

Smart Help Desk Automated Ticketing System

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Abstract – Automated technical queries help desk is proposed to possess instant real-time quick solutions and ticket categorization. Incorrect routing of tickets to the incorrect resolver group causes delay in resolving the matter. It also causes unnecessary resource utilization, customer satisfaction deterioration and affects the business. To beat these problems, the proposed "Smart Automated Ticketing System" supports supervised machine learning techniques which automatically predicts the category of the ticket using the natural language ticket description entered by the user through a chat interface. Our proposed automated approach isn't only focused on automating repetitive tasks of routing tickets manually but also viewing historical data, enabling IT support desk processes to spot unforeseen insights and patterns. It also helps in faster resolution of customer issues and sends them an email about the status of the ticket. This process assures customer satisfaction and also keeps the customers within the loop.

Key Words: Help Desk Automation, Machine Learning, Text classification, SVM, Chatbot

1.INTRODUCTION

In a company, the Information Technology (IT) support help desk operation is a very important unit which handles the IT services of a business. Many large-scale organizations would have a comprehensive IT support team to handle the queries that are submitted by their customers on a daily basis. Many support engineers and agents would spend plenty of time on some repetitive tasks.

The industry has now come to appreciate that several business processes and tasks can be automated and also the help desk department is one amongst them. The concept is to take the repetitive workload of routing tickets and hand it over to the intelligent machine learning model so the staff could specialize in more value adding tasks and decision making to

the organization. The machine learning model would also help to cut back the human errors and make processes more efficient, which might finally lead to cost saving and productivity increase.

Our "Smart Automated Ticketing System" uses supervised machine learning techniques which automatically predicts the category of the ticket using the natural language ticket description entered by the user. Raising a ticket automatically for this problem, it'll intelligently identify the matter and to which department it belongs to and route it to the concerned team for them to unravel it. Then the resolving team comes across this new open ticket, assigns it to an agent. The agent will resolve the difficulty and update the status of the ticket to the database. The agent will send an email to the user giving them the answer of the problem and updating them about the status of the ticket.

1.1 Need

When customers want to interact with the company, generally help desks act as a single point of contact (SPOC). The customers attempt to convey their issues in the form of emails, phone calls, etc. The level 1 responders of the help desk usually check out these invoices, extract information like the underlined problem, urgency, the department that may solve this matter etc. They fill up an online ticket generating form with all of this information and raise and route the ticket to the suitable department concerned. While routing if the problem is routed to another department, then the concerned one, the ticket becomes useless and the process should be redone. This incorporates a negative impact on the Resolution time of the ticket and slows down the whole process. There are a lot of benefits of implementing a classifier system. They are simplified user interface, faster resolution time, improved productivity, effective resource utilization, customer satisfaction and growth in business

1.2 Scope

Some Future aspects which may be seen in this field;

- Increased reliability on the software to act on the decisions taken on certain incidents.
- Increased Precision and accuracy of the decision-making process to give better and robust outcomes. So that plenty of tasks can be automated in the future.
- Give faster results/answers, so that the ultimate customer satisfaction of solving a problem within seconds can be achieved.
- Vaster and more levels of automation can be achieved with strong algorithms and better data.

2. REQUIREMENT ANALYSIS

● Hardware requirements

1. Intel i3 processor
2. 6GB of DDR3 RAM
3. OS version: Windows 10 64-bit

● Software requirements

1. IDE Used: Visual Studio Code
2. Google Colab
3. Backend: Firebase
4. Framework: React
5. Services: Email-js, Chart js

3. METHODOLOGY

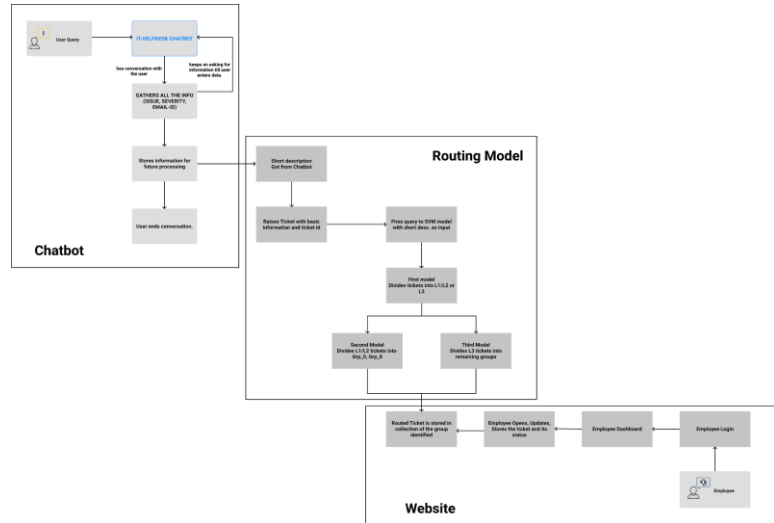
- First the dataset provided was analyzed, the structure of the info provided - number of columns, field, data types etc was understood.
- Exploratory Data Analysis was done to derive further insights from this data set as follows
 - Data is extremely imbalanced, there are around ~45% of the Groups with less than 20 tickets.
 - Few of the tickets are in foreign language like German
 - The data features a lot of noise in it, for eg- few tickets associated with account setup are spread across multiple assignment groups.
- Performed the data cleaning and preprocessing
 - Translation: A little number of tickets were written in German. Hence, the

Google translate python api was used to convert German to English to generate the input data for the next steps. However, the google translator rest api can only process a limited number of texts on a daily basis, so text is translated in batches and saved the file for further processing.

- Make text all lowercase in order that the algorithm doesn't treat the identical words in different cases as different.
- Removing Noise i.e., everything that isn't during a standard number or letter i.e., Punctuation, Numerical values
- Removing extract spaces
- Removed punctuations
- Removed words containing numbers
- Stop word Removal: Some extremely common words which might appear to be of little value in helping select documents matching a user need. These words are called stop words
- Lemmatization
- Tokenization: Tokenization is simply the term used to describe the method of converting the traditional (normal) text strings into a list of tokens i.e words that are actually needed. Sentence and Word tokenizer can be used.
- In this approach the ticket would be classified into L1/L2 or L3 classes and so it would be further classified into one of the given assignment groups.
- Created a model to classify the given tickets as l1/l2 or l3 tickets, it was found that Linear SVC was giving a better score.
- Next, another model was trained considering only the l1/l2 level of incidents consisting of GRP_0 and GRP_8.
- Finally, a third model was trained considering l3 level of tickets.
- A keras implementation with focal loss as a loss function to handle the class imbalance problem was done, which helps in giving more weightage to groups with less samples, but the results were not satisfactory.



4.1 Group_0 Word Cloud

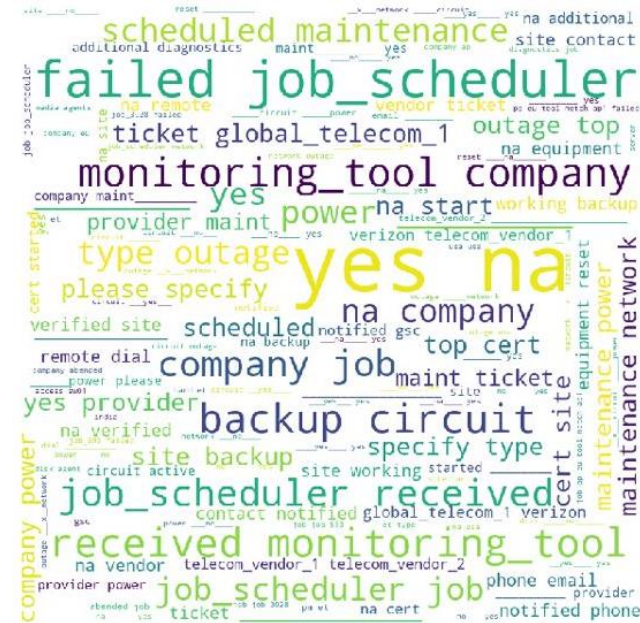


4.3 UML Diagram

4. DESIGN AND DEVELOPMENT

4.1 Dashboard Interface

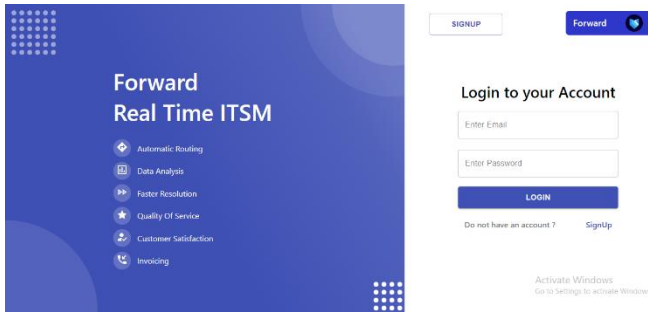
The Dashboard interface is where the agents of the company will work to resolve incoming issues (Ticket). Through this website the agents can not only update tickets with their respective solution but also inform the customers, the status of their ticket. This seamless workflow is achieved through following interfaces, namely; The “Login page” and “Sign up page”, which allows an agent to register and login into the dashboard software. The “Dashboard page” where the agents can have an overview about the entire operation. The “Issue’s page” where the incoming traffic of tickets first get populated, which then can be assigned to the agents for them to work on the issue further. The “MyTask” page which gives an idea of the tickets assigned to the particular agent with the account and also their progress report through illustrative graphs. While clicking on any of the tickets brings you to the “MoreInfo page” where the agent can get more information regarding the issue (Ticket) and can also update the ticket with a solution. The following are the actual images of the implementations.



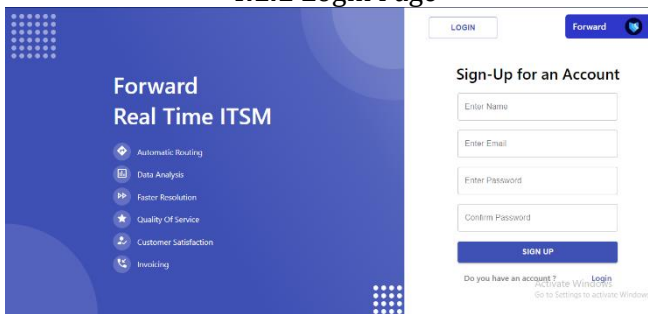
4.2 Group_8 Word Cloud

- Finally, Logistic Regression gave better performance with hyperparameter tuning and this model would be used for classifying the L3 tickets into one of the groups.
 - accuracy 0.70704
 - f1 score 0.704932

The performance can often be further improved by collecting more data for tickets and by running deep learning models like RNN and LSTM’s.



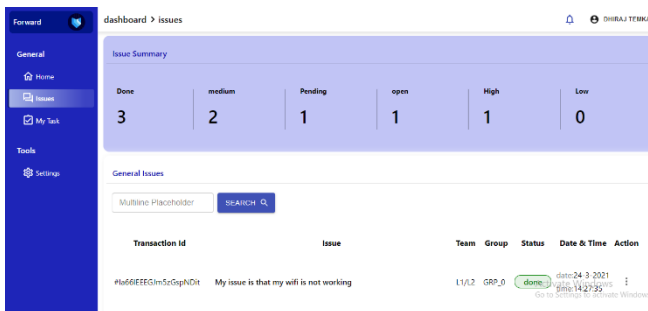
4.1.1 Login Page



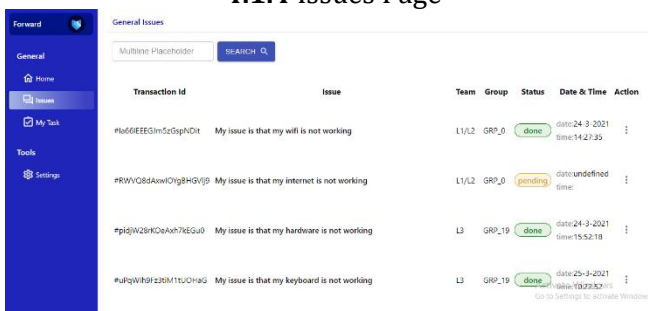
4.1.2 Signup page



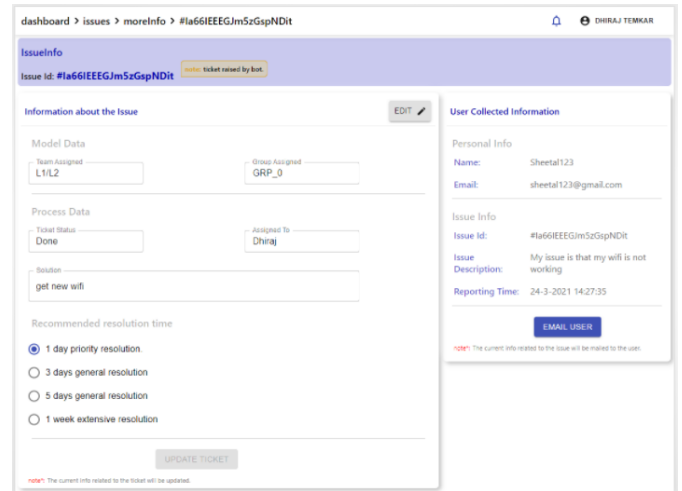
4.1.3 Dashboard



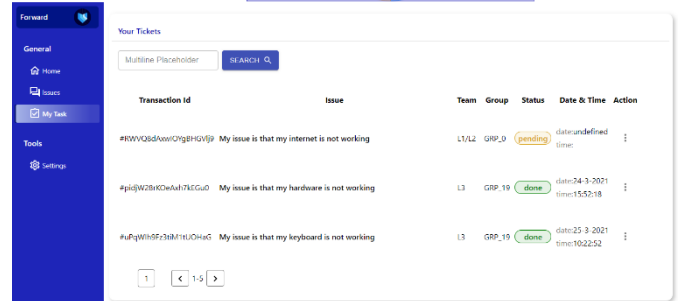
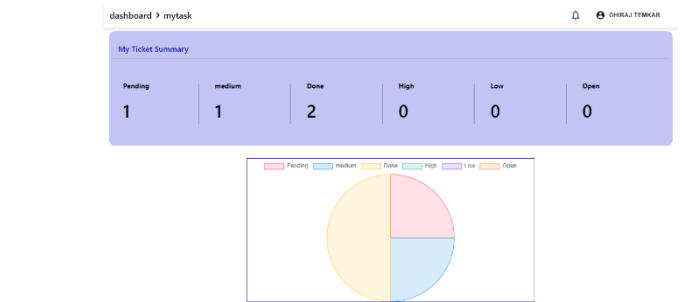
4.1.4 Issues Page



4.1.5 Issues Page-Tickets

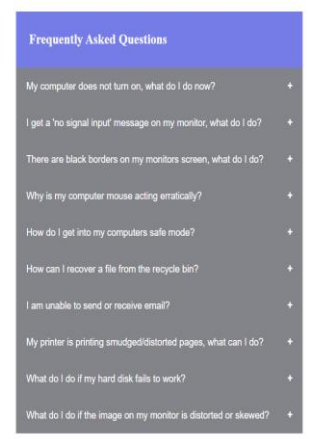


4.1.6 MoreInfo-(Ticket updation form)



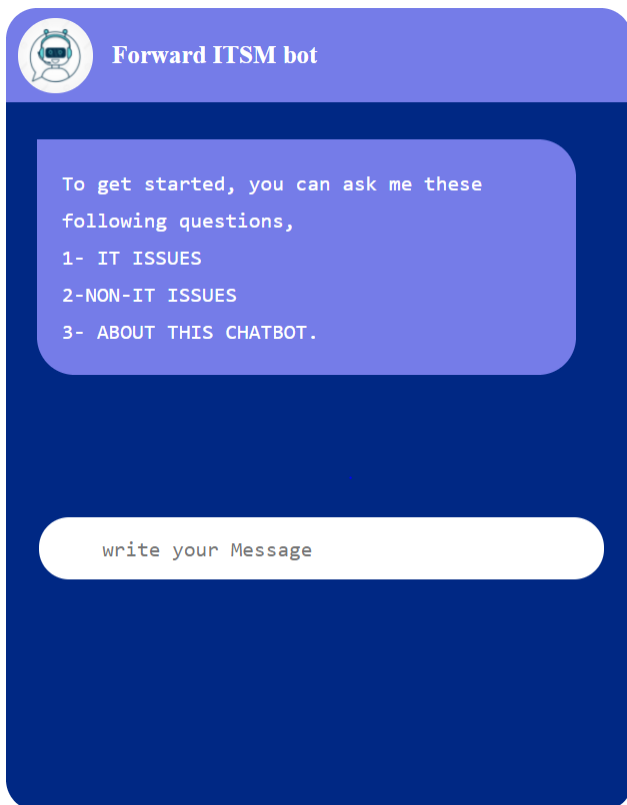
4.1.7 MyIssues-page

4.2 Chatbot Interface

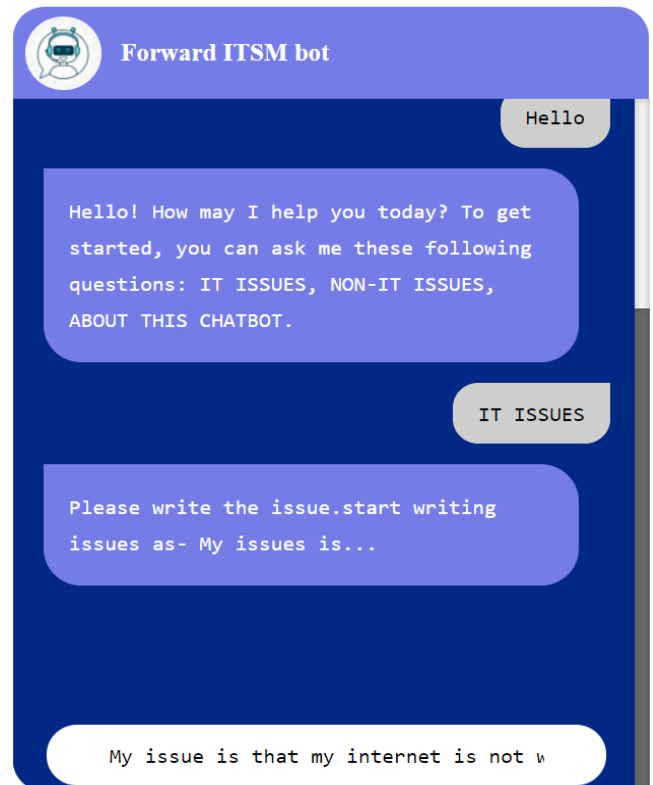


4.2.1 Chatbot interface

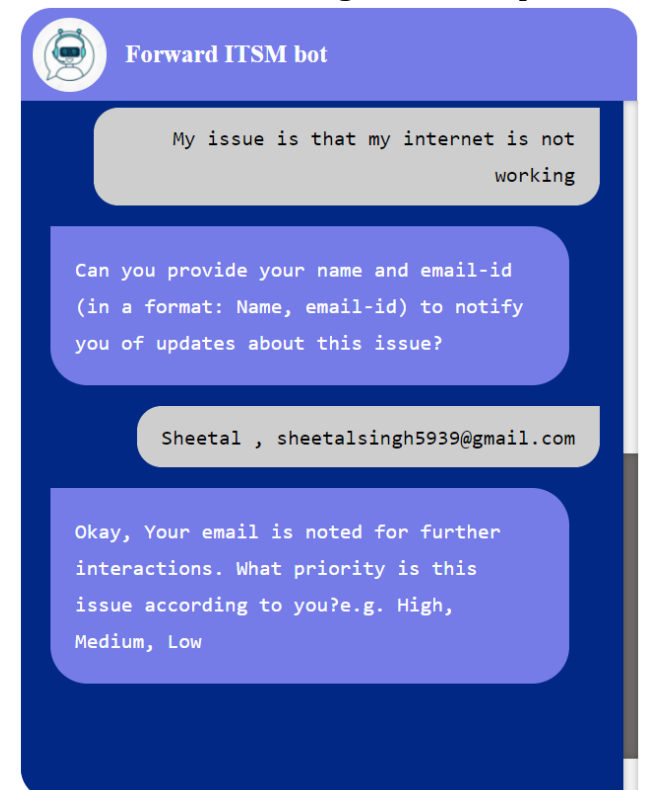
The Chatbot consists of an interface from where users can report any complaints and issues. Rather than implementing the traditional process of submitting queries through a web-based form, an interactive chatbot was created that asks the customers questions and collects relevant information which is sent to our machine learning classifier model to get the "Group" and "Team" information, raising a ticket for the customers' issue. In this manner the user has a friendly interface through which they can interact, build meaningful connections one at a time. To achieve this, a web based chatbot was created using Python, Flask, HTML, CSS, Javascript. The actual implementation of the chatbot is as shown below;



4.2.2 Chatbot-Initial



4.2.3 Chatbot-Asking issue description



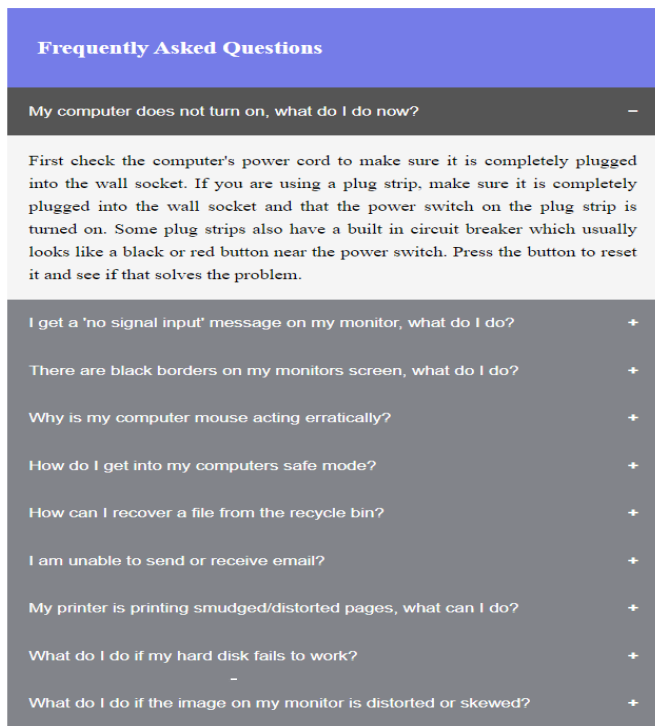
4.2.4 Chatbot asking details required for ticket



4.2.5 Chatbot Raising Ticket

4.3 FREQUENTLY ASKED QUESTIONS:

Frequently asked questions are a section listed for users which they can refer and find a solution quickly without having to chat with the chatbot and raising a ticket.



4.2.6 Frequently asked questions

5. CONCLUSIONS

Automation of routing technical queries increases the overall efficiency of day-to-day processes of the support help desk by 3 percent. Even though replacing the manual Human ticket assigner entirely with AI bot is not possible, yet the automation ML model handles over 90 percent of incoming tickets correctly, according to one of our research papers. It is reducing massive human effort per day. Along with this a reasonably good accuracy has been achieved using Support vector machines (SVM) classifier model since it worked well for all samples of our service desk ticket data. An important challenge for ticket classification is to deal with the unstructured noisy data, at first. We used various data cleaning techniques to remove the noise in the unstructured ticket data. Our proposed automated ticket classification system results in improved end user experience and customer satisfaction, effective support resource utilization and quicker ticket resolution time.

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