue5(2)/IJETTCS-2015-10-09-16.pdf [Accessed 11 Oct. 2017].

D. Latimore, D I. . Watson, I. & C. Maver. C. (2000). The customer speaks: '3300 Internet users tell us what they want from retail financial services'. Yusuf Dauda, S.Y., & Lee, J (2015).

' A conjoint analysis of consumers′ preference on future online banking services, Nigeria: Elsevier Ltd.

Goncalo Bapista, G. and Tiago Oliveira, T. (2015). 'Understanding mobile banking: The unified theory of acceptance and use of technology combined with cultural moderators', : Elsevier Ltd. EEE521 Final Year Project 2017/18 B00659303 4 Ajimon George. A and G.S. Gireesh Kumar, G. (2013)

'Antecedents of Customer Satisfaction In Internet Banking: Technology Acceptance Model (TAM) Redefined', Global Business Review, 14(4), pp. [Online]. Available at: http://journals.sagepub.com/doi/10.1177/0972150913501602 Available at: https://smartech.gatech.edu/bitstream/handle/1853/58516/evaluation_of_modern_tools_for_an_omscs_advisor_chatbot%281%29.pdf?sequence=1&isAllowed (Accessed: 21/10/2017). Eric Leenders, E. (2018).'

Banking's digital revolution continues', Available at: https://www.ukfinance.org.uk/bankings-digital-revolution-continues/ (Accessed: 12/10/2017). Susan Etlinger, S. (2017).

'The Conversational BusinessTHE CONVERSATIONAL BUSINESS: How Chatbots will reshape Digital Experiences'. [Online]. Available at: https://andyblackassociates.co.uk/wp-content/uploads/2015/06/ConversationalBusiness_FINAL?1.pdf (Accessed: 16/10/2017). YY Onufreiv, YY. (2017).

‘The Rise In Chatbots Trends’THE RISE IN CHATBOTS TRENDS. THE RISE IN CHATBOTS TRENDS. - (-), 82-83. (Accessed 16/10/2017) Eric Gregori, E. (2017). 'Evaluation of Modern Tools for an OMSCS Advisor Chatbot'. [Online]. Available at: https://smartech.gatech.edu/bitstream/handle/1853/58516/evaluation_of_modern_tools_for_an_omscs_advisor_chatbot%281%29.pdf?sequence=1&isAllowed (Accessed: 21/10/2017).

Erik Cambria, E., Bebo White, B. (2014) 'Jumping NLP Curves: A Review of Natural Language Processing Research', IEEE Computational Intelligence MAgazineCOMPUTATIONAL INTELLIGENCE MAGAZINE. [Online]. Available at: http://sentic.net/jumping-nlp?curves.pdf (Accessed: 21/10/2017). Daniel Jurafsky, D. and James H. Martin, J. H. (2017).

An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition. Third Edition [Online]. Available at: https://web.stanford.edu/~jurafsky/slp3/ed3book.pdf (Accessed: 21/10/2017). https://www.bba.org.uk/wp?content/uploads/2014/06/BBA_Competition_Report_23.06_WEB_2.0.pdf EEE521 Final Year Project 2017/18 B00659303 5 Rohan Kar, R. and Rishin Haldar, R. (2016).

Applying Chatbots to the Internet of Things: Opportunities and Architectural Elements',, , (), pp. [Online]. Available at: https://arxiv.org/abs/1611.03799 (Accessed: 06/11/2017). Nat Landry, N. (2011).

‘ Iterative and Agile Implementation Methodologies in Business Intelligence and Software Development’, : Lulu Enterprises. A B M Moniruzzaman, A. B. M. and Dr Syed Akhter Hossain, S.A. (2013).

' Comparative Study on Agile software development methodologies', Global Journal of Computer Science and Technology, 13(7), pp. [Online]. Available at: https://arxiv.org/ftp/arxiv/papers/1307/1307.3356.pdf (Accessed: 08/11/2017) Asif Irshad Khan, A.I., Rizwan Jameel Qurashi, R. J and Usman Ali Khan, U. A. (2011). 'A Comprehensive Study of Commonly Practiced Heavy and Light Weight Software Methodologies ',

IJCSI International Journal of Computer Science Issues, 8(4), pp. [Online]. Available at: https://arxiv.org/ftp/arxiv/papers/1111/1111.3001.pdf (Accessed: 08/11/2017) Jonathan Lazar, J. (2001) User-centered Web Development, United States of America: Jones and Bartlett Publishers .

Graham Oakes, G. (2008). ‘Project Reviews, Assurance and Governance’, United Kingdom: Gower Publishing Limited. Instructional Software Research and Development (2007) Structured System Anal And Design Isrd, New Delhi: Tata McGraw-Hill Publishing Company Limited. Pauline M. McGuirk, P. M. Phillip and O'Neill, P. (2016).

'Using questionnaires in qualitative human geography', University of Wollongong, Faculty of Social Sciences, (), pp. 11 [Online]. Available at: http://ro.uow.edu.au/cgi/viewcontent.cgi?article=3519&context=sspapers (Accessed: 12/11/2017).

Melanie Exner-Stöhr , M., Alexander Kopp , A., Leonhard Kühne-Hellmessen , L., Lukas Oldach , L., Daniela Roth, D. Aand Alfred Zimmermann, A. (2017). 'The potential of Artificial Intelligence in academic research at a Digital University', Digital Enterprise Computing, (), pp. 3 [Online]. Available at: https://dl.gi.de/bitstream/handle/20.500.12116/120/paper05.pdf?sequence=1&isAllowed=y (Acce ssed: 16/11/2017).

EEE521 Final Year Project 2017/18 B00659303 6 Kazuo Yano, K. (2017). 'How artificial intelligence will change HR'.40(3), 43-44.(Accessed 16/11/2017) Stuart J. Russell, S. J and Peter Norvig, P. (1995).

Artificial intelligence A modern approach. Noor Atikah, N., Amira Fauzi, A., Rohayanti Hassan, R., Zuraini Ali Shah, Z. A. and Zalmiyah Zakaria, Z. (2016) Extraction of Non-Functional Requirements in Reviewing Requirements Specification Document, 2, pp. 1 (Accessed 19/11/2017).

Frank Tsui, F., Orlando Karam, O. and Barbara Berna, B. (2016). 'Essentials of Software Engineering'. 4th Edition [Online]. Available at: https://books.google.co.uk/books?hl=en&lr=&id=fV?HDQAAQBAJ&oi=fnd&pg=PP1&dq=functional+and+nonfunctional+requirements+definition+soft ware+development&ots=P3-Cil3TVN&sig=kWwrD0XWLzWyxfi49W4XVfWxXWg#v=onepage&q&f=false (Accessed: 19/11/2017).

Milan van Eeuwen, V. M. (2017). 'Mobile conversational commerce: messenger chatbots as the next interface between businesses and consumers', University of Twente, (), pp. 2 [Online]. Available at: http://essay.utwente.n l/71706/1/van%20Eeuwen_MA_BMS.pdf(Accessed: 20/11/2017) Teller Vision. (2017).

'HGS Identifies Top 10 Customer Experience Trends', Issues and Trends, (), pp. 4 [Online]. Available at: http://eds.a.ebscohost.com/eds/pdfviewer/pdfviewer?vid=14&sid=1fd6a005- b85b-430e-b3c8-30a3f70d947e%40sessionmgr4007 (Accessed: 21/11/2017).

Bayan Abu Shawar, B. A. and Eric Atwell, E. (2007). 'Chatbots: Are they Really Useful?', LDV?Forum, pp. 29, 30 [Online].Available: http://eprints.whiterose.ac.uk/81930/1/AComparisonBetweenAliceElizabeth.pdf (Ac cessed:22/11/2017).

OLGA ANNENKO, O. (2016). When to Use Webhooks vs. APIs To Sync Data Between Applications, Available at: https://www.elastic.io/sync-data-between-applications-apis?webhooks/ (Accessed: 01/03/2018). EEE521 Final Year Project 2017/18 B00659303 7 DialogFlow. (2015).

' A Speech Interface in 3 Steps', Available at: https://blog.dialogflow.com/post/speech-interface-3-steps/ (Accessed: 01/03/2018). DZone. (20918).

‘ A Writer's Guide to Conversational Interfaces’, Available at: https://dzone.com/articles/a-writers-guide-to-conversational-interfaces?fromrel=true(Accessed: 20/03/2018).

Taylor Otwell, T. (2018). Laravel, Available at: https://laravel.com/docs/5.5/blade (Accessed: 05/02/2018). cs.hmc.edu. (2018).’ Domain Specific Design Patterns: Designing For Conversational User Interfaces’.

[online] Trento: cs.hmc.edu. Available at: https://arxiv.org/ftp/arxiv/papers/1802/1802.09055.pdf [Accessed 14 Mar. 2018]. Google. (2018).

‘Design Principles and Methodology’, Available at: https://developers.google.com/actions/design/principles (Accessed: 27/03/2018).

http://www.spokenlanguagetechnology.com/docs/McTear_ESSV_2018.pdf. (Accessed d04/03/2018) Asbjørn Følstad, A. and, Petter Brandtzæg, P. (August 2017).

‘ Chatbots and the new world of HCI’, Available at: http://interactions.acm.org/archive/view/july-august-2017/chatbots-and-the-new-world-of?hci (Accessed: 14/02/2018).

Open Banking Ltd 2018 (2018) Open Banking, Available at: https://www.openbanking.org.uk/about-us/ (Accessed: 18/03/ 2018)

c. Problem Statement Definition

It is evident from the research carried out in the literature review that modern financial services are constantly seeking to expand their technologies, both to improve customer service and increase delivery of services through the advancements in technology. This is to gain a competitive edge over other banks for financial benefits and to expand its customer base. A domain specific chatbot will be implemented to assist users with their banking. In order to overcome the user satisfaction issues associated with online banking services.

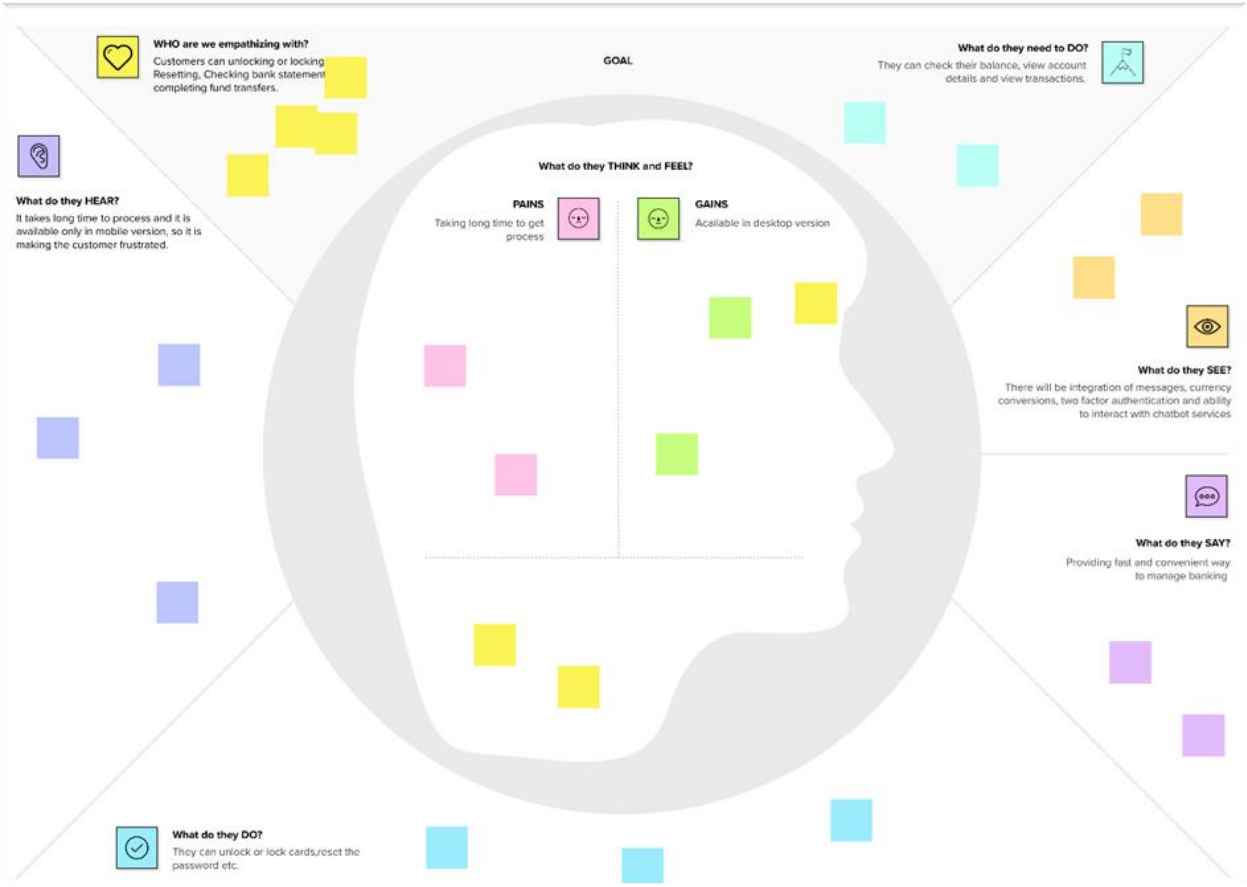
The chatbot will provide personal and efficient communication between the user and their bank in order to manage their finances and get assistance when needed, such as; answering any queries and booking appointments. The chatbot will allow users to feel confident and comfortable when using this service regardless of the user’s computer literacy due to the natural language used in messages. It also provides a very accessible and efficient service as all interactions will take place within the one chat conversation negating the need for the user to navigate through a site.

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas

3.2 Brainstorming

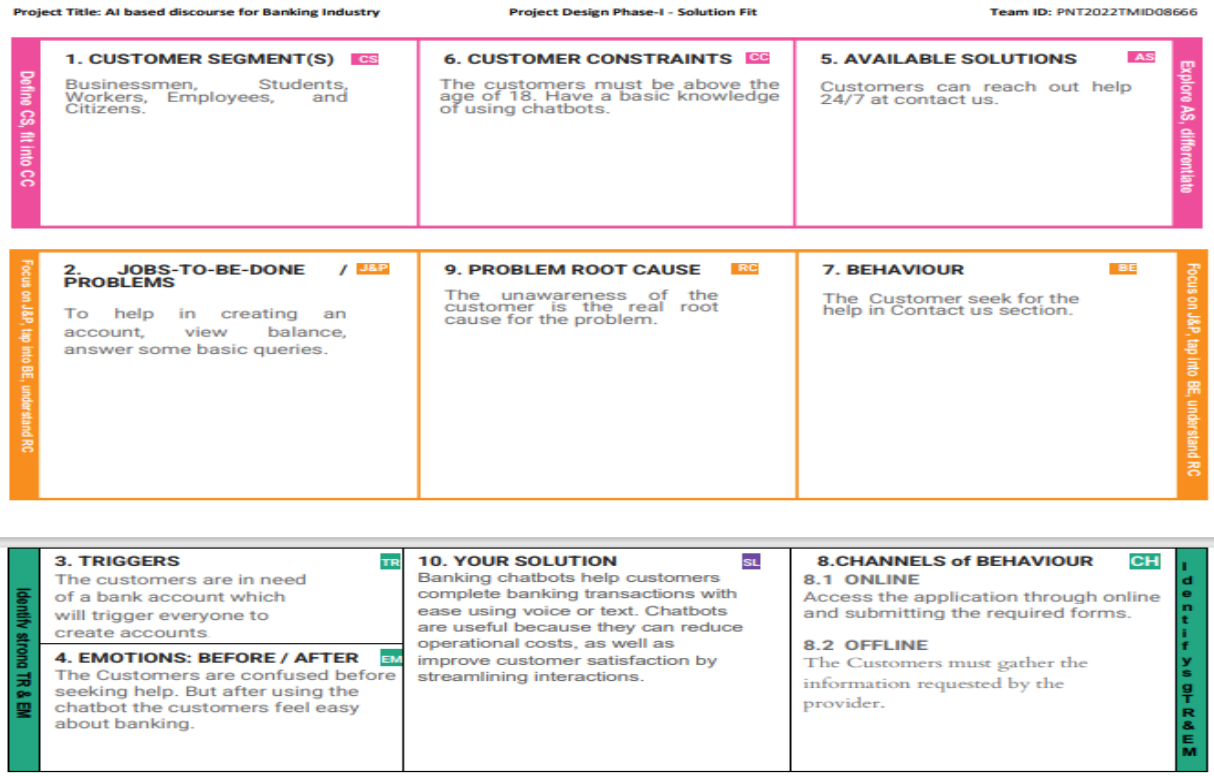
Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate,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



3.3 Proposed Solution

The proposed solution is to create a chatbot to simulate a human conversation to assist users with their banking needs and to provide a more personal experience. Advancements in artificial Intelligence, machine learning techniques, improved aptitude for decision making, larger availability of domains and corpus, have increased the practicality of integrating a chat bot into applications (Dole et al., 2015). Users will be able to ask any banking related queries in natural language that they are comfortable using such as; view account information, transactions and check balance. The chatbot will identify and understand what the user is asking and generate an appropriate response based on the conversational context. Immediate responses will be provided by the chatbot to redeem the need for the user to have to call or visit their local banks branch and wait in queue in order to get through to an advisor for assistance. In order to make the application more secure Googles 2 Factor Authentication will be integrated to increase security ensuring only registered users can gain access to their account preventing the risk of fraud.

3.4 Problem Solution fit



4. REQUIREMENT ANALYSIS

4.1 Functional requirement

Allow unregistered users to register on the application and save their details to the database.

• Provide confirmations notifications through emaiSMSl.

• Registered users will be able to login, once login details are submitted to database the user will be presented with a QR code implemented through Google's Two-Factor Authentication and a unique code will be generated and sent to the user's mobile device.

• The chat bot must allow users to view information about accounts held by them i.e. savings, loans, current account.

• The Chat bot will allow users to view their transactions through a transactions statement sent to the users email.

• The Chat bot will integrate with the TrueLayer Starling API which will return data about the users' bank account.

• The Chat bot will assist users with their queries and carry out appropriate actions such as scheduling appointments. with finance consultants.

• Users will be able to converse with the Chat bot through voice or text commands and it will understand what the user is saying through natural language understandinprocessing provided through the integration of Dialogflow API.

• The chat bot should be able to maintain the conversational state when the context may be unclear through previous messages and conversations.

• Provide text and audio responses.

4.2 Non-Functional requirements

The chatbot must be efficient with very little lag in response time for instance no longer than 5 seconds to reply to a user message.

• The chatbot must be reliable with next to no faults or bugs

• The database must be scalable to adopt to a growing number of users

• The chatbot must be secure as sensitive data is being used, Googles 2-Factor Authentication will be implemented as an extra security feature

• Comply with data protection laws such as the Data Protection Act 1198

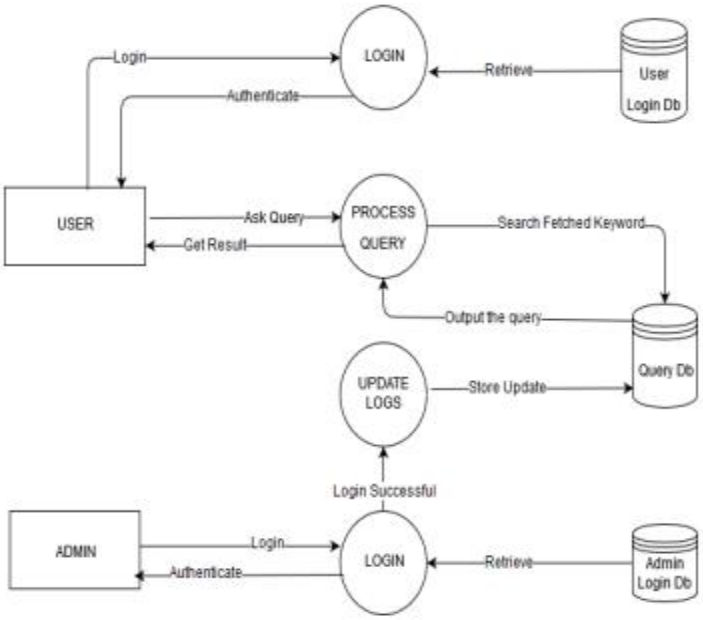
•The use of natural language used to interact with the chatbot promotes human computer interaction.

• Provide accurate responsesaccurate responses to input

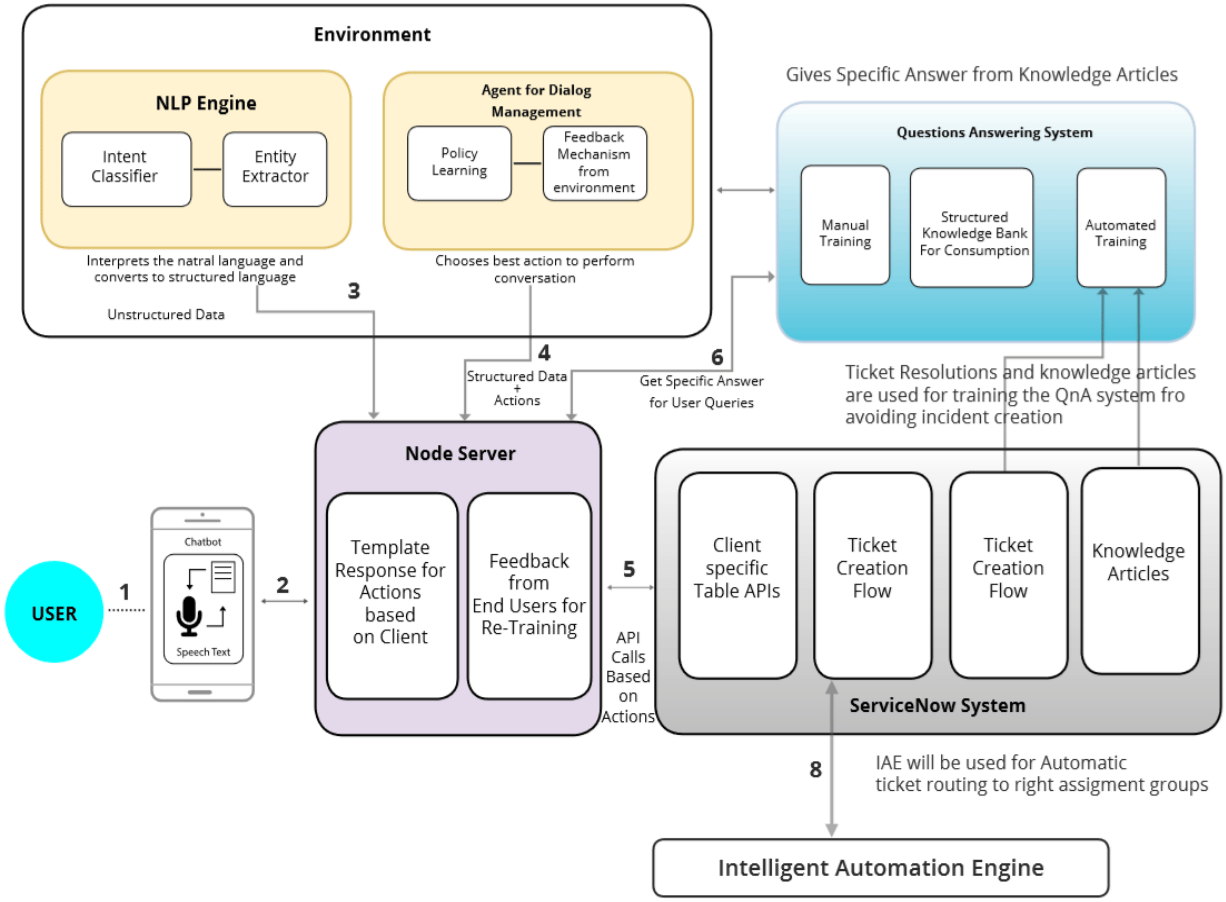
• Appropriate handling of unexpected input & , and correctly inform the user if it cannot provide assistance

5. PROJECT DESIGN

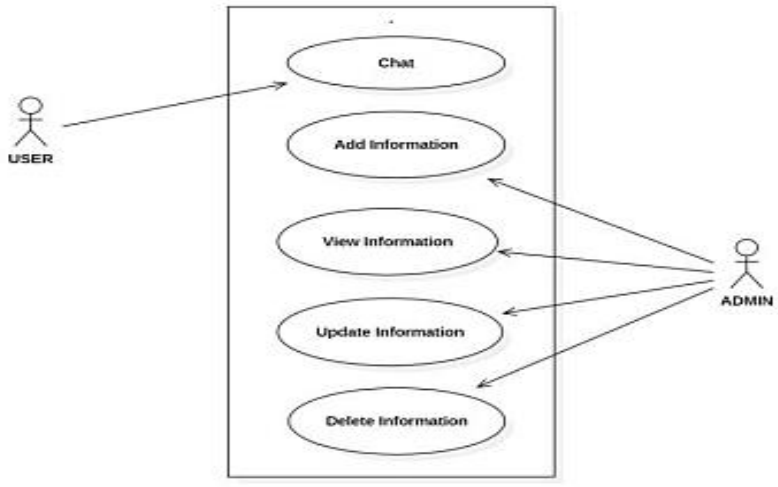
5.1 Data Flow Diagrams



5.2 Solution & Technical Architecture



5.3 User Stories

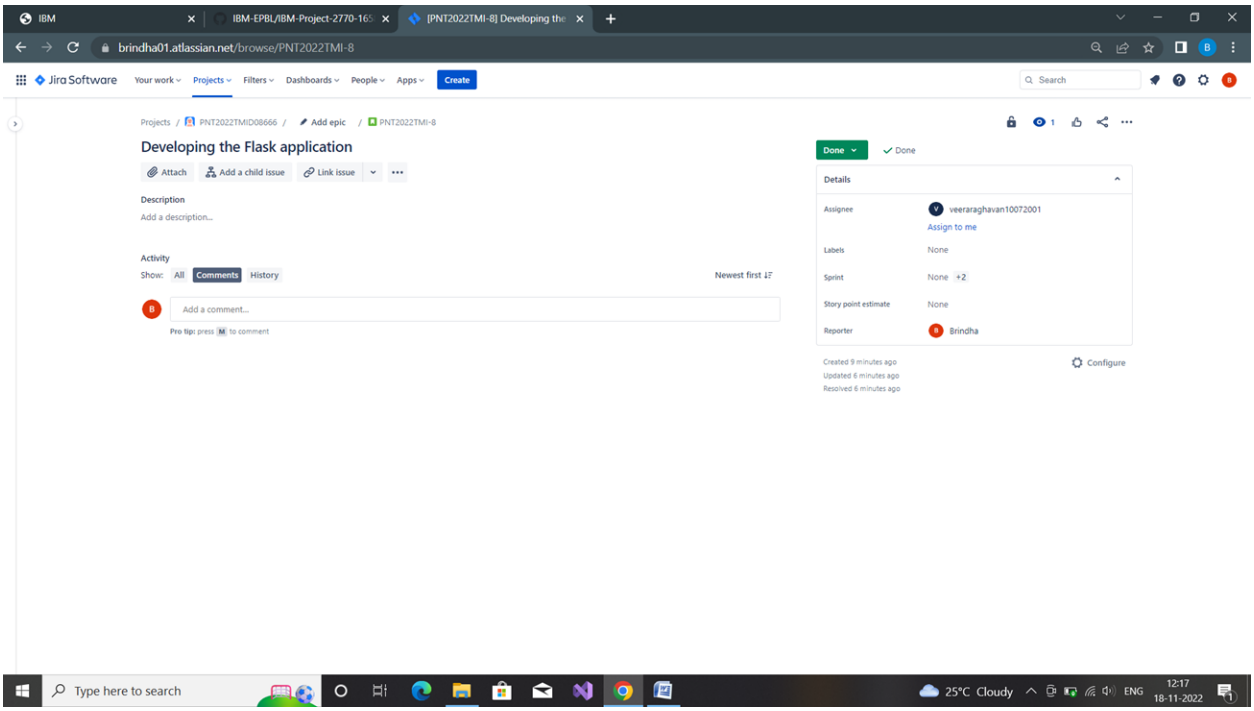


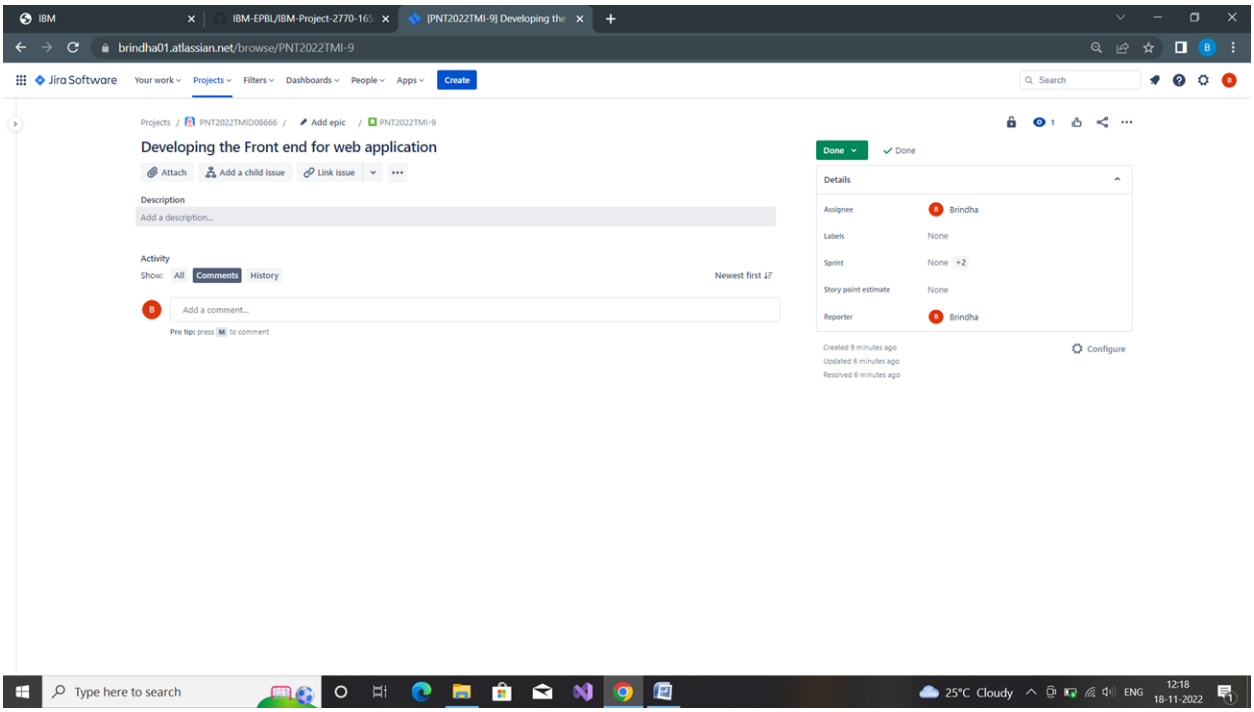
6. PROJECT PLANNING & SCHEDULING

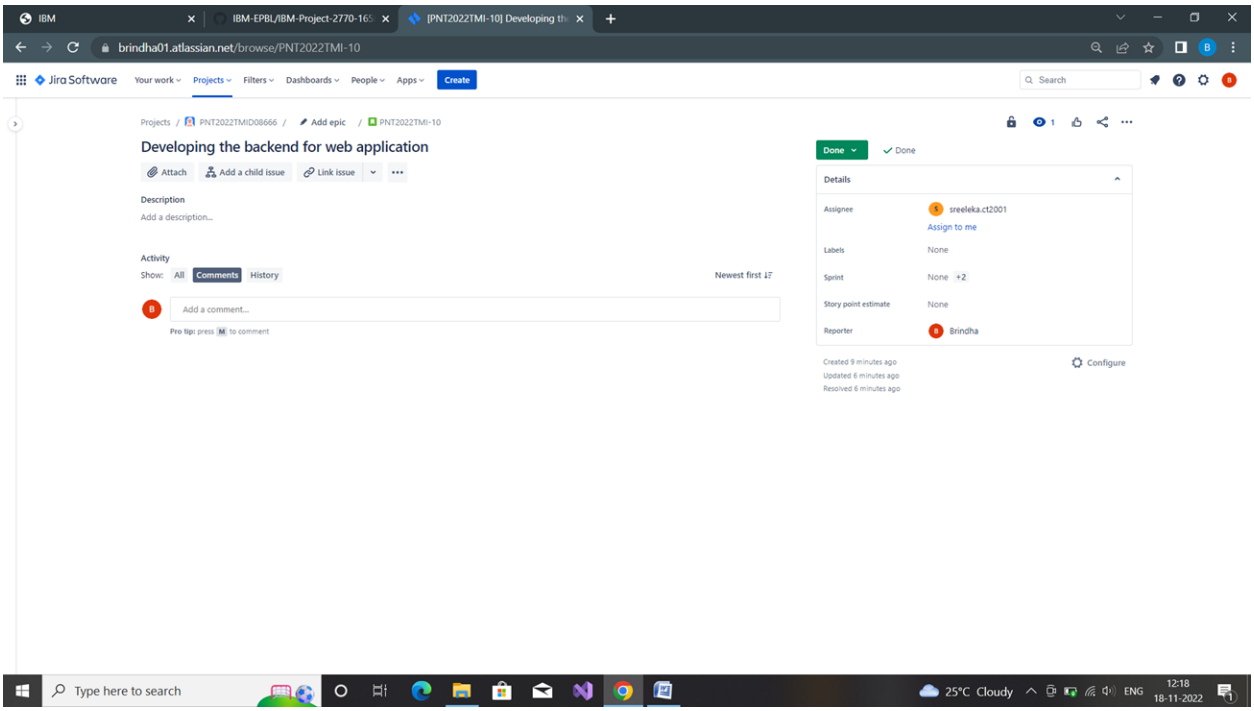
6.1 Sprint Planning & Estimation

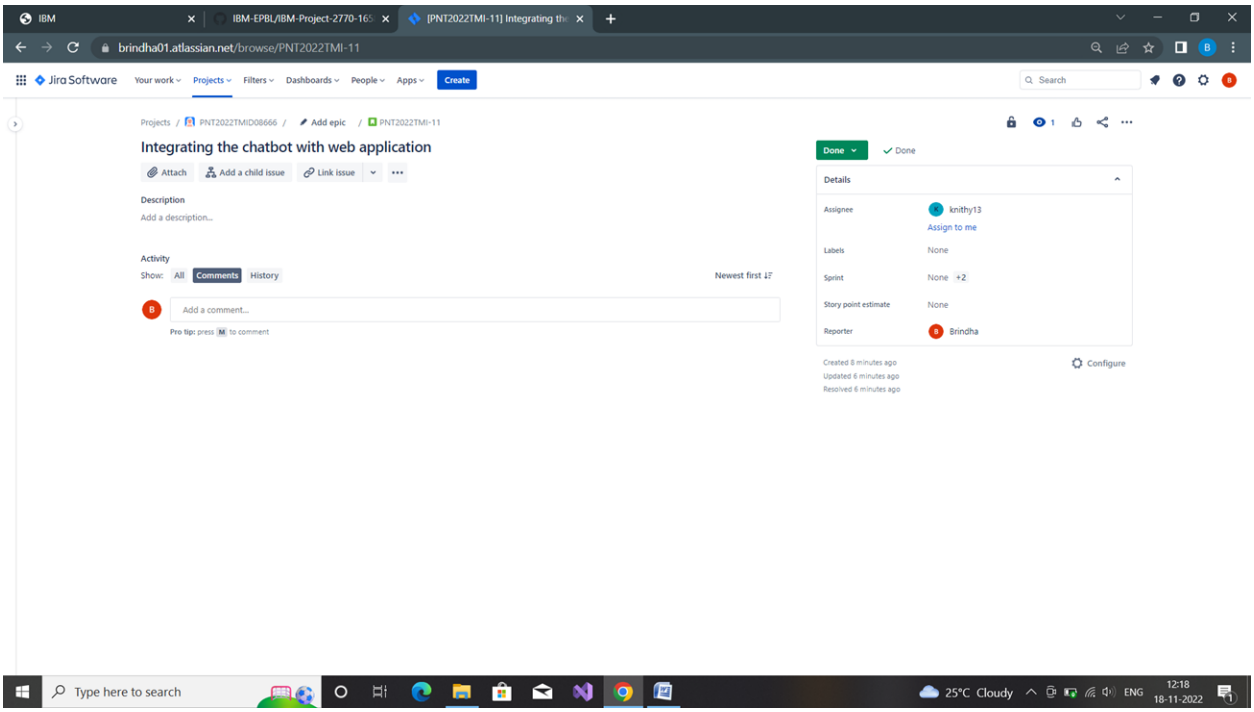
The purpose of evaluating the software is to identify the quality of the chatbot by outlining the performance attributes and analysing the results, future work is purposed along with a reflection of the current work completed. The results from the user questionnaires gave great insight into the overall response and precision rate. The questionnaires were distributed across a user group consisting of 15 individuals with varying technical knowledge. These were completed by parents and prospective students at the Ulster University Open Day as part of the school of Engineering and Computing, this user group is truly reflective of the target audience that would benefit from an application like this. The results from the user questionnaires will be compared to the simulated user interactions identifying subjective and objective metrics. During the questionnaire the users were observed to capture free standing information regarding the interaction experience which also qualify as subjective measurements. This allowed the identification of other quality metrics which were not initially considered and lead to a deeper understanding of the chatbots performance. (How often the chatbot repeated itself,).

6.2 Sprint Delivery Schedule

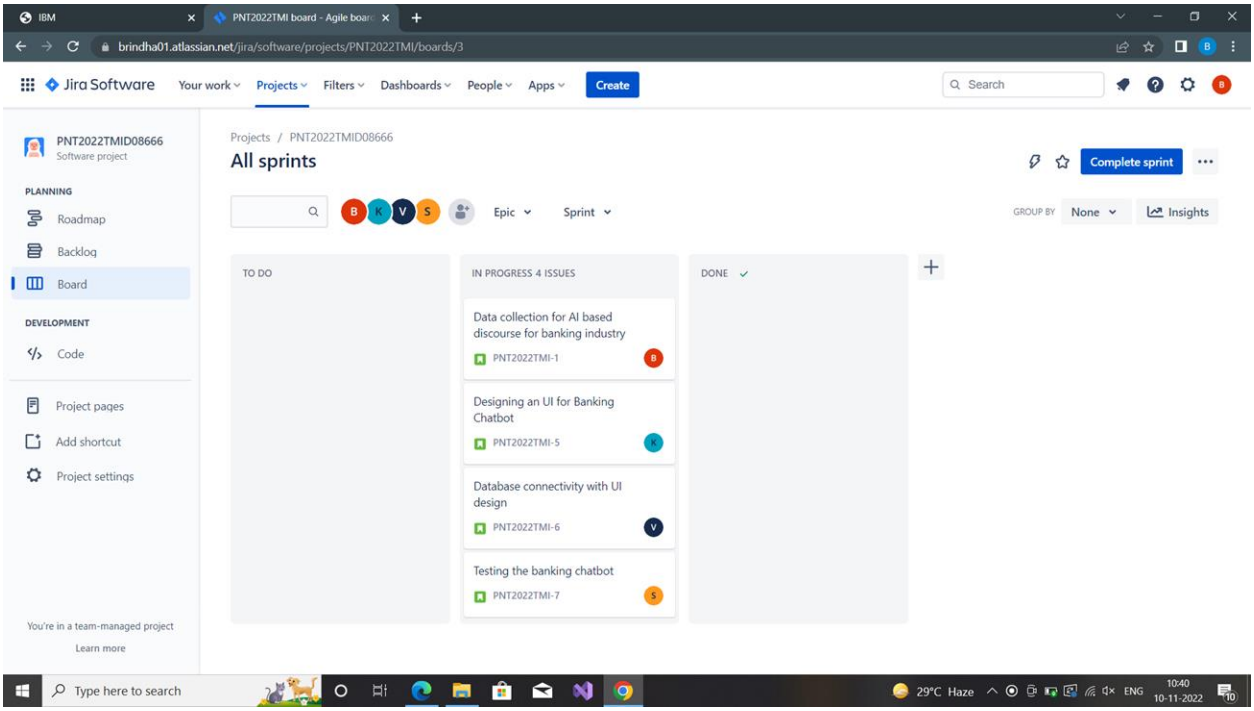

IBM
IBM-EPBL/IBM-Project-2770-165
[PNT2022TMI-8] Developing the
brindha01.atlassian.net/browse/PNT2022TMI-8
Jira Software
Your work
Projects
Filters
Dashboards
People
Apps
Create
Search
Projects / PNT2022TMID08666 / Add epic / PNT2022TMI-8
Developing the Flask application
Attach
Add a child issue
Link issue
Description
Add a description...
Activity
Show: All Comments History
Newest first
Add a comment...
Pro tip: press M to comment
Done
Done
Details
Assignee
veeraraghavan10072001
Assign to me
Labels
None
Sprint
None +2
Story point estimate
None
Reporter
Brindha
Created 9 minutes ago
Updated 6 minutes ago
Resolved 6 minutes ago
Configure
Type here to search
25°C Cloudy
ENG
12:17
18-11-2022

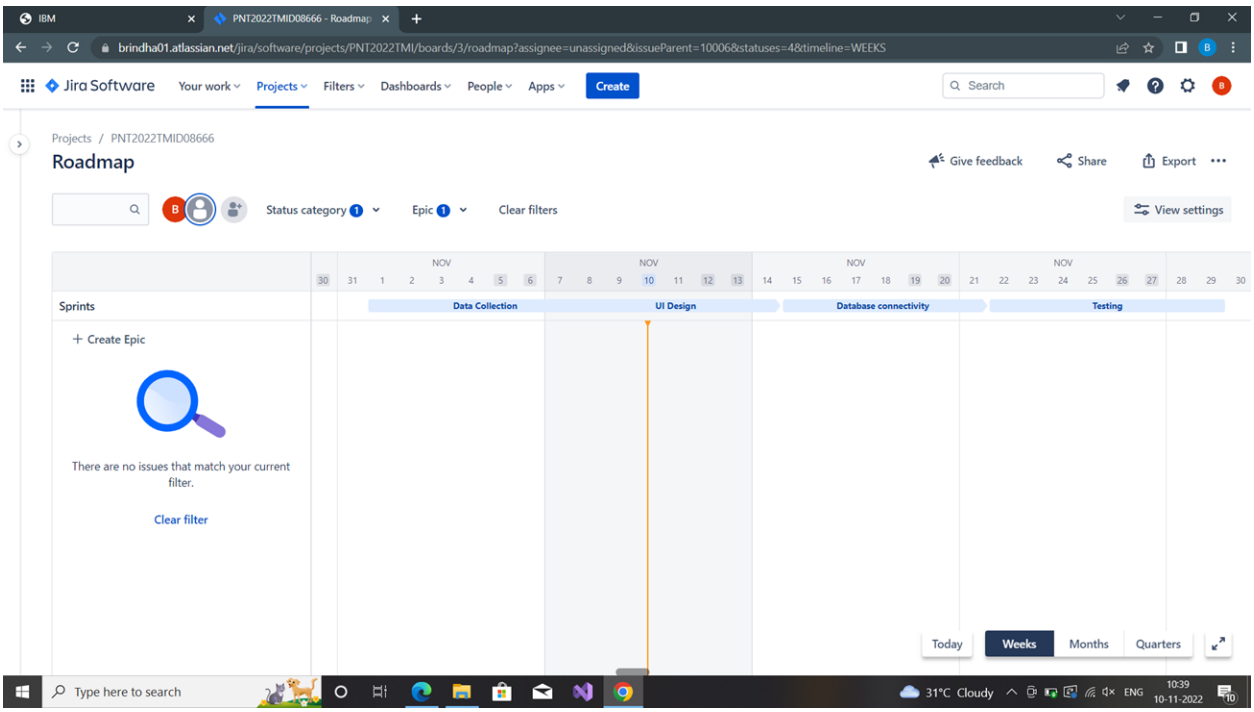

IBM
IBM-EPBL/IBM-Project-2770-165
[PNT2022TMI-9] Developing the
brindha01.atlassian.net/browse/PNT2022TMI-9
Jira Software
Your work
Projects
Filters
Dashboards
People
Apps
Create
Search
Projects / PNT2022TMID08666 / Add epic / PNT2022TMI-9
Developing the Front end for web application
Attach
Add a child issue
Link issue
Description
Add a description...
Activity
Show: All Comments History
Newest first
Add a comment...
Pro tip: press M to comment
Done
Done
Details
Assignee
Brindha
Labels
None
Sprint
None +2
Story point estimate
None
Reporter
Brindha
Created 9 minutes ago
Updated 6 minutes ago
Resolved 6 minutes ago
Configure
Type here to search
25°C Cloudy
ENG
12:18
18-11-2022


IBM
IBM-EPBL/IBM-Project-2770-165
[PNT2022TMI-10] Developing th
brindha01.atlassian.net/browse/PNT2022TMI-10
Jira Software
Your work
Projects
Filters
Dashboards
People
Apps
Create
Search
Projects / PNT2022TMID08666 / Add epic / PNT2022TMI-10
Developing the backend for web application
Attach
Add a child issue
Link issue
Description
Add a description...
Activity
Show: All Comments History
Newest first
Add a comment...
Pro tip: press M to comment
Done
Done
Details
Assignee
sreeleka.ct2001
Assign to me
Labels
None
Sprint
None +2
Story point estimate
None
Reporter
Brindha
Created 9 minutes ago
Updated 6 minutes ago
Resolved 6 minutes ago
Configure
Type here to search
25°C Cloudy
ENG
12:18
18-11-2022


IBM
IBM-EPBL/IBM-Project-2770-165
[PNT2022TMI-11] Integrating th
brindha01.atlassian.net/browse/PNT2022TMI-11
Jira Software
Your work
Projects
Filters
Dashboards
People
Apps
Create
Search
Projects / PNT2022TMID08666 / Add epic / PNT2022TMI-11
Integrating the chatbot with web application
Attach
Add a child issue
Link issue
Description
Add a description...
Activity
Show: All Comments History
Newest first
Add a comment...
Pro tip: press M to comment
Done
Done
Details
Assignee
knithy13
Assign to me
Labels
None
Sprint
None +2
Story point estimate
None
Reporter
Brindha
Created 8 minutes ago
Updated 6 minutes ago
Resolved 6 minutes ago
Configure
Type here to search
25°C Cloudy
ENG
12:18
18-11-2022

6.3 Reports from JIRA





7. CODING & SOLUTIONING

7.1 Feature 1

```
<!DOCTYPE html>
                    <html lang="en">
                    <link rel="stylesheet" href="style.css">

                    <head>
                      <meta charset="UTF-8">
                      <title>Chatbot</title>
                    </head>
                    <body>
                    <div class="container">
                      <div class="chatbox">
                        <div class="chatbox__support">
                          <div class="chatbox__header">
                            <div class="chatbox__image--header">
                              <img src="https://img.icons8.com/color/48/000000/circled-user-female-skin-type-5--v1.png" alt="image">
                            </div>
                            <div class="chatbox__content--header">
                              <h4 class="chatbox__heading--header">Chat support</h4>
                              <p class="chatbox__description--header">Hi. My name is Sam. How can I help you?</p>
                            </div>
                          </div>
                          <div class="chatbox__messages">
                            <div></div>
                          </div>
                          <div class="chatbox__footer">
                            <input type="text" placeholder="Write a message...">
                            <button class="chatbox__send--footer send__button">Send</button>
                          </div>
                        </div>
                        <div class="chatbox__button">
                          <button><img src="./images/chatbox-icon.svg" /></button>
                        </div>
                      </div>
                    </div>

                      <script src="./app.js"></script>

                    </body>
                    </html>
```

7.2 Feature 2

```
class Chatbox {
        constructor() {
            this.args = {
                openButton: document.querySelector('.chatbox__button'),
                chatBox: document.querySelector('.chatbox__support'),
                sendButton: document.querySelector('.send__button')
            }

            this.state = false;
            this.messages = [];
        }

        display() {
            const {openButton, chatBox, sendButton} = this.args;

            openButton.addEventListener('click', () => this.toggleState(chatBox))

            sendButton.addEventListener('click', () => this.onSendButton(chatBox))

            const node = chatBox.querySelector('input');
            node.addEventListener("keyup", ({key}) => {
                if (key === "Enter") {
                    this.onSendButton(chatBox)
                }
            })
        }

        toggleState(chatbox) {
            this.state = !this.state;

            // show or hides the box
            if(this.state) {
                chatbox.classList.add('chatbox--active')
            } else {
                chatbox.classList.remove('chatbox--active')
            }
        }

        onSendButton(chatbox) {
            var textField = chatbox.querySelector('input');
            let text1 = textField.value
```

```
    if (text1 === "") {
        return;
    }

    let msg1 = { name: "User", message: text1 }
    this.messages.push(msg1);

    fetch('http://127.0.0.1:5000/predict', {
        method: 'POST',
        body: JSON.stringify({ message: text1 }),
        mode: 'cors',
        headers: {
          'Content-Type': 'application/json'
        },
      })
      .then(r => r.json())
      .then(r => {
        let msg2 = { name: "Sam", message: r.answer };
        this.messages.push(msg2);
        this.updateChatText(chatbox)
        textField.value = ''

    }).catch((error) => {
        console.error('Error:', error);
        this.updateChatText(chatbox)
        textField.value = ''
      });
}

updateChatText(chatbox) {
    var html = '';
    this.messages.slice().reverse().forEach(function(item, index) {
        if (item.name === "Sam")
        {
            html += '<div class="messages__item messages__item--visitor">' + item.message + '</div>'
        }
        else
        {
            html += '<div class="messages__item messages__item--operator">' + item.message + '</div>'
        }
      });

    const chatmessage = chatbox.querySelector('.chatbox__messages');
```

```
            chatmessage.innerHTML = html;
        }
    }


    const chatbox = new Chatbox();
    chatbox.display();
```

7.3 Feature 3

```
import torch
import torch.nn as nn


class NeuralNet(nn.Module):
    def __init__(self, input_size, hidden_size, num_classes):
        super(NeuralNet, self).__init__()
        self.l1 = nn.Linear(input_size, hidden_size)
        self.l2 = nn.Linear(hidden_size, hidden_size)
        self.l3 = nn.Linear(hidden_size, num_classes)
        self.relu = nn.ReLU()

    def forward(self, x):
        out = self.l1(x)
        out = self.relu(out)
        out = self.l2(out)
        out = self.relu(out)
        out = self.l3(out)
        # no activation and no softmax at the end
        return out
```

7.4 Feature

```
import random
import json

import torch

from model import NeuralNet
from nltk_utils import bag_of_words, tokenize

device = torch.device('cuda' if torch.cuda.is_available() else 'cpu')
```

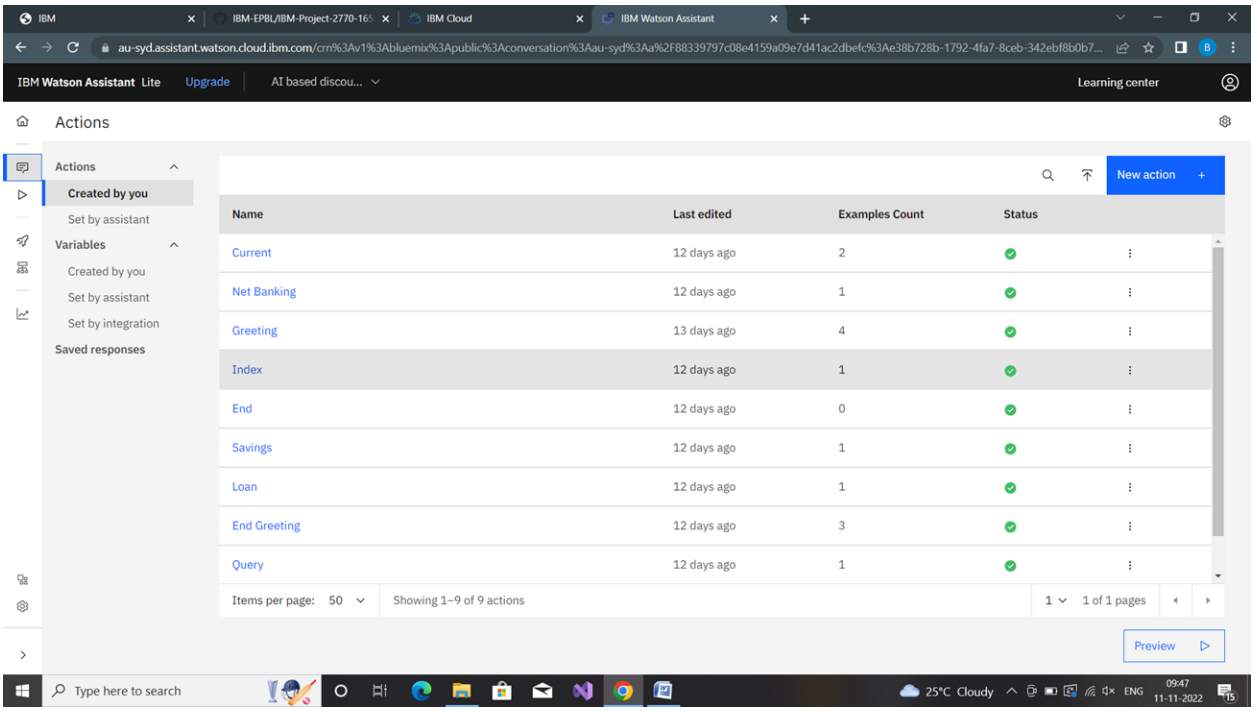
```
with open('intents.json', 'r') as json_data:
    intents = json.load(json_data)

FILE = "data.pth"
data = torch.load(FILE)

input_size = data["input_size"]
hidden_size = data["hidden_size"]
output_size = data["output_size"]
all_words = data['all_words']
tags = data['tags']
model_state = data["model_state"]

model = NeuralNet(input_size, hidden_size, output_size).to(device)
model.load_state_dict(model_state)
model.eval()

bot_name = "Sam"

def get_response(msg):
    sentence = tokenize(msg)
    X = bag_of_words(sentence, all_words)
    X = X.reshape(1, X.shape[0])
    X = torch.from_numpy(X).to(device)

    output = model(X)
    _, predicted = torch.max(output, dim=1)

    tag = tags[predicted.item()]

    probs = torch.softmax(output, dim=1)
    prob = probs[0][predicted.item()]
    if prob.item() > 0.75:
        for intent in intents['intents']:
            if tag == intent["tag"]:
                return random.choice(intent['responses'])

    return "I do not understand..."


if __name__ == "__main__":
    print("Let's chat! (type 'quit' to exit)")
```

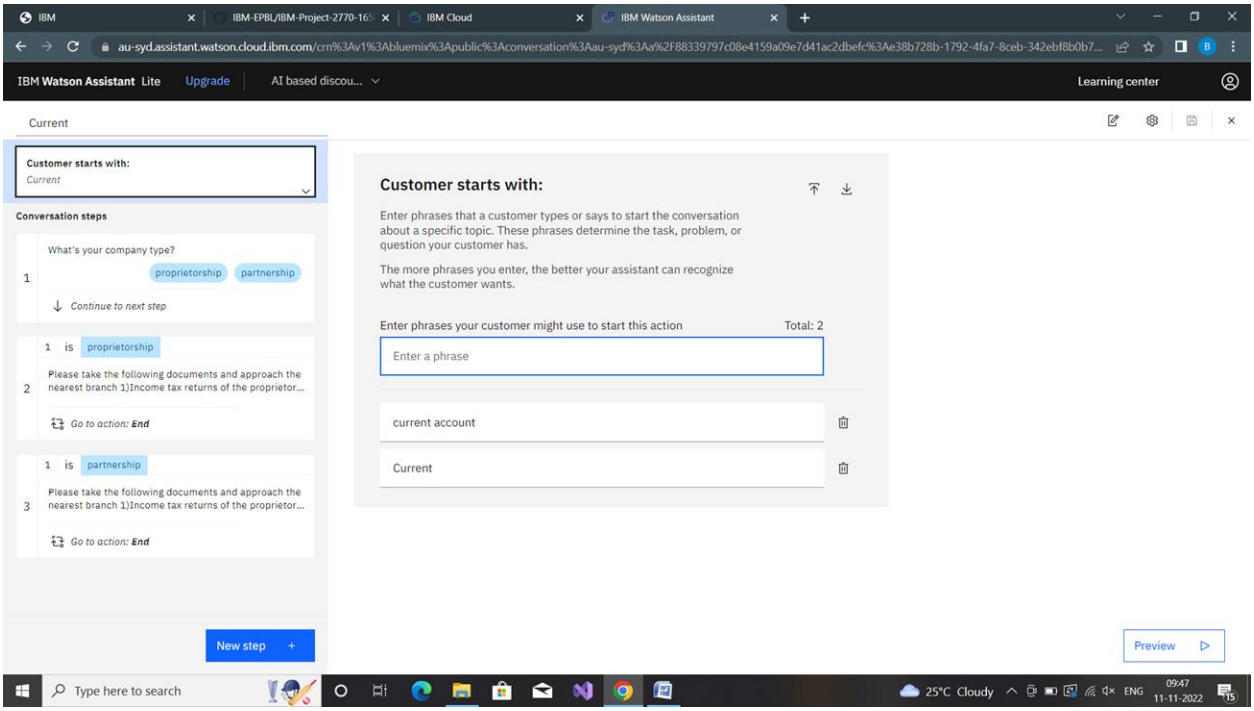
```
while True:
    # sentence = "do you use credit cards?"
    sentence = input("You: ")
    if sentence == "quit":
        break

    resp = get_response(sentence)
    print(resp)
```

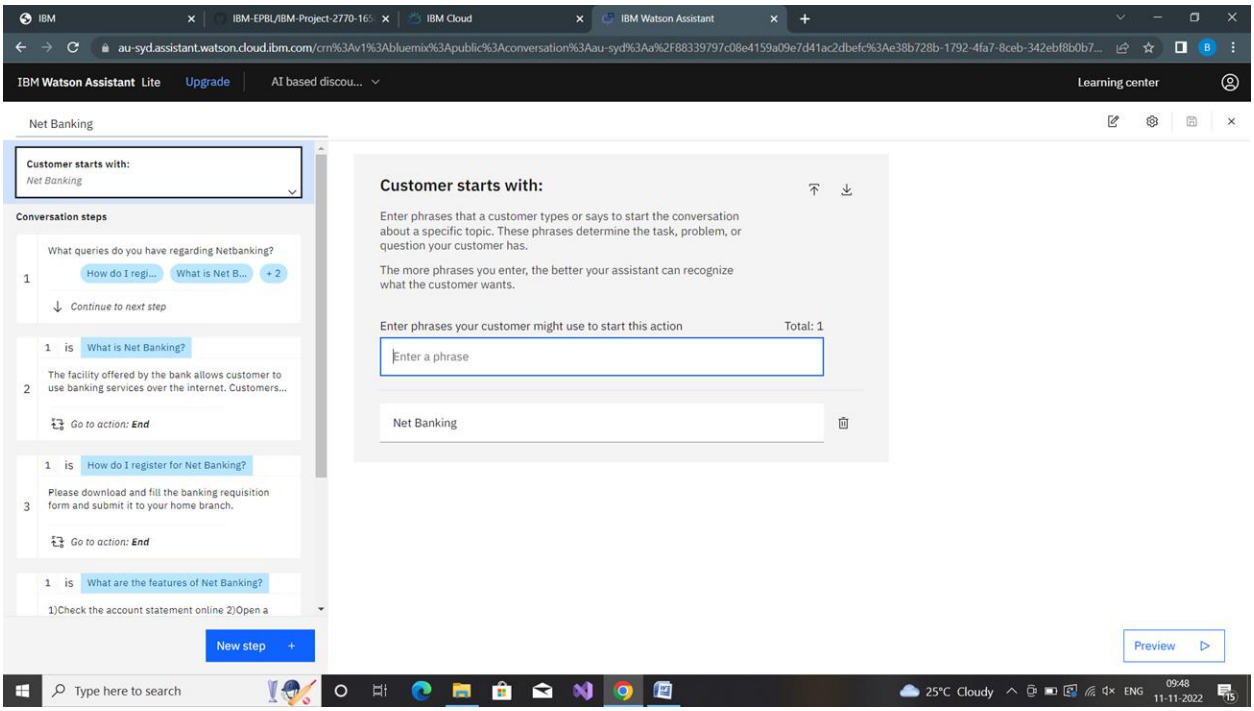
8. TESTING

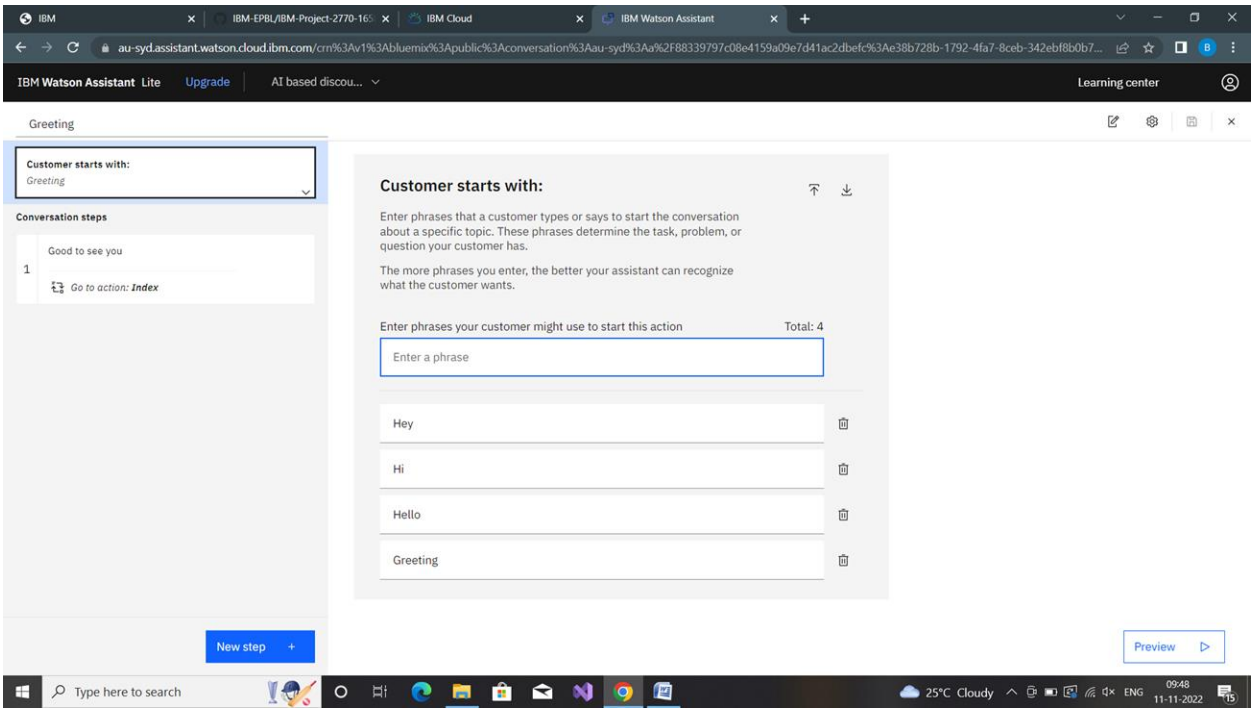
8.1 Test Cases

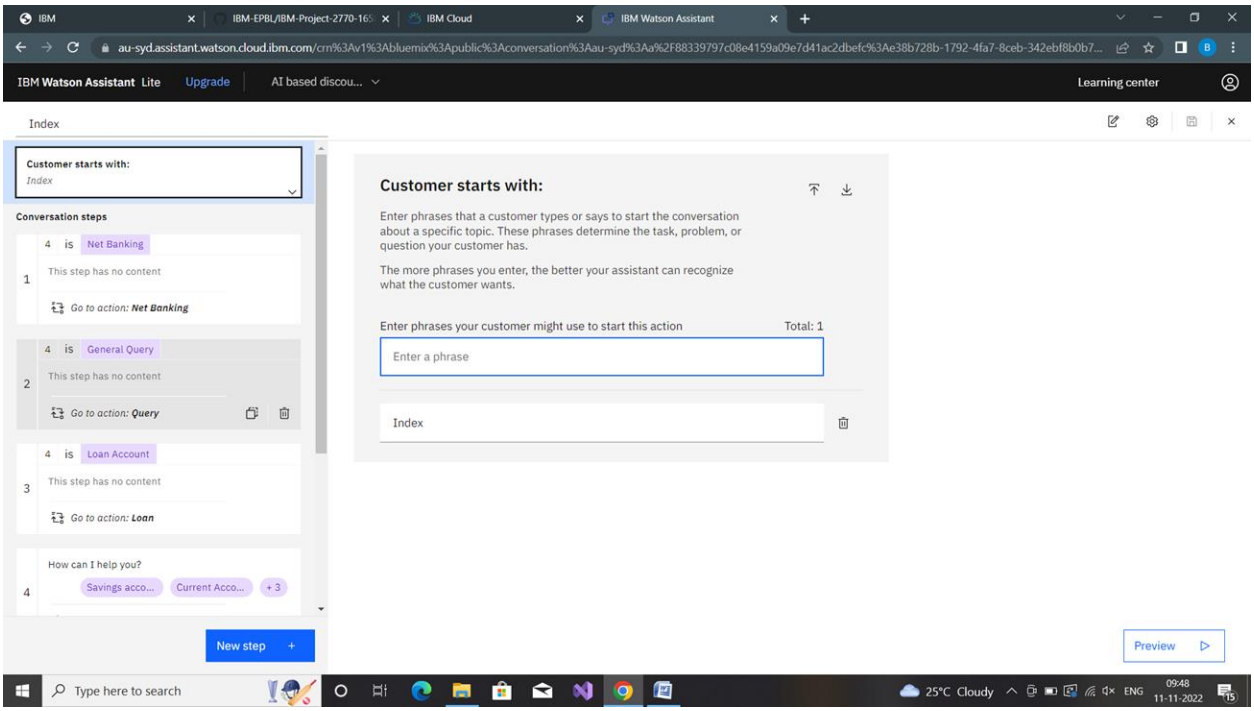
A crucial part of any software development lifecycle is testing. This involves carrying out certain procedures and operations to understand the limitations of the software. It is evident that with testing the constraints of the application that particular bugs and errors are picked up and documented through test cases. This will improve the overall standard and quality of the chatbot and enhance the user experience. Various testing methods were carried out in order to measure the overall effectiveness of the chatbot. The dialog was tested to measure the efficiency of the chatbot which includes measuring how well the chatbot can understand a user supplied utterance, even if miss spelt. Identifying if the intent was recognised, with average response times between text and voice interactions are also included in said response. The chatbot was tested in a specific manner to record the performance metrics.

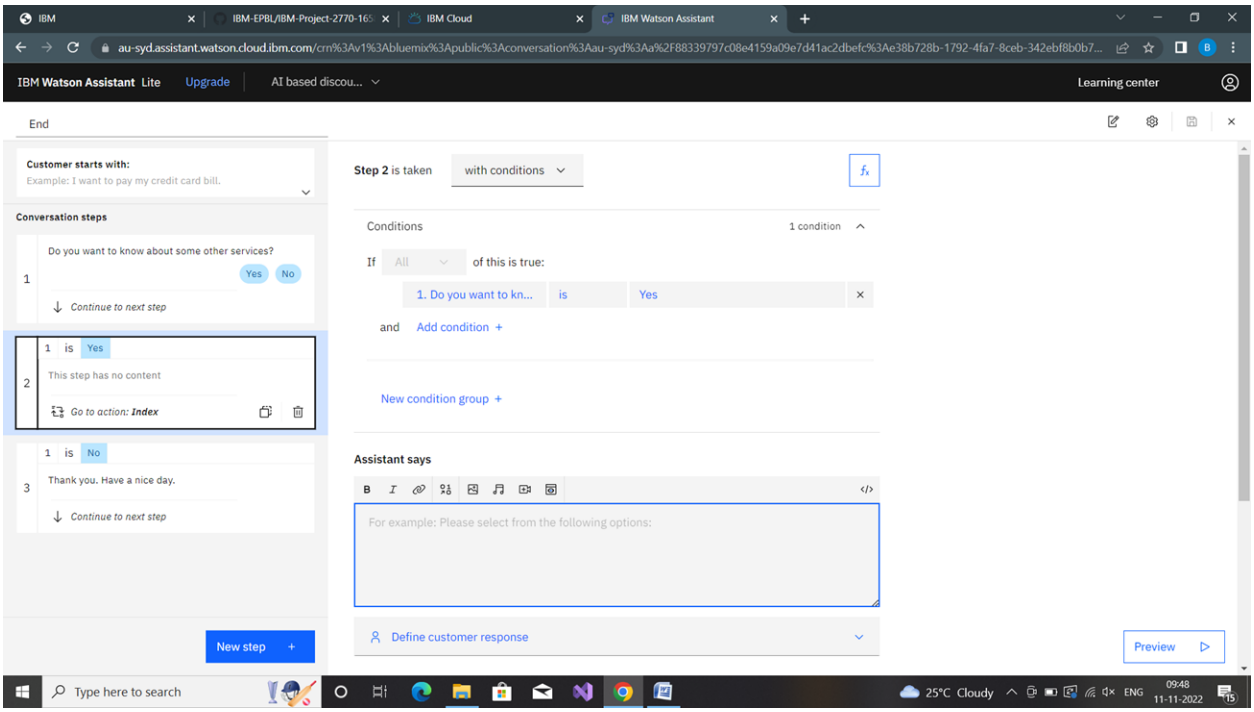

IBM Watson Assistant Lite
Upgrade
Learning center
Actions
Created by you
Set by assistant
Variables
Created by you
Set by assistant
Set by integration
Saved responses
New action
Name
Last edited
Examples Count
Status
Current
12 days ago
2
Net Banking
12 days ago
1
Greeting
13 days ago
4
Index
12 days ago
1
End
12 days ago
0
Savings
12 days ago
1
Loan
12 days ago
1
End Greeting
12 days ago
3
Query
12 days ago
1
Items per page: 50
Showing 1–9 of 9 actions
1 of 1 pages
Preview
Type here to search
25°C Cloudy
ENG
09:47
11-11-2022

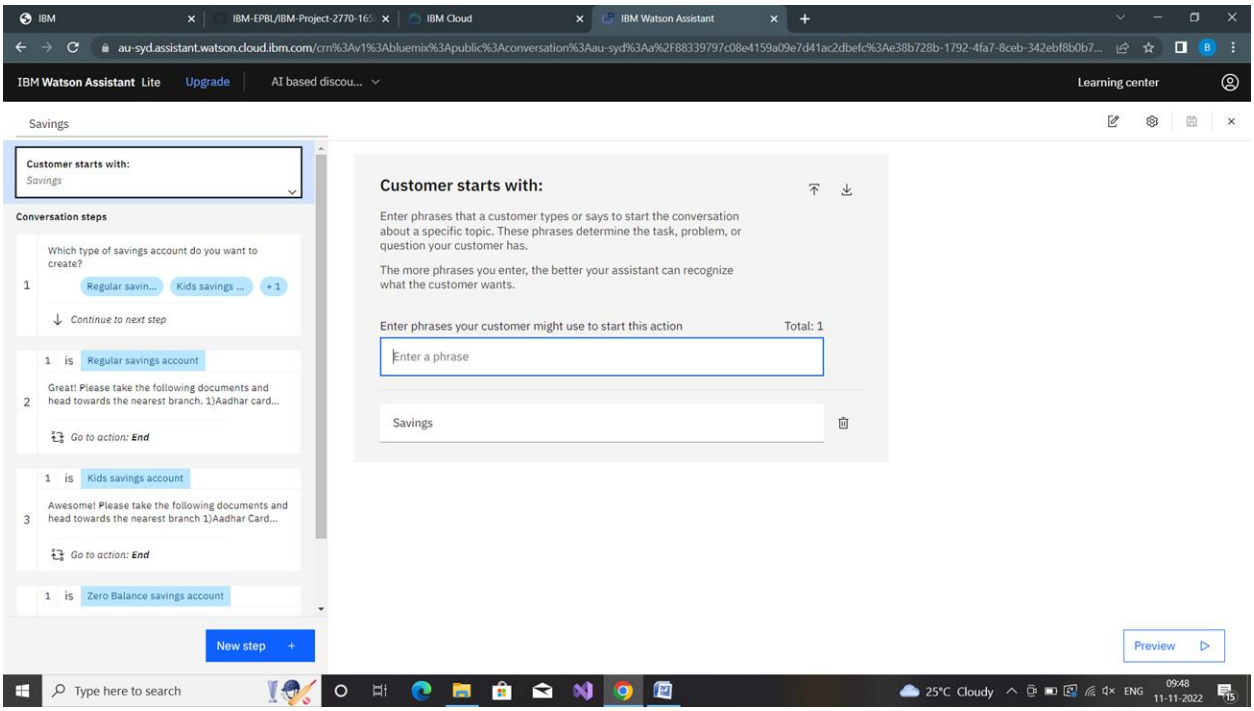

IBM Watson Assistant Lite
Upgrade
Learning center
Current
Customer starts with:
Current
Conversation steps
What's your company type?
proprietorship
partnership
Continue to next step
1 is proprietorship
Please take the following documents and approach the nearest branch 1)Income tax returns of the proprietor...
Go to action: End
1 is partnership
Please take the following documents and approach the nearest branch 1)Income tax returns of the proprietor...
Go to action: End
New step
Customer starts with:
Enter phrases that a customer types or says to start the conversation about a specific topic. These phrases determine the task, problem, or question your customer has.
The more phrases you enter, the better your assistant can recognize what the customer wants.
Enter phrases your customer might use to start this action
Total: 2
Enter a phrase
current account
Current
Preview
Type here to search
25°C Cloudy
ENG
09:47
11-11-2022

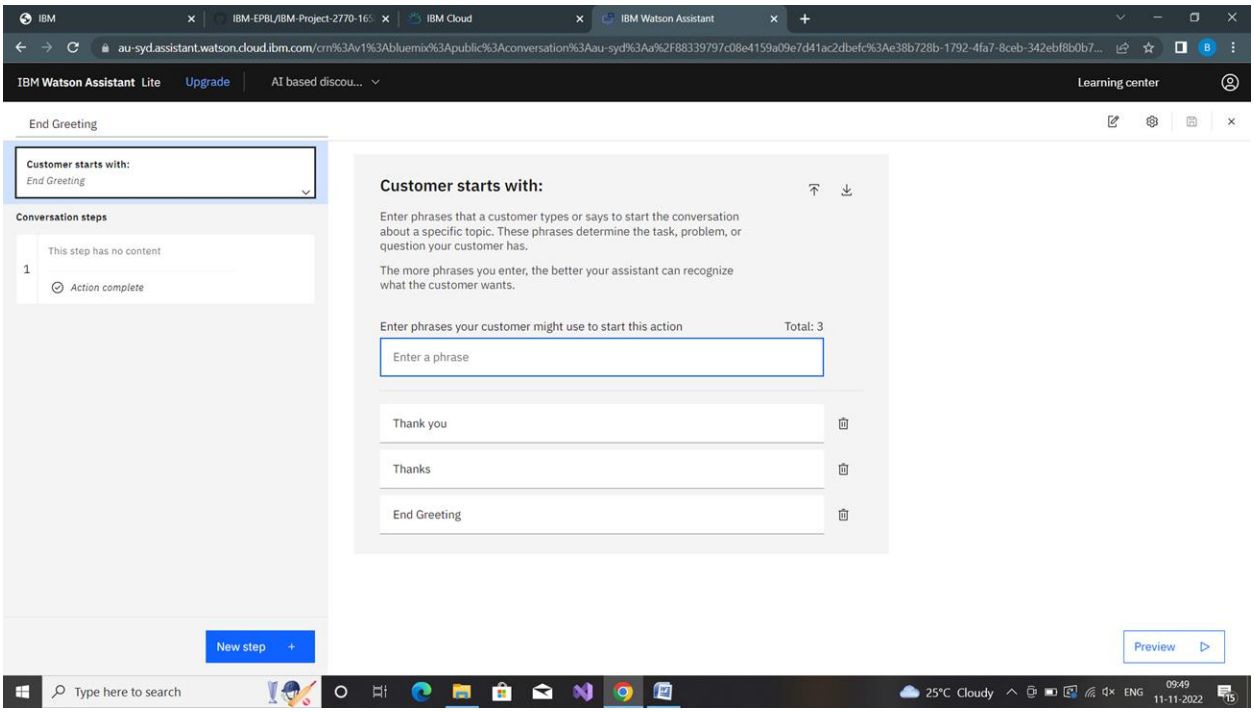

IBM
IBM-EPBL/IBM-Project-2770-16
IBM Cloud
IBM Watson Assistant
au-syd.assistant.watson.cloud.ibm.com/crn%3Av1%3Abluemix%3Apublic%3Aconversation%3Aau-syd%3Aa%2F88339797c08e4159a09e7d41ac2dbefc%3Ae38b728b-1792-4fa7-8ceb-342ebf8b0b7...
IBM Watson Assistant Lite
Upgrade
AI based discou...
Learning center
Net Banking
Customer starts with:
Net Banking
Conversation steps
What queries do you have regarding Netbanking?
How do I regi...
What is Net B...
+ 2
Continue to next step
1 is What is Net Banking?
The facility offered by the bank allows customer to use banking services over the internet. Customers...
Go to action: End
1 is How do I register for Net Banking?
Please download and fill the banking requisition form and submit it to your home branch.
Go to action: End
1 is What are the features of Net Banking?
1)Check the account statement online 2)Open a
New step
Customer starts with:
Enter phrases that a customer types or says to start the conversation about a specific topic. These phrases determine the task, problem, or question your customer has.
The more phrases you enter, the better your assistant can recognize what the customer wants.
Enter phrases your customer might use to start this action
Total: 1
Enter a phrase
Net Banking
Preview
Type here to search
25°C Cloudy
ENG
09:48
11-11-2022

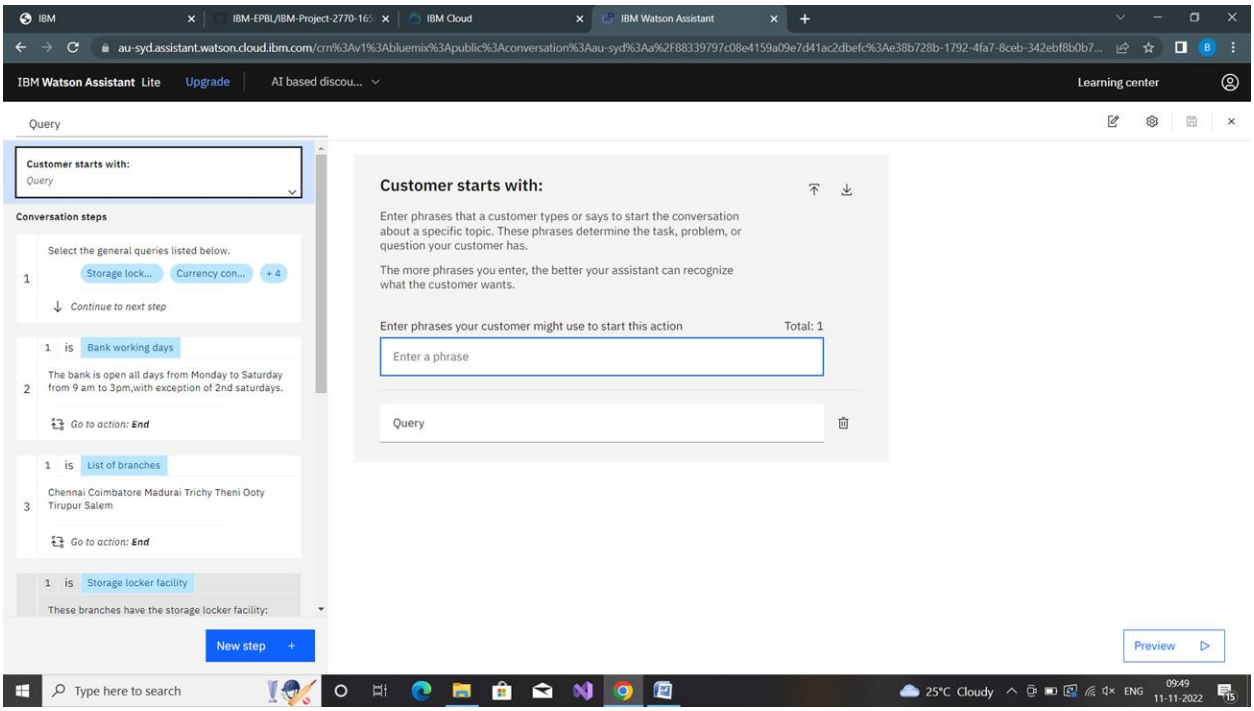

IBM
IBM-EPBL/IBM-Project-2770-16
IBM Cloud
IBM Watson Assistant
au-syd.assistant.watson.cloud.ibm.com/crn%3Av1%3Abluemix%3Apublic%3Aconversation%3Aau-syd%3Aa%2F88339797c08e4159a09e7d41ac2dbefc%3Ae38b728b-1792-4fa7-8ceb-342ebf8b0b7...
IBM Watson Assistant Lite
Upgrade
AI based discou...
Learning center
Greeting
Customer starts with:
Greeting
Conversation steps
Good to see you
Go to action: Index
New step
Customer starts with:
Enter phrases that a customer types or says to start the conversation about a specific topic. These phrases determine the task, problem, or question your customer has.
The more phrases you enter, the better your assistant can recognize what the customer wants.
Enter phrases your customer might use to start this action
Total: 4
Enter a phrase
Hey
Hi
Hello
Greeting
Preview
Type here to search
25°C Cloudy
ENG
09:48
11-11-2022

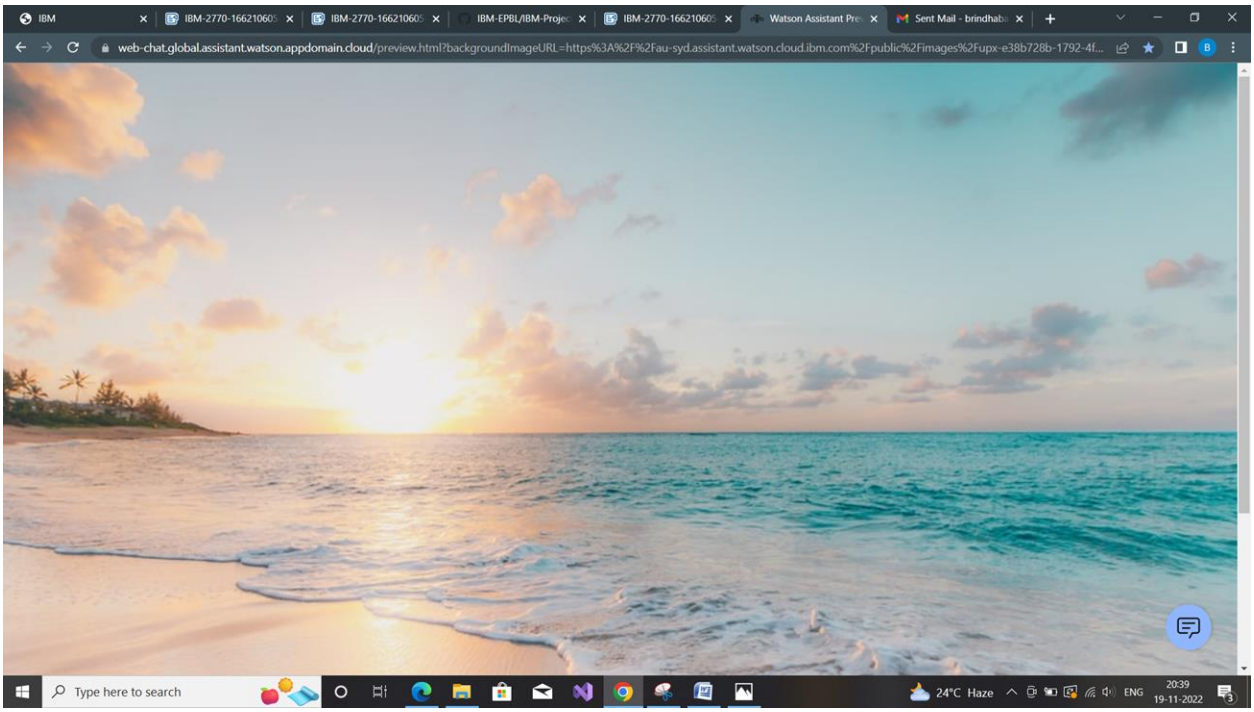

IBM Watson Assistant Lite
Upgrade
Learning center
Index
Customer starts with:
Index
Conversation steps
4 is Net Banking
This step has no content
Go to action: Net Banking
4 is General Query
This step has no content
Go to action: Query
4 is Loan Account
This step has no content
Go to action: Loan
How can I help you?
Savings acco...
Current Acco...
+ 3
New step
Customer starts with:
Enter phrases that a customer types or says to start the conversation about a specific topic. These phrases determine the task, problem, or question your customer has.
The more phrases you enter, the better your assistant can recognize what the customer wants.
Enter phrases your customer might use to start this action
Total: 1
Enter a phrase
Index
Preview
Type here to search
25°C Cloudy
ENG
09:48
11-11-2022

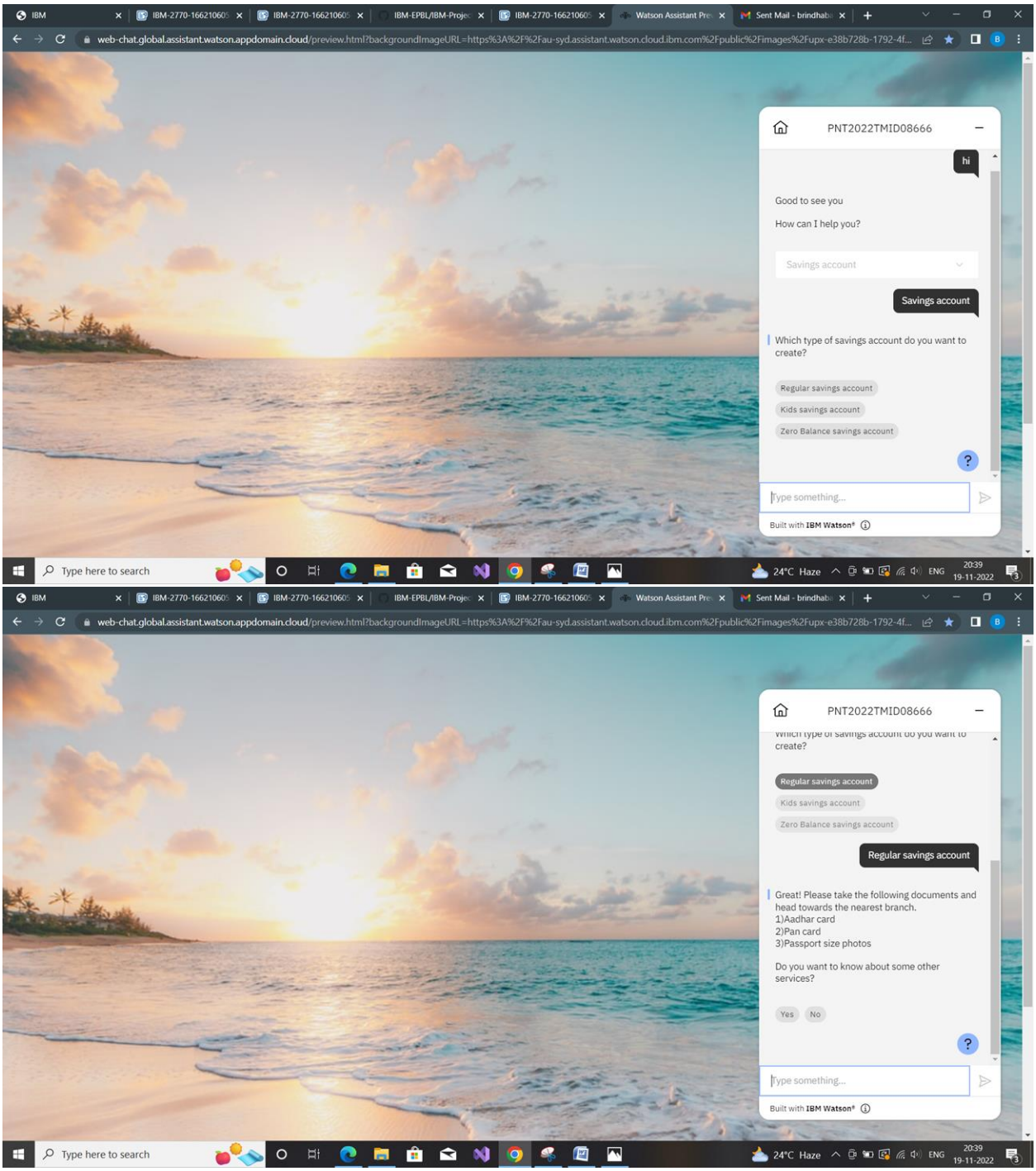

IBM Watson Assistant Lite
Upgrade
Learning center
End
Customer starts with:
Example: I want to pay my credit card bill.
Conversation steps
Do you want to know about some other services?
Yes
No
Continue to next step
1 is Yes
This step has no content
Go to action: Index
1 is No
Thank you. Have a nice day.
Continue to next step
New step
Step 2 is taken
with conditions
Conditions
1 condition
If All of this is true:
1. Do you want to kn...
is
Yes
and
Add condition +
New condition group +
Assistant says
For example: Please select from the following options:
Define customer response
Preview
Type here to search
25°C Cloudy
ENG
09:48
11-11-2022


IBM Watson Assistant Lite
Upgrade
Learning center
Savings
Customer starts with:
Savings
Conversation steps
Which type of savings account do you want to create?
Regular savin...
Kids savings ...
+ 1
Continue to next step
1 is Regular savings account
Great! Please take the following documents and head towards the nearest branch. 1)Aadhar card...
Go to action: End
1 is Kids savings account
Awesome! Please take the following documents and head towards the nearest branch 1)Aadhar Card...
Go to action: End
1 is Zero Balance savings account
New step
Customer starts with:
Enter phrases that a customer types or says to start the conversation about a specific topic. These phrases determine the task, problem, or question your customer has.
The more phrases you enter, the better your assistant can recognize what the customer wants.
Enter phrases your customer might use to start this action
Total: 1
Enter a phrase
Savings
Preview


IBM Watson Assistant Lite
Upgrade
Learning center
End Greeting
Customer starts with:
End Greeting
Conversation steps
This step has no content
Action complete
New step
Customer starts with:
Enter phrases that a customer types or says to start the conversation about a specific topic. These phrases determine the task, problem, or question your customer has.
The more phrases you enter, the better your assistant can recognize what the customer wants.
Enter phrases your customer might use to start this action
Total: 3
Enter a phrase
Thank you
Thanks
End Greeting
Preview

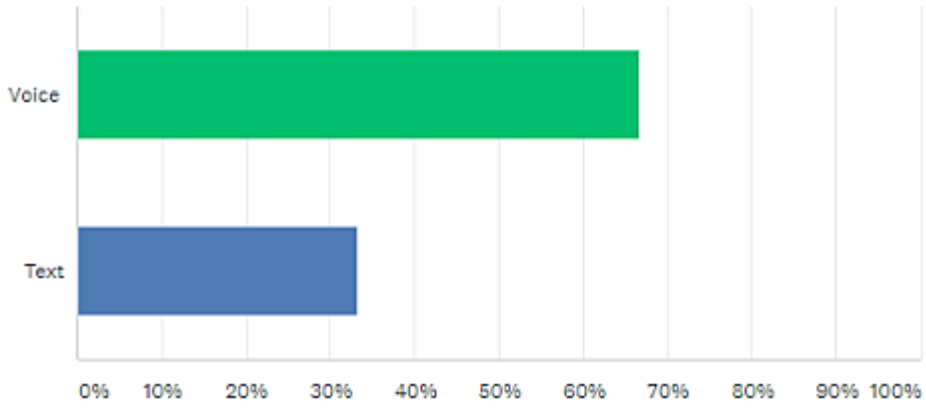

IBM Watson Assistant Lite
Upgrade
Learning center
Query
Customer starts with:
Query
Conversation steps
Select the general queries listed below.
Storage lock...
Currency con...
+ 4
Continue to next step
1 is Bank working days
The bank is open all days from Monday to Saturday from 9 am to 3pm,with exception of 2nd saturdays.
Go to action: End
1 is List of branches
Chennai Coimbatore Madurai Trichy Theni Ooty Tirupur Salem
Go to action: End
1 is Storage locker facility
These branches have the storage locker facility:
New step
Customer starts with:
Enter phrases that a customer types or says to start the conversation about a specific topic. These phrases determine the task, problem, or question your customer has.
The more phrases you enter, the better your assistant can recognize what the customer wants.
Enter phrases your customer might use to start this action
Total: 1
Enter a phrase
Query
Preview
Type here to search
25°C Cloudy
ENG
09:49
11-11-2022


web-chat.global.assistant.watson.appdomain.cloud/preview.html?backgroundImageURL=https%3A%2F%2Fau-syd.assistant.watson.cloud.ibm.com%2Fpublic%2Fimages%2Fupx-e38b728b-1792-4f...
Type here to search
24°C Haze
ENG
20:39
19-11-2022



8. RESULTS

8.1 Performance Metrics



10. ADVANTAGES & DISADVANTAGES

One of the biggest benefits of using chatbots in the banking industry is that it offers 24/7 availability for your customers. People might experience problems with their accounts at any time of the day.

Another great benefit of using chatbots is that it will increase the productivity of your other banking employees. Rather than having each of your employees help with frequently asked questions, you can allow a chatbot to take over all of these responsibilities.

Often, banks have peak times and require extra staffing for busier times during the day or during specific seasons. In these cases, they need to have extra employees scheduled to deal with the higher volume of calls.

When customers use chatbots, they need to ask questions in specific ways to be able to get accurate answers. Chatbots can only answer questions that have been programmed previously. This downside however, can be eliminated by connecting an

effective live agent solution to your CX strategy and adding unresolved questions to your chatbot's knowledge base.

Finally, using a chatbot for your banking services may require additional measures to protect the identities of your users. This is because they may be sharing private or sensitive account information.

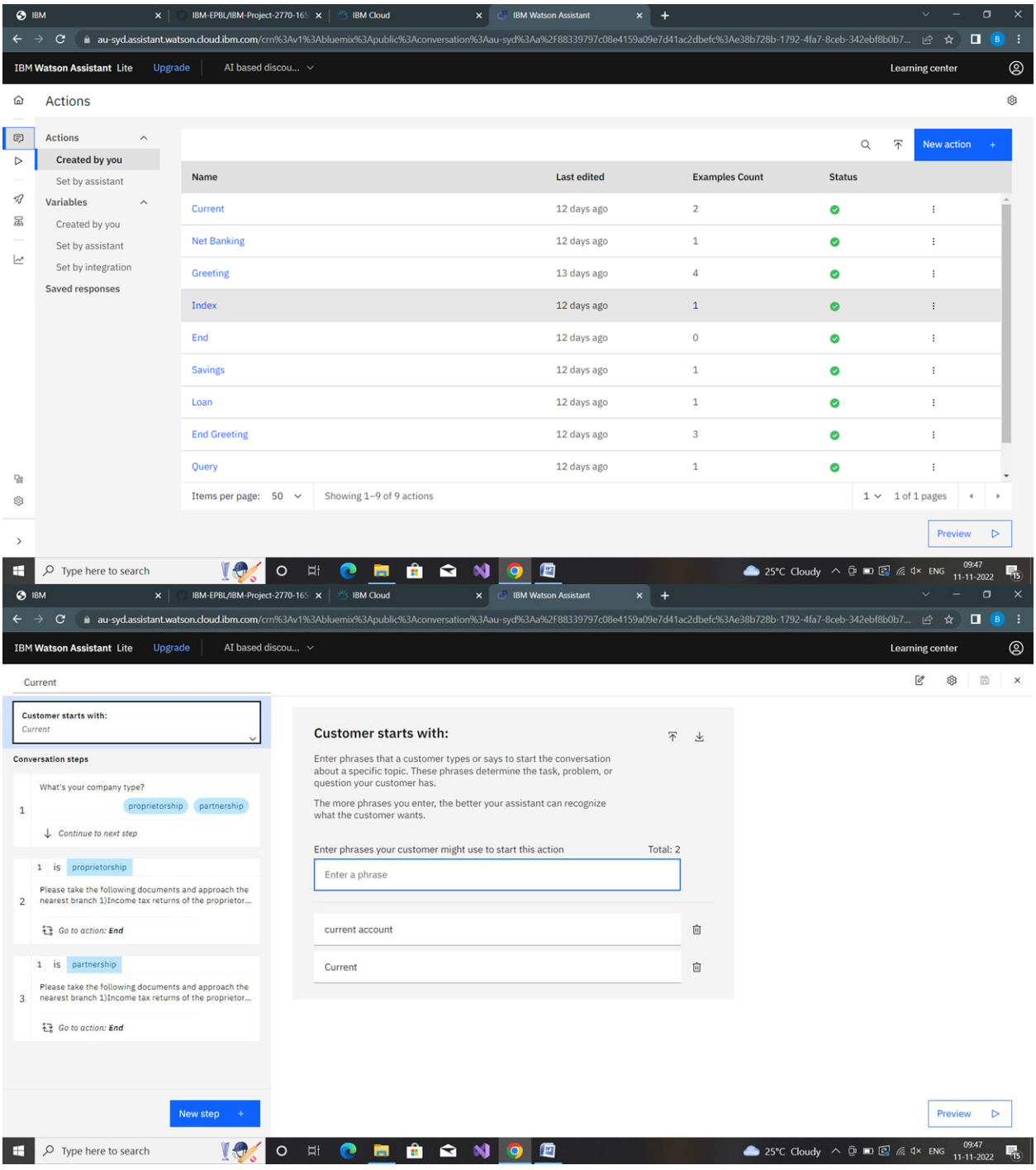
11. CONCLUSION

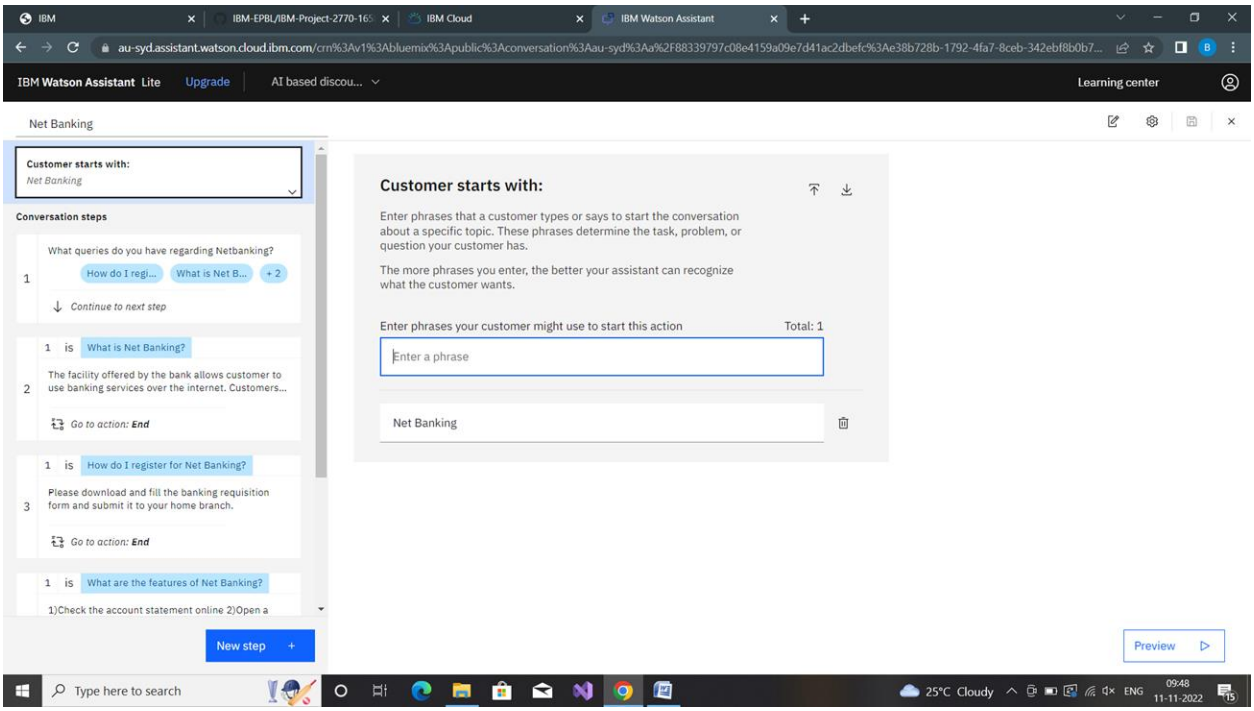
There is clear evidence based on the research conducted that there will be a drastic increase in the number of chatbots being implemented within the financial service industry. The vast amount of research that has been carried out, and currently ongoing, within the artificial intelligence field has led to the rise of more sophisticated and intellectual chatbots. This will prove to be immensely beneficial in providing convenient and accessible customer service at a rapid scale.

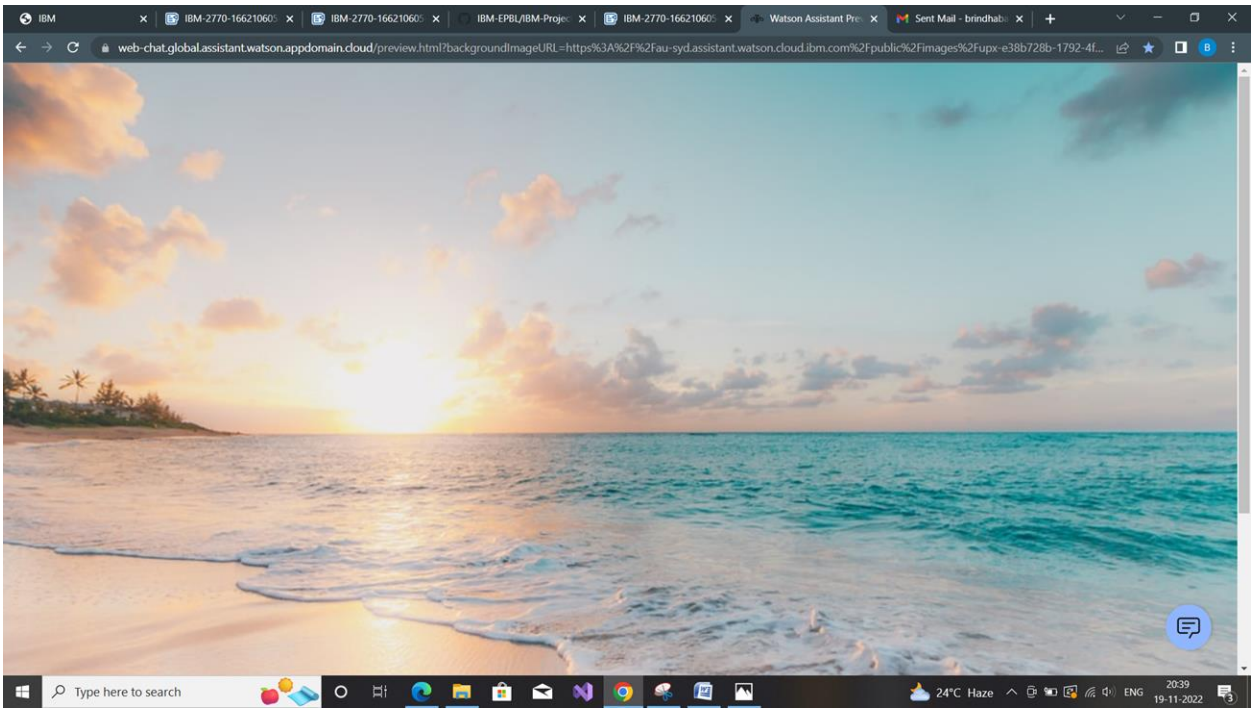
12. FUTURE SCOPE

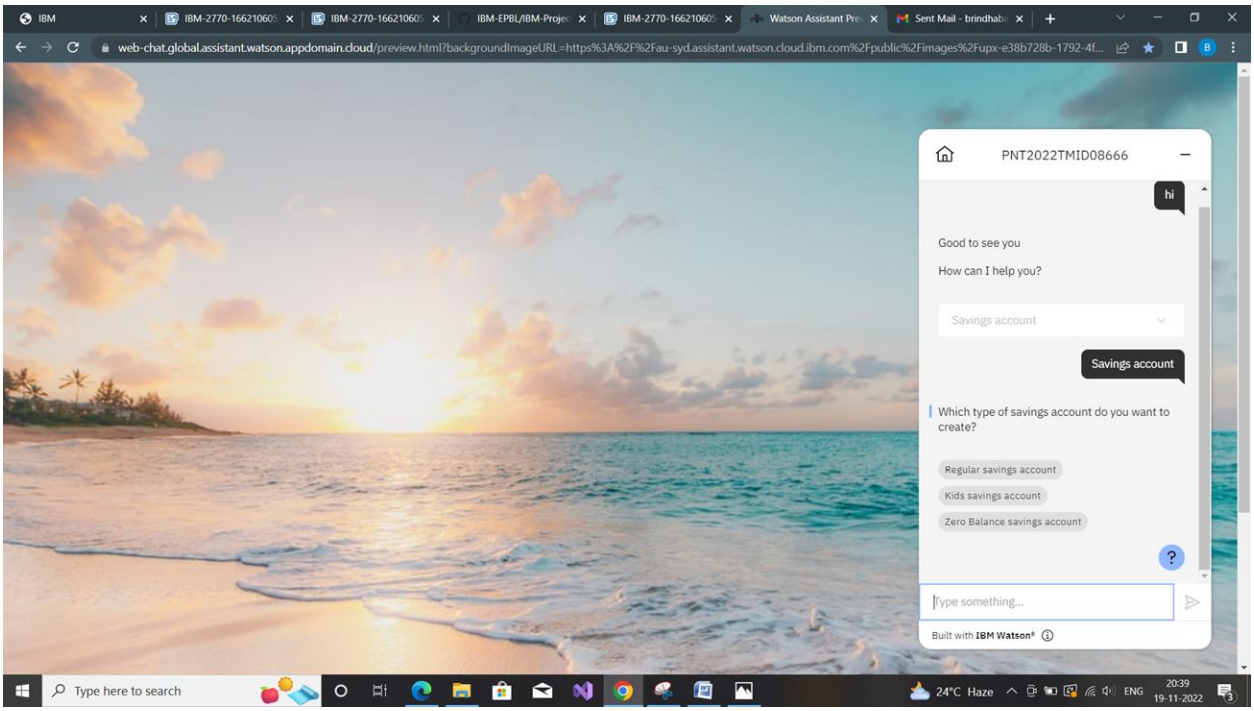
One of the integration s streams that were initially thought of during development was to integrate the chatbot with the Facebook Messenger service, however during development it was brought to light through of recent media events such as the Cambridge Aanalytica discreditscandal, that which resulted in Facebook haltedpausing their process of allowing other apps to integrate with its messenger service app review, so this integration was not developed as Facebook hads stopped allowing developers to create new apps or chatbots through the service. Although Facebook have now just recently reopened their app review processs, now allowing developersallowing developers to integrate with the Messenger service again, enabling this integration feature to be developed for future protypes (Facebook, 2018). Integrating Google authentication would have been an advantageous feature to implement, allowing users to link their Google account across the multiple devices the agent is distributed on, for instance, Google Assistant enhancing the cross-platform experience for users.

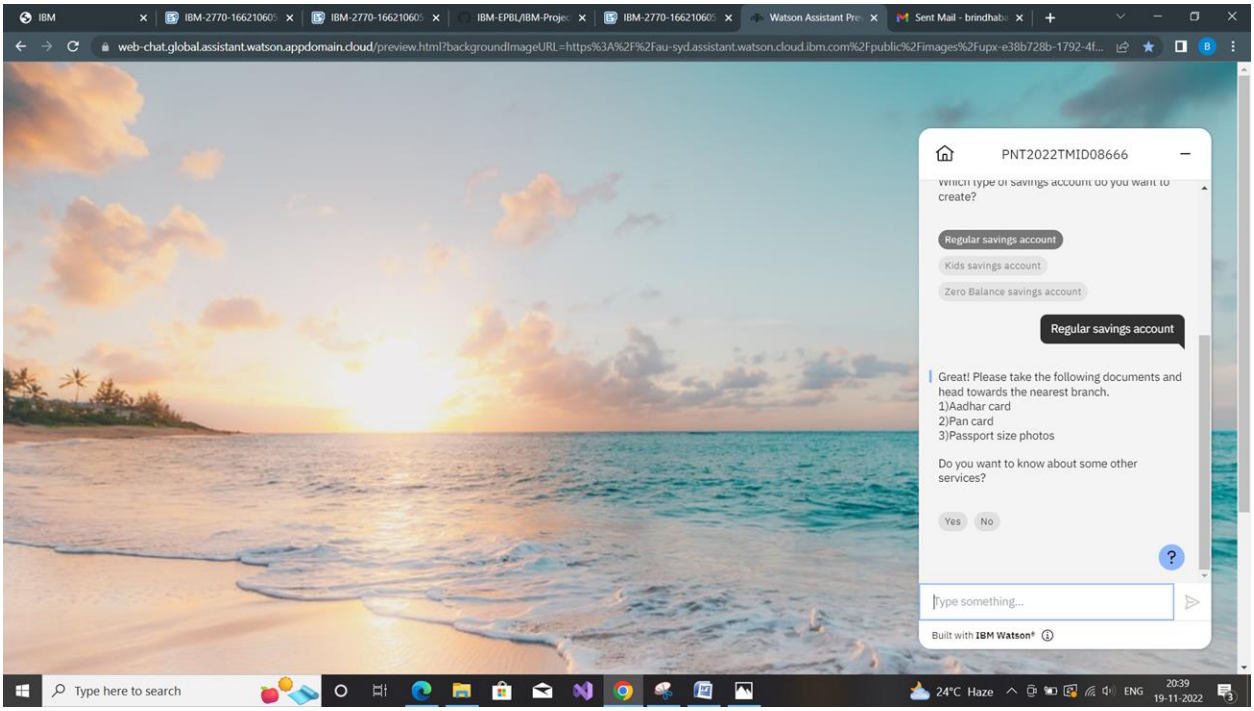
13. APPENDIX

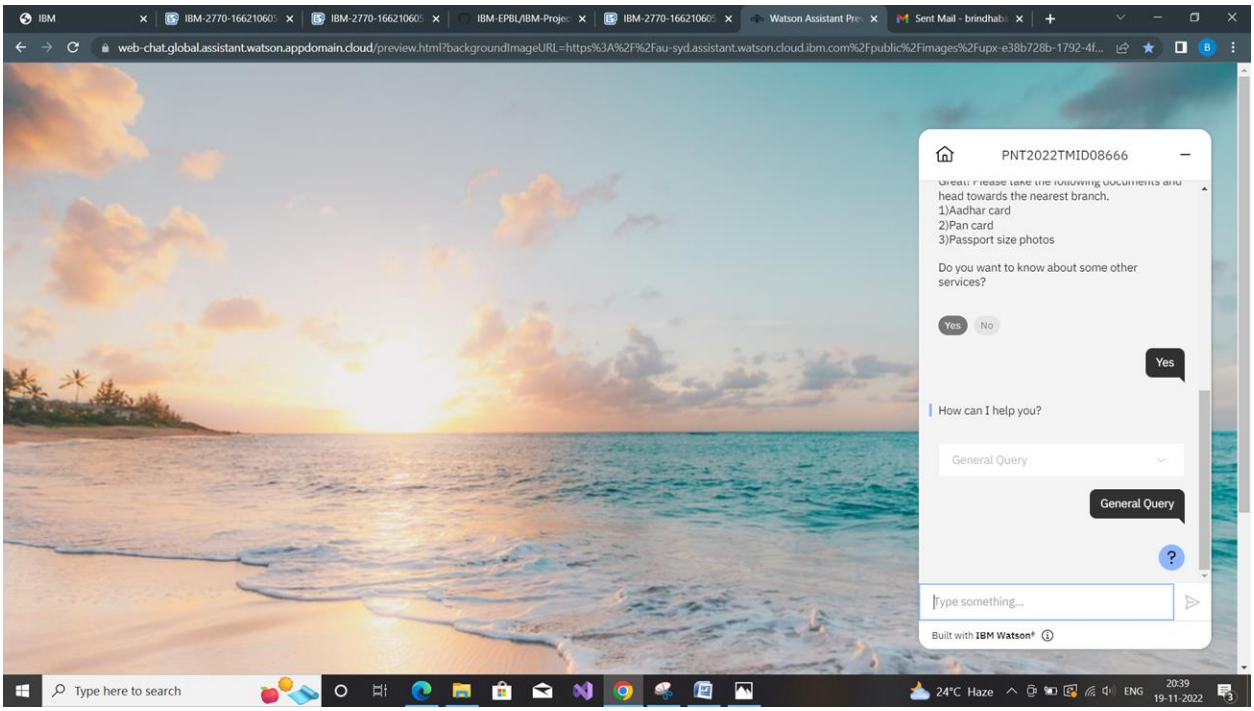

IBM
IBM-EPBL/IBM-Project-2770-165
IBM Cloud
IBM Watson Assistant
au-syd.assistant.watson.cloud.ibm.com/crn%3Av1%3Abluemix%3Apublic%3Aconversation%3Aau-syd%3Aa%2F88339797c08e4159a09e7d41ac2dbefc%3Ae38b728b-1792-4fa7-8ceb-342ebf8b0b7...
IBM Watson Assistant Lite
Upgrade
AI based discou...
Learning center
Actions
Actions
Created by you
Set by assistant
Variables
Created by you
Set by assistant
Set by integration
Saved responses
New action
Name
Last edited
Examples Count
Status
Current
12 days ago
2
Net Banking
12 days ago
1
Greeting
13 days ago
4
Index
12 days ago
1
End
12 days ago
0
Savings
12 days ago
1
Loan
12 days ago
1
End Greeting
12 days ago
3
Query
12 days ago
1
Items per page: 50
Showing 1–9 of 9 actions
1 of 1 pages
Preview
Type here to search
25°C Cloudy
ENG
09:47
11-11-2022
Current
Customer starts with:
Current
Conversation steps
1
What's your company type?
proprietorship
partnership
Continue to next step
2
1 is proprietorship
Please take the following documents and approach the nearest branch 1)Income tax returns of the proprietor...
Go to action: End
3
1 is partnership
Please take the following documents and approach the nearest branch 1)Income tax returns of the proprietor...
Go to action: End
New step
Customer starts with:
Enter phrases that a customer types or says to start the conversation about a specific topic. These phrases determine the task, problem, or question your customer has.
The more phrases you enter, the better your assistant can recognize what the customer wants.
Enter phrases your customer might use to start this action
Total: 2
Enter a phrase
current account
Current
Preview


IBM Watson Assistant Lite
Upgrade
Learning center
Net Banking
Customer starts with:
Net Banking
Conversation steps
What queries do you have regarding Netbanking?
How do I regi...
What is Net B...
+ 2
Continue to next step
1 is What is Net Banking?
The facility offered by the bank allows customer to use banking services over the internet. Customers...
Go to action: End
1 is How do I register for Net Banking?
Please download and fill the banking requisition form and submit it to your home branch.
Go to action: End
1 is What are the features of Net Banking?
1)Check the account statement online 2)Open a
New step
Customer starts with:
Enter phrases that a customer types or says to start the conversation about a specific topic. These phrases determine the task, problem, or question your customer has.
The more phrases you enter, the better your assistant can recognize what the customer wants.
Enter phrases your customer might use to start this action
Total: 1
Enter a phrase
Net Banking
Preview
Type here to search
25°C Cloudy
ENG
09:48
11-11-2022


web-chat.global.assistant.watson.appdomain.cloud/preview.html?backgroundImageURL=https%3A%2F%2Fau-syd.assistant.watson.cloud.ibm.com%2Fpublic%2Fimages%2Fupx-e38b728b-1792-4f...
Type here to search
24°C Haze
ENG
20:39
19-11-2022


web-chat.global.assistant.watson.appdomain.cloud/preview.html?backgroundImageURL=https%3A%2F%2Fau-syd.assistant.watson.cloud.ibm.com%2Fpublic%2Fimages%2Fupx-e38b728b-1792-4f...
PNT2022TMID08666
hi
Good to see you
How can I help you?
Savings account
Savings account
Which type of savings account do you want to create?
Regular savings account
Kids savings account
Zero Balance savings account
Type something...
Built with IBM Watson®
Type here to search
24°C Haze
ENG
20:39
19-11-2022


web-chat.global.assistant.watson.appdomain.cloud/preview.html?backgroundImageURL=https%3A%2F%2Fau-syd.assistant.watson.cloud.ibm.com%2Fpublic%2Fimages%2Fupx-e38b728b-1792-4f...
PNT2022TMID08666
create?
Regular savings account
Kids savings account
Zero Balance savings account
Regular savings account
Great! Please take the following documents and head towards the nearest branch.
1)Aadhar card
2)Pan card
3)Passport size photos
Do you want to know about some other services?
Yes
No
Type something...
Built with IBM Watson®
Type here to search
24°C Haze
ENG
20:39
19-11-2022



Source Code

```
import torch
                import torch.nn as nn


                class NeuralNet(nn.Module):
                    def __init__(self, input_size, hidden_size, num_classes):
                        super(NeuralNet, self).__init__()
                        self.l1 = nn.Linear(input_size, hidden_size)
                        self.l2 = nn.Linear(hidden_size, hidden_size)
                        self.l3 = nn.Linear(hidden_size, num_classes)
                        self.relu = nn.ReLU()

                    def forward(self, x):
                        out = self.l1(x)
                        out = self.relu(out)
                        out = self.l2(out)
                        out = self.relu(out)
                        out = self.l3(out)
                        # no activation and no softmax at the end
                        return out
```

```
import numpy as np
import nltk
# nltk.download('punkt')
from nltk.stem.porter import PorterStemmer
stemmer = PorterStemmer()


def tokenize(sentence):
    """
    split sentence into array of words/tokens
    a token can be a word or punctuation character, or number
    """
    return nltk.word_tokenize(sentence)


def stem(word):
    """
    stemming = find the root form of the word
    examples:
    words = ["organize", "organizes", "organizing"]
    words = [stem(w) for w in words]
    -> ["organ", "organ", "organ"]
    """
    return stemmer.stem(word.lower())


def bag_of_words(tokenized_sentence, words):
    """
    return bag of words array:
    1 for each known word that exists in the sentence, 0 otherwise
    example:
    sentence = ["hello", "how", "are", "you"]
    words = ["hi", "hello", "I", "you", "bye", "thank", "cool"]
    bog   = [  0 ,    1 ,    0 ,   1 ,    0 ,    0 ,      0]
    """
    # stem each word
    sentence_words = [stem(word) for word in tokenized_sentence]
    # initialize bag with 0 for each word
    bag = np.zeros(len(words), dtype=np.float32)
    for idx, w in enumerate(words):
        if w in sentence_words:
            bag[idx] = 1
```

return bag

```
<!DOCTYPE html>
<html lang="en">
<link rel="stylesheet" href="style.css">

<head>
  <meta charset="UTF-8">
  <title>Chatbot</title>
</head>
<body>
<div class="container">
  <div class="chatbox">
    <div class="chatbox__support">
      <div class="chatbox__header">
        <div class="chatbox__image--header">
          <img src="https://img.icons8.com/color/48/000000/circled-user-female-skin-type-5--v1.png" alt="image">
        </div>
        <div class="chatbox__content--header">
          <h4 class="chatbox__heading--header">Chat support</h4>
          <p class="chatbox__description--header">Hi. My name is Sam. How can I help you?</p>
        </div>
      </div>
      <div class="chatbox__messages">
        <div></div>
      </div>
      <div class="chatbox__footer">
        <input type="text" placeholder="Write a message...">
        <button class="chatbox__send--footer send__button">Send</button>
      </div>
    </div>
    <div class="chatbox__button">
      <button><img src="./images/chatbox-icon.svg" /></button>
    </div>
  </div>
</div>

  <script src="./app.js"></script>

</body>
</html>
```

```
import random
                import json

                import torch

                from model import NeuralNet
                from nltk_utils import bag_of_words, tokenize

                device = torch.device('cuda' if torch.cuda.is_available() else 'cpu')

                with open('intents.json', 'r') as json_data:
                    intents = json.load(json_data)

                FILE = "data.pth"
                data = torch.load(FILE)

                input_size = data["input_size"]
                hidden_size = data["hidden_size"]
                output_size = data["output_size"]
                all_words = data['all_words']
                tags = data['tags']
                model_state = data["model_state"]

                model = NeuralNet(input_size, hidden_size, output_size).to(device)
                model.load_state_dict(model_state)
                model.eval()

                bot_name = "Sam"

                def get_response(msg):
                    sentence = tokenize(msg)
                    X = bag_of_words(sentence, all_words)
                    X = X.reshape(1, X.shape[0])
                    X = torch.from_numpy(X).to(device)

                    output = model(X)
                    _, predicted = torch.max(output, dim=1)

                    tag = tags[predicted.item()]

                    probs = torch.softmax(output, dim=1)
```

```
    prob = probs[0][predicted.item()]
    if prob.item() > 0.75:
        for intent in intents['intents']:
            if tag == intent["tag"]:
                return random.choice(intent['responses'])

    return "I do not understand..."


if __name__ == "__main__":
    print("Let's chat! (type 'quit' to exit)")
    while True:
        # sentence = "do you use credit cards?"
        sentence = input("You: ")
        if sentence == "quit":
            break

        resp = get_response(sentence)
        print(resp)
```

GitHub Link:- https://github.com/IBM-EPBL/IBM-Project-2770-1658482555