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Minor Project Report
On
ROBOTIC PROCESS AUTOMATION FOR E-mail ENQUIRY
SYSTEM

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SCHOOL OF COMPUTER SCIENCE & ENGINEERING

CERTIFICATE

This is to certify that Minor Project entitled “ROBOTIC PROCESS AUTOMATION” is a bonafide work carried out by the student team Ms. Shreedevi Olekar – 01FE17BCS193, Ms. Sonam Jadhav – 01FE17BCS207, Ms. Soujanya Hiregoudar – 01FE17BCS210, Ms. Spoorthy S K –01FE17BCS217, in partial fulfillment of completion of sixth semester B. E. in Computer Science and Engineering during the year 2019 – 2020. The project report has been approved as it satisfies the academic requirement with respect to the project work prescribed for the above said program.

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Signature with date

Name of the Examiners

- 1.
- 2.

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ABSTRACT

Robotic Process Automation (RPA) is an emerging approach that automates repetitive human tasks using robots. RPA offers many benefits including improved business efficiency, increased productivity, data security, reduced cycle time, and improved accuracy while allowing organizations to relieve their employees from repetitive and tedious tasks. Majority of the processes conducted by the organizations are done with the help of computers and are primarily focused on improving productivity, efficiency and customer satisfaction. The processes are not only the production processes but also the processes that are done in the back-end. These back-end automation systems are called Robotic Process Automation (RPA). It automates the straightforward tasks thereby reducing human intervention. However, implementing RPA represents a challenge and organizations must learn to manage RPA adoption to achieve maximum results. This project aims to help organizations to effectively adopt RPA for automating email-based reply to customer feedback using sentimental analysis and robotic process automation. More precisely, it proposes a new method to guide organizations in analyzing the customers reviews with the help of sentimental analysis in order to identify the most suitable for RPA. This report describes the project development of robotic process automation that was developed to manage reviews regarding the products sent by customers through emails and replying them with appropriate message showing how important the customer reviews matter to the companies. Robotic process automation is mainly helpful and designed for companies mostly for an e-commerce industry where they receive hundreds of reviews every day. Where it is difficult to reply each review manually in a short time therefore the developed bot decreases the time requirement to complete the task efficiently. The RPA tool UiPath is used to develop the bot, UiPath is a free available tool for developing bots the issues with UiPath, for a skilled resource in the RPA there is a shortage. Dataset is self-generated. The customer feedback is extracted and sentiment analysis is performed on it. The reply is sent to customer according to the sentiment. The system has best resulted reducing the man power.

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1. INTRODUCTION

Robotic Process Automation emerges as a new technology which is found on automation of repetitive, routine, rule based human tasks, aiming to bring benefits to the organizations that decide to implement such software solution. It offers many benefits including improved business efficiency, increased productivity, data security, reduced cycle-time and improved accuracy while allowing organizations to relieve their employees from repetitive and tedious work. According to the Robotic Process Automation and Artificial Intelligence RPA is the application of the technology to configure software robots that capture and interpret existing applications for processing transactions, manipulating data, and communicating with other software system. RPA provides many benefits including increased productivity with a minimal process change, better service quality, decreased delivery time while automating business process and freeing employees from tedious and repetitive tasks.

1.1 Overview of the Project

Robotic Process Automation (RPA) is an emerging approach that automates repetitive human tasks using robots. This project aims to help organizations to effectively adopt RPA for automating email-based reply to customer feedback using sentimental analysis and robotic process automation.

1.2 Motivation

Most modern working environments are pretty hectic places. Organisations need to run smoothly and efficiently to really operate at their full potential. The easiest way to ensure that a company is a well-oiled machine is to refine and automate its simple, everyday business practices. By eliminating human errors such as tiredness or lack of knowledge, RPA reduces the rate of errors thereby providing a lower level of operational risk. UiPath has embedded the capability to trigger python scripts, which means it can even trigger machine learning models, now bringing them in to business process automation leads to different possibilities. Robots can now predict and take decisions wherever required and bring in the data science capabilities. In addition, UiPath had introduced Natural Language processing (NLP) which will make reading and understanding of documents/emails more possible.

Now that UiPath team had planned to become agile and have releases every 3 months, it might bring in more and more advantages, we will try to keep this updated. Do you know that 1 minute of work for the software robot is equivalent to approximately 15 minutes of work for a person? In addition, the robots are working around the clock, giving organizations' vital 24/7 processing capabilities. Most enterprise RPA tools comes with features like visual designer, drag-and-drop, point-and-click, desktop recorders and many more. This makes the software easy to use, even for non-IT users with limited or no programming knowledge. As a consequence of implementing RPA, many companies took the opportunity to standardize and streamline their existing processes.

1.3 Objectives of the project

- Reduce computational cost.
- To improve scalability.
- Automate reply to the customer reviews.
- To classify the customers reviews into positive and negative by sentimental analysis.

1.4 Literature Survey

Sl no.	Title and Published year	Authors	Methodology	Remarks
1	Delineated Analysis of Robotic Process Automation Tools ^[1] 2018	Ruchi Issac, Riya Muni, Kenali Desai	This paper provides the analysis of three leading RPA platforms namely, UiPath Studio, Automation Anywhere and BluePrism . This analysis helps the commercial industries to determine which platform is the most eligible to use.	In this paper,an overarching study of all the tools has been provided, including their shortcomings and place of optimum use . This paper also species that UiPath should be considered the best automation tool out of all those that are currently in the market.
2	A Study of Robotic process automation among artificial intelligence ^[3]	KP Naveen Reddy, Undavalli Harichandana, T Alekhya,	This paper comprises of RPA Systems developing the action list by looking at the user perform that task within the applications graphical user	This paper says that due to RPA it might lower the barrier to use of automation in products that may not otherwise feature arthropod genus for this purpose.

	Feb 2019	Rajesh SM	Interface(GUI's) and then perform the automation by repletion those tasks directly with GUI.	
3	Robotic Process Automation – The future of business organization ^[7] 2018	Dr. Sunita Patil, Mr.Sahishnu Patil	Paper discusses about IPA developed from RPA and AI , Paper discusses about the various business fields where RPA is useful.	In this paper it is concluded that RPA is the future of business organizations.
4	Towards the process analysis approach to adopt RPA ^[2]	Audrey Bourgouin, Abderrahmane Leshob, and Laurent Renard	Paper discusses about RPA potential of the process and RPA Relevance of the process	Paper analyse business process of classify them based on whether they are suitable for RPA
5	Automation of A Business process using robotic process automation (RPA) ^[8]	A. Leshob, A. Bourgouin and L. Renard	The agents involved in the operation were divided into two groups one with RPA and the another without RPA. ON the group without RPA without there was front and back office agents, on the group with RPA there was only front office agents. Because the robot performs the back-office activities.	They decided RPA because they considered RPA is more suitable for high volume standardised tasks that are rules driven.
6	Sentiment Analysis for Automated Email Response System ^[9] 2018	Kobayashi, Arai, Imai, S. Tanimoto	Email is the most widely used form of written communication, especially for teacher-student communication. Most routine email responses are repetitive in nature but consume a lot of academic time. An automated email response system can save much of this time. This research is focused on detection and classification of sentiment in student-teacher email	RNN results improved with training starting with an accuracy of 26 percent at first epoch and reaching to an accuracy of 87 percent. Hence RNN trained model will be used for sentiment analysis in Automatic Email Response System.

			conversations.	
7	Applying of RPA in Administrative Process of Public Administration ^[4]	Raissa Uskenbayeva, Zhyldyz Kalpeyeva, Ryskhan Satyabaldiyeva, Aiman Moldagulova, Aizhan Kassymova	The proposed methodology in this paper takes into account the peculiarities of government processes, meets the requirements of government agencies.	The proposed model improves the performance of government agencies and citizen satisfaction, reduces costs in automating the functions and process.
8	Communication Robot for elderly based on Robotic Process Automation. ^[6]	T. Kobayashi, K. Arai, T. Imai, S. Tanimoto, H. Sato and A. Kana	This paper describes about the communication robots like SNS Agency Robot. IoT technology and artificial Intelligence along with RPA to build the system. It defines the basic model that is effective in configuring not only a communication robot for elderly but also general consumer services by RPA.	RPA process ensures the automation and usability of the process. Paper analyse business process of classify them based on whether they are suitable for RPA
9	Improving Corporate Secretary Productivity using Robotic Process Automation. ^[5] 2019	W. William and L. William	This paper proposes an RPA system which would automatically prepare documents for both annual compliance processes and ad-hoc client's requests/inquiries. It would communicate the necessary actions and follow up with the clients.	RPA processes help automate things and reduce man power.

Table 1: Literature survey

1.5 Problem Statement

Automate email-based reply to customer feedback using robotic process automation and sentimental analysis.

2.PROPOSED SYSTEM

2.1 Proposed system

- Customers send the feedback to our system through mail.
- Our system classifies the customers reviews into positive and negative feedback with the help of sentimental analysis.
- Based on the customers reviews replies are sent through the emails i.e “Thank you” mail for a positive feedback and for negative feedback reply is sent by describing the failure of the service.

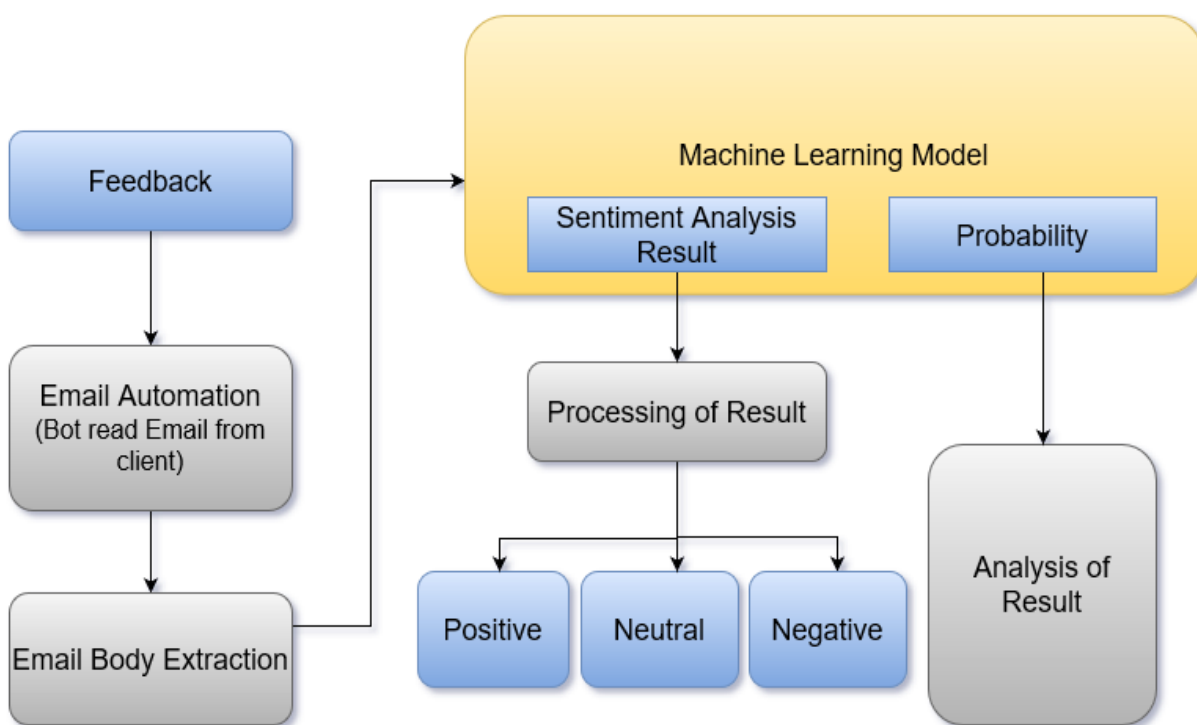


Figure 1: System Model

2.2 Description of Target users

Customer:

- User shall be able to send the feedback mail to our system.
- User shall be able to receive the feedback mail from our system.

2.3 Advantages/applications of proposed system

- The proposed system is effective for both large and small businesses.
- It minimizes human effort.
- The system is more efficient compared to the manual system.

2.4 Scope

- Reduce the computational cost.
- Replies are sent through Emails.

3.SOFTWARE REQUIREMENT SPECIFICATION

A software requirements specification (SRS) is a document that captures complete description about how the system is expected to perform, it is usually signed off the end of requirements engineering phase. An SRS minimizes the time and effort required by developers to achieve desired goals and also minimizes the development cost. A good SRS defines how an application will interact with system hardware, other programs and human users in a wide variety of real-world situations

3.1 Overview of SRS

A software requirements specification (SRS) is a description of a software system to be developed. It lays out functional and non-functional requirements, and which include a set of use cases that describe user interactions that the software must provide. The purpose of this SRS document is to provide a detailed overview of our software product, its parameters and goals. It describes the project's target audience and its user interface, hardware and software requirements, actors involved in it and their role.

3.2 Requirement specifications

Requirement specification includes what all the stakeholder required features to be incorporated in our system.

3.2.1 Functional requirements

- The system shall be able to apply the sentiment analysis to categorise the customer reviews.
- The system shall be able to reply to the positive and negative reviews accordingly through email.

3.2.2 Use case diagrams

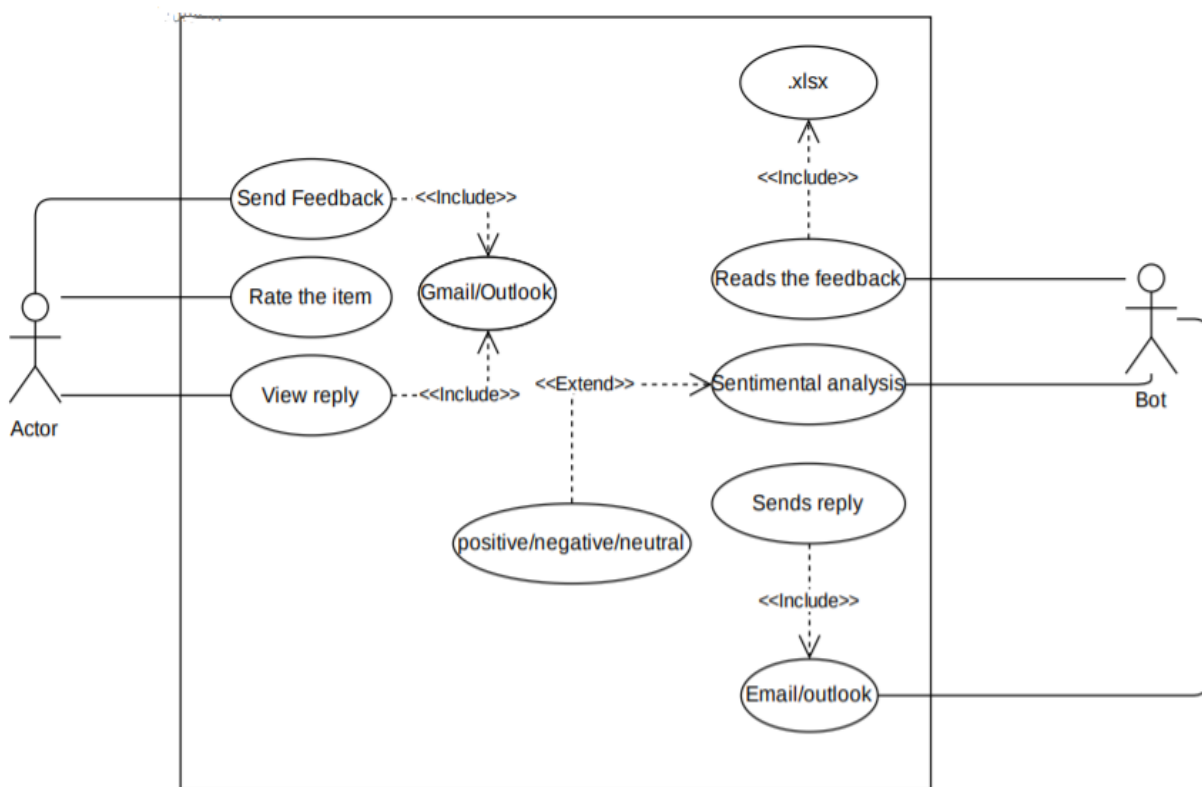


Figure 2: Use case diagram

3.2.3 Use Case descriptions using scenarios

Use case: send feedback.

Actor: customer.

Goal: to send a review.

Pre-condition: sending through gmail/outlook.

Post-condition: review should be stored in .xlsx format.

Success scenario: review should be successfully stored in .xlsx sheet.

Exception scenario: failed storing.

Use case: rate an item/product.

Actor: customer.

Goal: to rate the product.

Pre-condition: rating through Gmail/outlook.

Post-condition: rating should be stored in .xlsx format.

Success scenario: rating should be successfully stored in .xlsx sheet.

Exception scenario: failed storing.

Use case: view reply.

Actor: customer.

Goal: to view the response given by the bot.

Pre-condition: viewing through Gmail/outlook.

Post-condition: -

Success scenario: response by the bot is visible.

Exception scenario: failed receiving the response.

Use case: taking feedback.

Actor: bot.

Goal: extract the review from the customer.

Pre-condition: review body should be stored in .xlsx format.

Post-condition: -.

Success scenario: extracting the mail body and storing in .xlsx.

Exception scenario: failed storing.

Use case: sentimental analysis.

Actor: bot.

Goal: to categorize as positive neutral and negative review.

Pre-condition: ratings and reviews of the customers.

Post-condition: rating and reviews should be stored in .xlsx format.

Success scenario: Categorizing as positive neutral and negative review.

Exception scenario: failed to categorize.

Use case: send reply.

Actor: bot.

Goal: to send reply to the respected review.

Pre-condition: reviews should be categorized as positive neutral and negative.

Post-condition: rating and reviews should be stored in .xlsx format.

Success scenario: sending reply to the customers.

Exception scenario: failed to send reply.

3.2.4 Non-Functional requirements

- The system shall be available at all the time without any drop in efficiency.
- The system shall able to adjust changes without any transformation.

3.3 Software and Hardware requirements

Software requirements:

- OS- Windows 10
- UiPath Studio
- Python 3.6
- IDE- Spyder or Jupyter Notebook

- Email service

Hardware requirements:

- i5 processor
- 8gb RAM

4. SYSTEM DESIGN

4.1. Architecture of the system

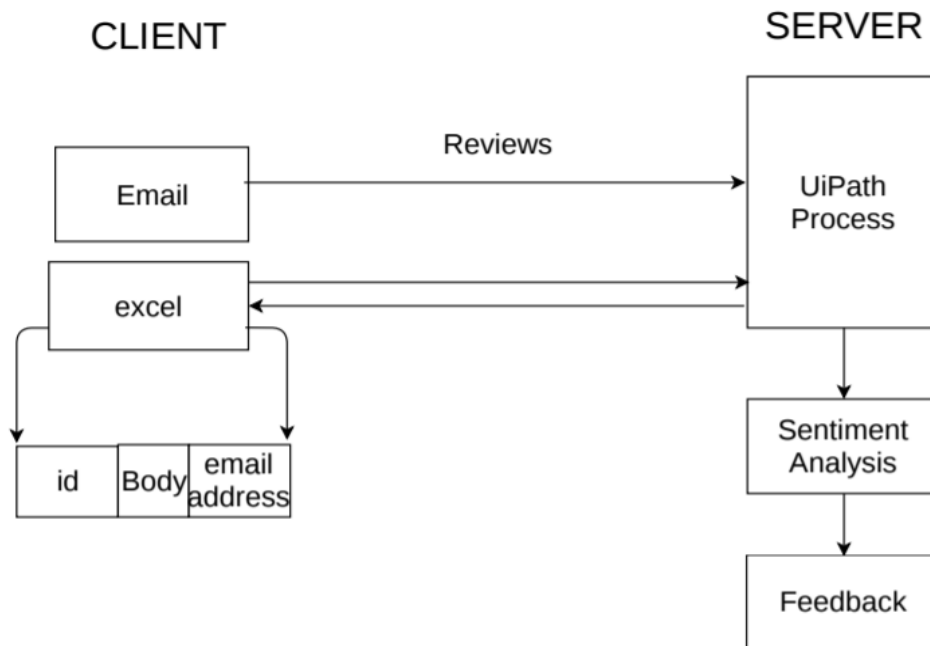


Figure 3: System Architecture

Figure 3: Architectural design is concerned with understanding how a software system should be organized and designing the overall structure of that system. The architecture serves as the blueprint for both the system and the project developing it, as it is the primary carrier of system qualities such as performance, modifiability, and security, none of which can be achieved without a unifying architectural vision. Architecture is an artifact for early analysis to make sure that a design approach will yield an acceptable system.

4.2. Level 0 DFD

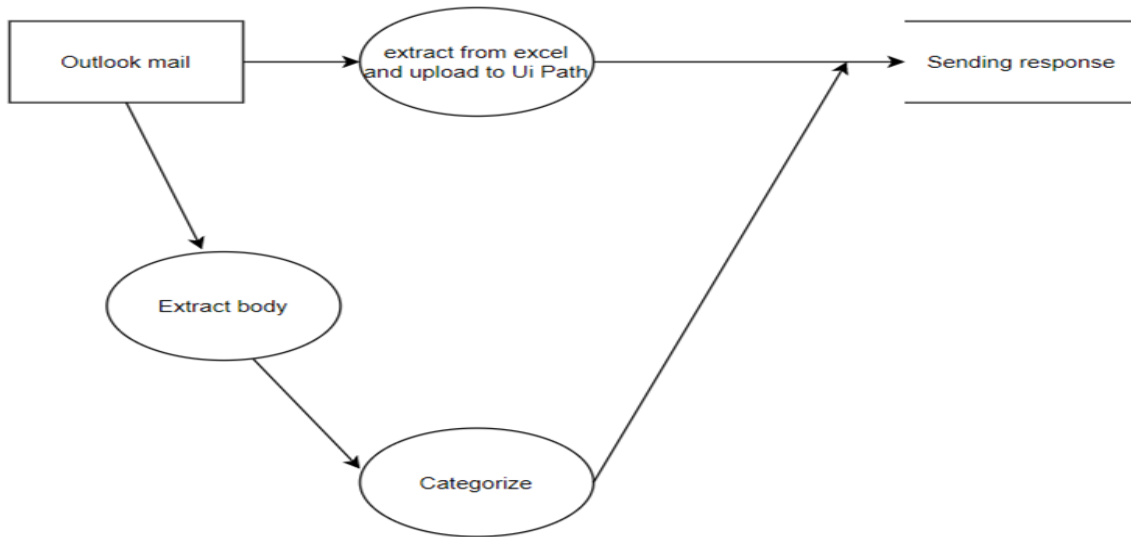


Figure 4: Level 0 DFD

Figure 4: The above figure shows a context Data Flow Diagram that is drawn for a Email Automation system using RPA. It shows the extraction of the Email body given by the customers and categorizing using sentimental analysis and integrating it with the UiPath tool. In between the process and the external entities, there are data flow that indicates the information exchange between the entities and the system.

4.3. Detailed DFD for the proposed system

Dataflow diagram explains detailed flow of the project. It shows the flow from user requesting the main server for work.

Sentiment Analysis:

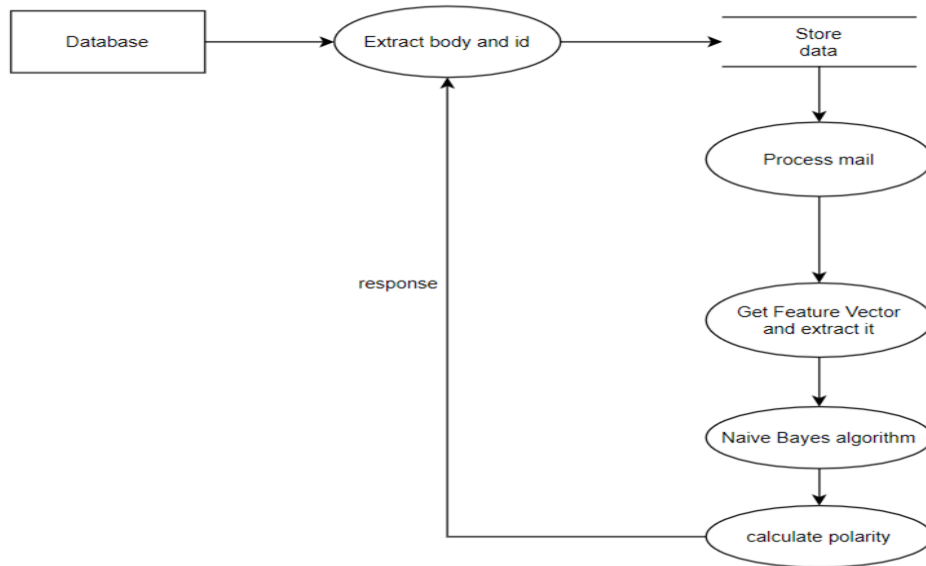


Figure 5: Level 1 DFD (Sentimental Analysis)

UiPath:

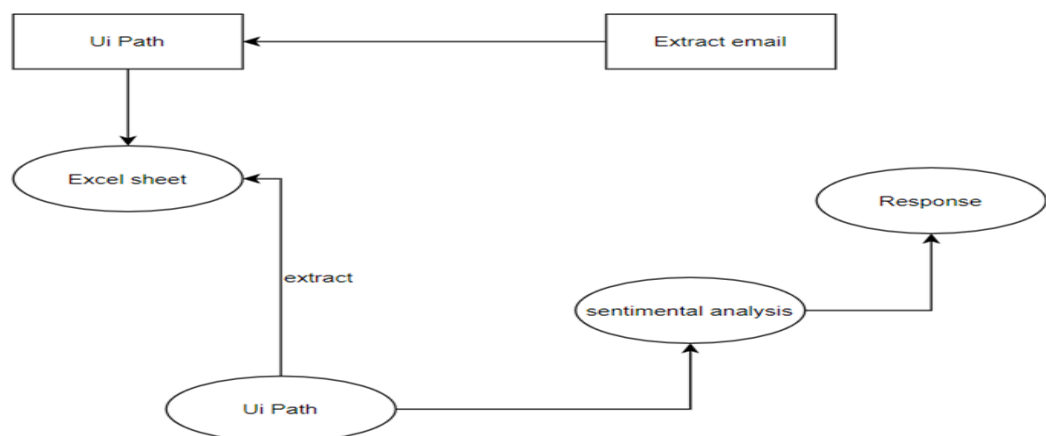


Figure 6: level 1 DFD(UiPath)

4.4 Sequence diagram

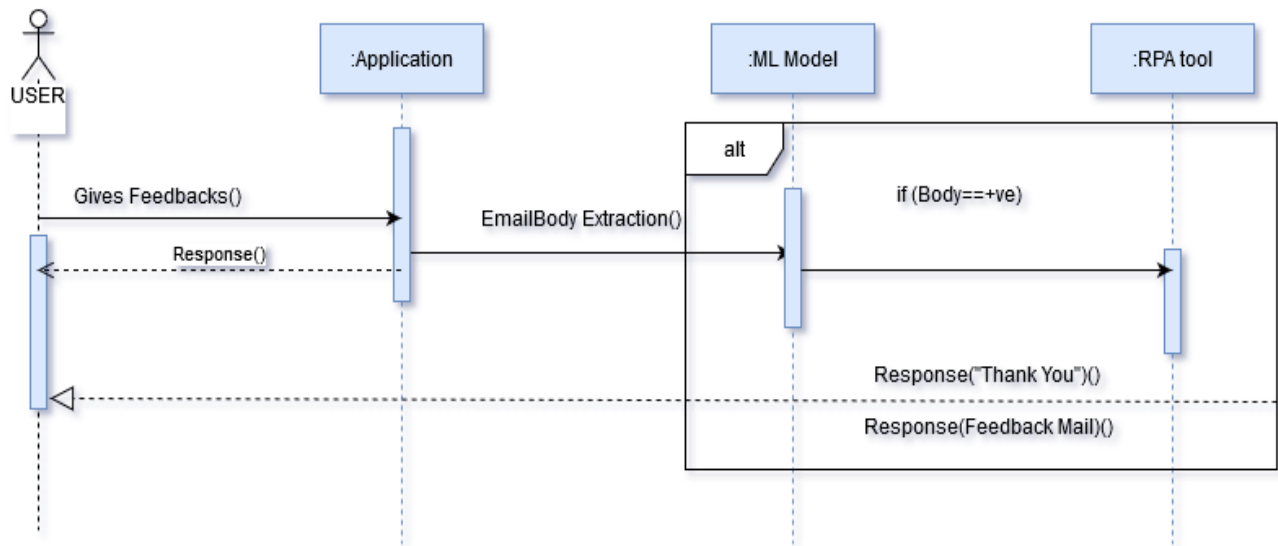


Figure 7: Sequence Diagram

Figure 7: Sequence diagram shows, for a particular scenario of a use case, the events that external actors generate, their order, and possible inter-system events. A sequence diagram is an easy way of describing the behavior of the system. A sequence diagram shows an interaction arranged in time sequence. The purpose of the sequence diagram is to document the sequence of messages among objects in a time-based view. Therefore, sequence diagram helps to predict how a system will behave and to discover responsibilities a class may need to have in the process of modeling a new system.

4.5. Sequence Diagram

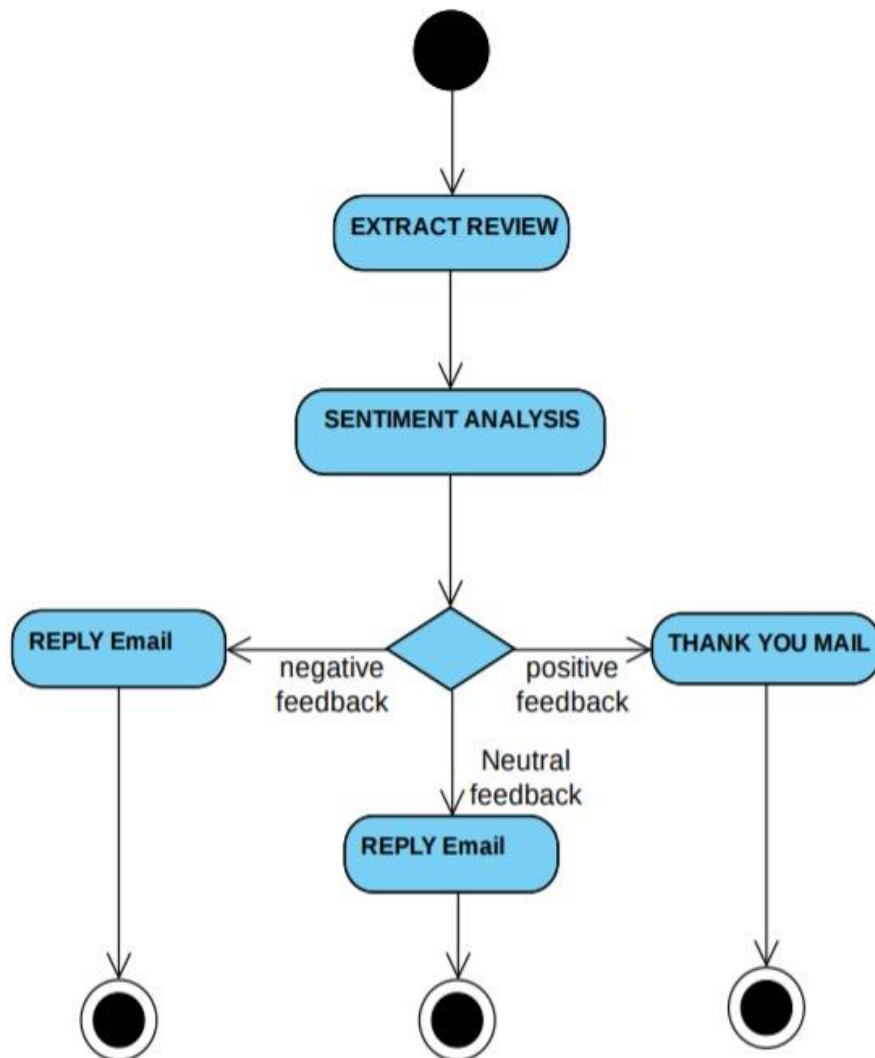


Figure 8: Activity Diagram

Figure 6: Activity diagram describes the dynamic aspects of the system. Activity diagram is basically a flowchart to represent the flow from one activity to another activity. The activity can be described as an operation of the system. The control flow is drawn from one operation to another.

4.6 Data set description

- [..\..\review3\Mails.xlsx](#)
- This is the self-generated data set. Customers reviews are read from the emails and extracted to separate .xlsx files through Robotic process automation by UiPath tool.
- It contains mainly 4 attributes- “ID”, ” Email”, ” Body” and “Ratings”. Where attribute ID and Ratings are numerical and rest are categorical.
- It has 100 tuples. The number of tuples depends on the customers reviews.
- There are no NAN values as it is self-generated dataset.

5. IMPLEMENTATION

5.1 Proposed Methodology

The software used to develop Automated Email Reply Processing is Robotic Process Automation tool i.e. UiPath studio along with excel sheet to store the data extracted from the emails sent by the customers. The methodology used is Waterfall Model. Waterfall Model is one of the software development life cycle model. Users proceed to next phase if and only if current phase is complete. Firstly, team collected requirements and analyzed it. Construction phase is important in waterfall model and very time consuming. To read and store the review emails sent by customers we used UiPath which reads and stores Body, subject along with sender email address to excel sheet. Another process in UiPath reads the data collected in excel sheet and apply sentimental analysis to the reviews and categorizes the reviews as positive and negative reviews. Based on which sender will receive the reply email. For testing module, it is categorized into unit testing, acceptance testing and integration testing. Once the bugs are found they are fixed before integrating whole system. Once the bot is developed, maintenance is mandatory to ensure the proper working of the project.

5.2 Modules

There are three modules in this project. Dataset creation is the first module where a self-generated dataset is created. UiPath extracts the e-mail body i.e. customer feedback and is stored into excel sheet. Sentiment analysis is the second module. In this module the customer reviews are classified as positive, negative and neutral. Replying to customer reviews is the third module. In this module, the reply is sent to the customer based on the sentiment.

Module 1 - Dataset creation:

Input: e-mail

Output: Excel sheet containing body of the e-mail and ID

Module 2 – Sentiment Analysis:

Input: Customer review

Output: Three excel sheets namely positive, negative and neutral are generated. Positive reviews are written in positive.xlsx. Negative reviews are written in negative.xlsx. Neutral

reviews are written in neutral.xlsx.

Module 3 – Replying to customer reviews:

Input: Positive feedback, Negative feedback, Neutral feedback.

Output: Thank you, email is sent to the customer for positive feedback. In case of negative feedback an e-mail is sent to individual customer for understanding the issue. Thank you, message is sent to each customer for neutral feedback.

6. TESTING

6.1 Test plan and Test cases

Module 1: Dataset Creation

Test ID	Input	Test ID description	Expected output	Actual output
1.	e-mail	UiPath takes e-mail containing customer review as input.	Excel sheet containing body of the email and ID	

Table 2: Dataset Creation

Module 2: Sentiment Analysis

Test ID	Input	Test ID description	Expected output	Actual output
1	“The product very good I am happy with the service.”	Positive review is sent by the customer.	Positive review. It is written into an excel file that has positive reviews.	
2	“Very upset with the product.”	Negative review is sent by the customer.	Negative review. It is written into an excel file that has negative reviews.	
3	“I love this product. “	Positive review is sent by the customer.	Positive review. It is written into an excel file that has positive reviews.	
4	“Worst. !!! waste of money”	Negative review is sent by the customer.	Negative review. It is written into an excel file that has negative reviews.	

Table 3: Sentimental analysis

Module 3: Replying to customer reviews.

Test ID	Input	Test ID description	Expected output	Actual output
1	Positive Feedback	Positive feedback is given by the customer.	Thank you, email is sent to the customer.	
2	Negative Feedback	Negative feedback is given by the customer.	An e-mail is sent to individual customer for understanding the issue.	
3	Neutral Feedback	Neutral feedback is given by the customer.	Thank you, message is sent to each customer.	

Table 4: Replying to customers

7. RESULTS AND DISCUSSION

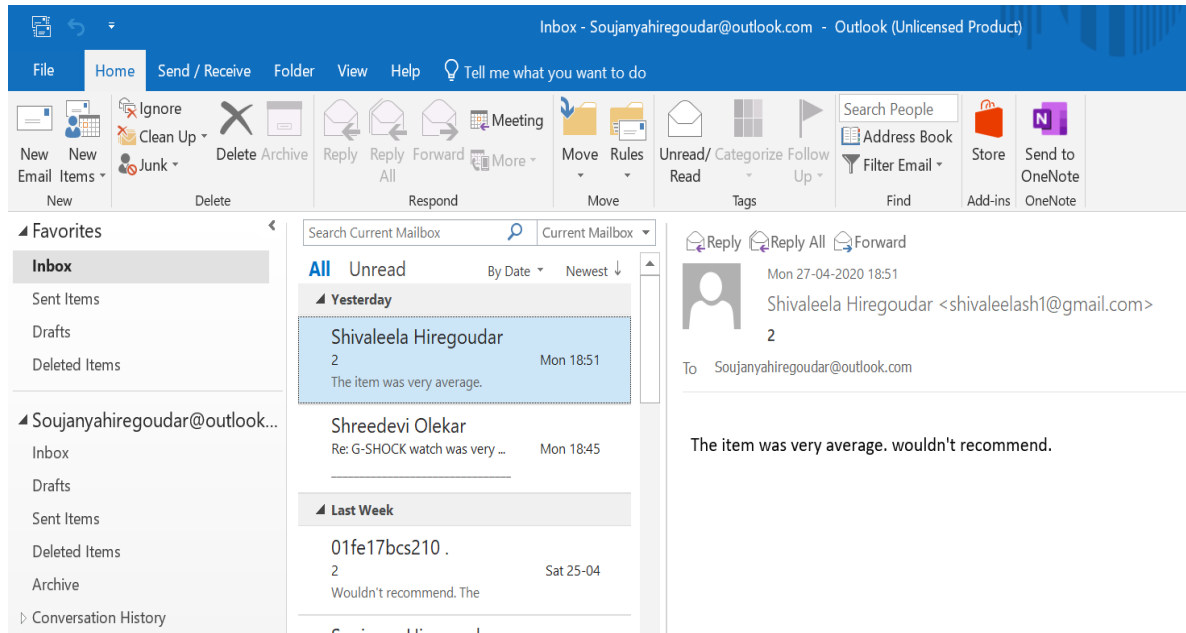
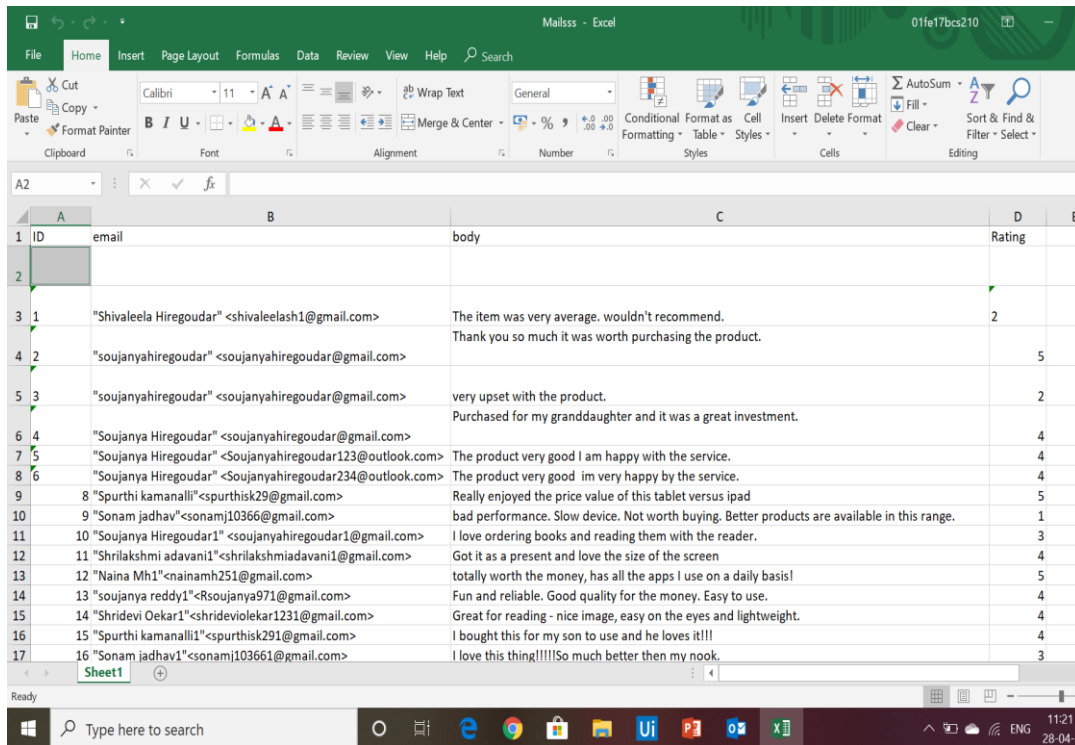


Figure 9: Email inbox

Description: The figure depicts the view of the received reviews from the customers which shows the inbox of the outlook mail where all the reviews are captured.



ID	email	body	Rating
1	"Shivaleela Hiregoudar" <shivaleelash1@gmail.com>	The item was very average. wouldn't recommend.	2
2	"soujanya hiregoudar" <soujanyahiregoudar@gmail.com>	Thank you so much it was worth purchasing the product.	5
3	"soujanya hiregoudar" <soujanyahiregoudar@gmail.com>	very upset with the product.	2
4	"Soujanya Hiregoudar" <soujanyahiregoudar@gmail.com>	Purchased for my granddaughter and it was a great investment.	4
5	"Soujanya Hiregoudar" <Soujanyahiregoudar123@outlook.com>	The product very good I am happy with the service.	4
6	"Soujanya Hiregoudar" <Soujanyahiregoudar234@outlook.com>	The product very good im very happy by the service.	4
8	"Spurthi kamanalli" <spurthisk29@gmail.com>	Really enjoyed the price value of this tablet versus ipad	5
9	"Sonam jadhav" <sonamj10366@gmail.com>	bad performance. Slow device. Not worth buying. Better products are available in this range.	1
10	"Soujanya Hiregoudar1" <soujanyahiregoudar1@gmail.com>	I love ordering books and reading them with the reader.	3
11	"Shrilakshmi adavani1" <shrilakshmiadavani1@gmail.com>	Got it as a present and love the size of the screen	4
12	"Naina Mh1" <nainamh251@gmail.com>	totally worth the money, has all the apps I use on a daily basis!	5
13	"soujanya reddy1" <Rsoujanya971@gmail.com>	Fun and reliable. Good quality for the money. Easy to use.	4
14	"Shridevi Oekar1" <shridevioletkar1231@gmail.com>	Great for reading - nice image, easy on the eyes and lightweight.	4
15	"Spurthi kamanalli1" <spurthisk291@gmail.com>	I bought this for my son to use and he loves it!!!	4
16	"Sonam jadhav1" <sonamj103661@gmail.com>	I love this thing!!!!!!So much better then my nook.	3

Figure 10: Generated Excel sheet

Description: The figure depicts the view of the received reviews from the customers which are read from the Email inbox by UiPath and stored the same in the excel sheet.

Classification Models



Figure 11: Multinomial NB Model

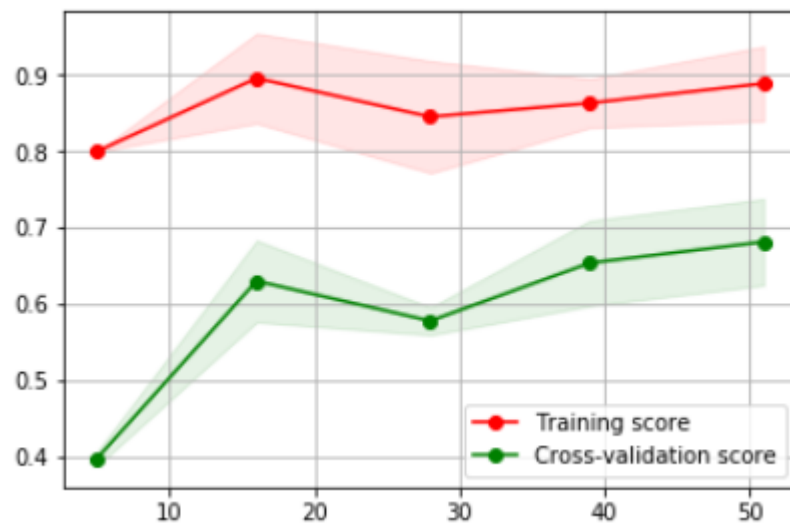


Figure 12: Bernouli NB Model

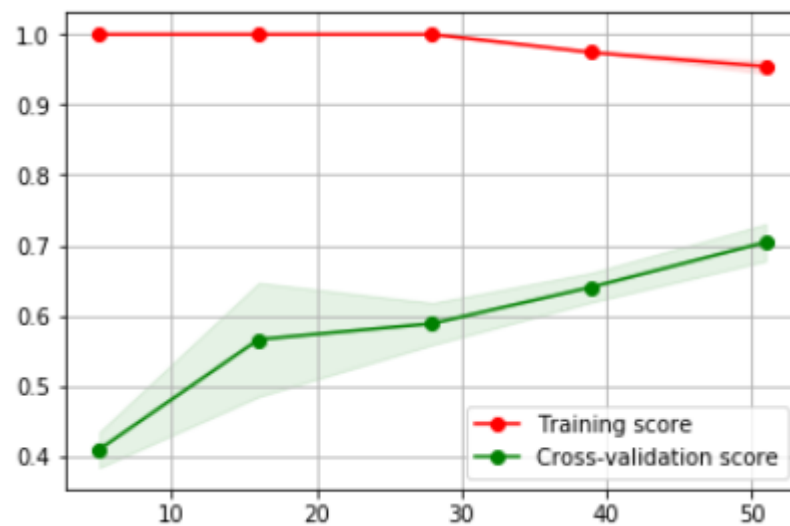


Figure 13: Logistic Regression Model

Accuracy:

Sl.no	Classification Model	Accuracy
1	Multinomial NB	0.91
2	Bernoulli's NB	0.88
3	Logistic Regression	0.76

Table 5: Classification Models Accuracy

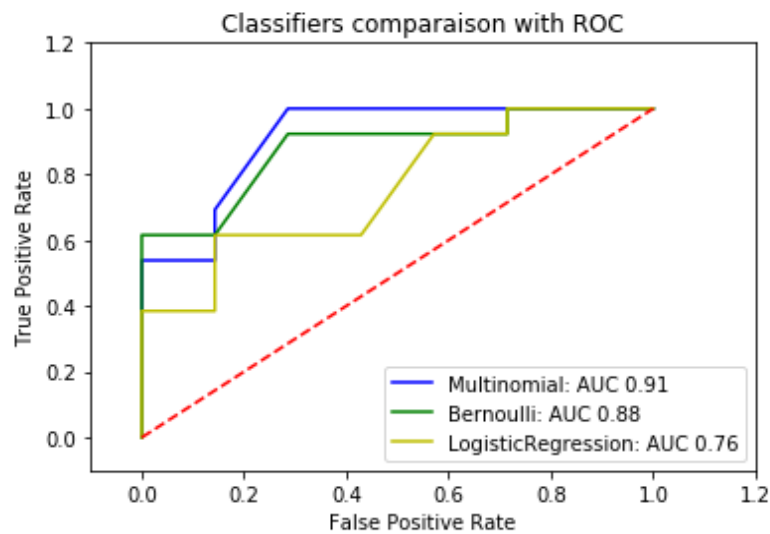
Classification models comparison:

Figure 14: Models comparison graph

Description: The Models comparison graph is constructed by plotting the true positive rate (TPR) against the false positive

rate (FPR). Interpretation: The closer the curve comes to the 45-degree diagonal of the ROC space the less is the accurate test.

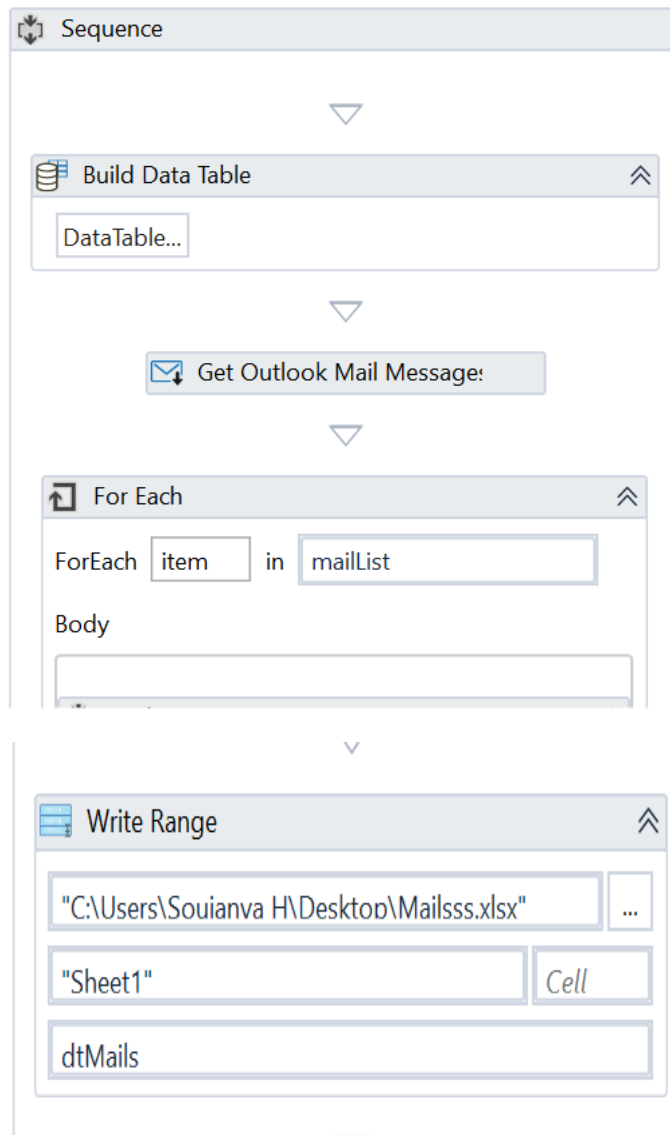
UI Path Processes:

Figure 15: UiPath process 1

Description: The figure depicts UiPath first process which reads the received reviews from Mail inbox and write the review text along with the sender email ids to excel sheet.

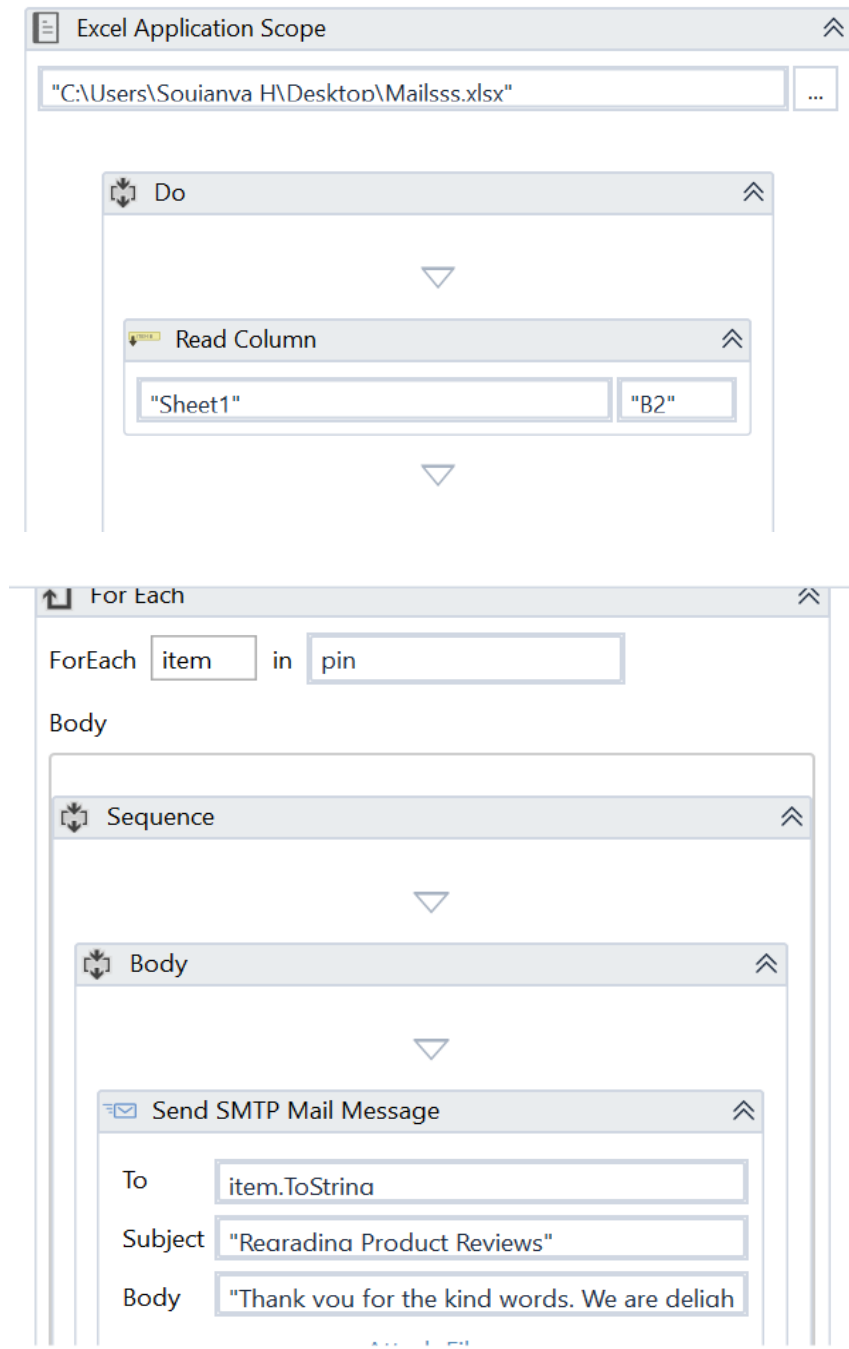


Figure 16: UiPath process 2

Description: The figure depicts UiPath second process which reads the reviews from the excel sheet and apply sentimental analysis to each review based on the result, UiPath reply back to the sender emails.

Regrading Product Review Inbox x

soujanyahiregoudar@gmail.com
to me ▾

Fri, 24 Apr, 00:28 (4 days ago) ☆ ↩ ⋮

Thank you for the kind words. We are delighted to hear that you were completely satisfied with our product.

Feedback like these help us constantly improve our customer experiences by knowing what we are doing right and what we can work on. We appreciate you taking the time to send us this helpful response.



soujanyahiregoudar@gmail.com
to me ▾

Mon, 27 Apr, 21:56 (13 hours ago) ☆ ↩ ⋮

Thank you for sharing your feedback with us. We apologize that our service did not satisfy your expectations.

Regrads,
Minor Team11

Figure 17: Reply emails to customers

Description: Based on the feedback received from the customer, application sends the corresponding reply emails to each customers id. for positive feedback thank you message is sent and for negative feedback apologize message is sent.

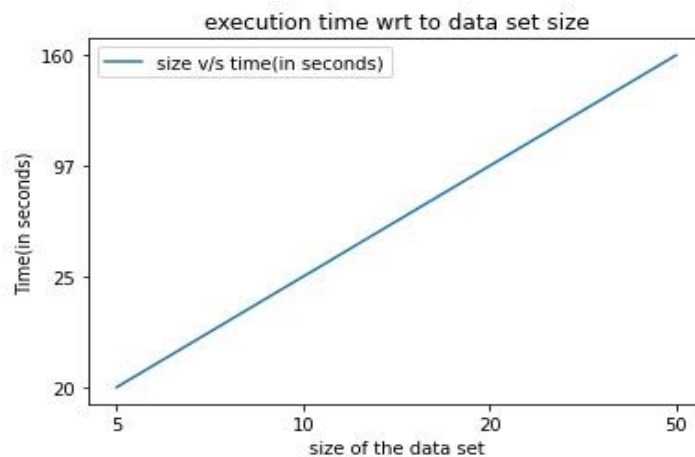


Figure 18: Execution time graph

Description: Above graph shows the time taken for bot to complete all the tasks with respect to the number of reviews provided. We can conclude that UiPath process(bot) takes on an average 3 to 4 second for 1 review. If the same process is carried out manually minimum time required to read the review and analyses the sentiment then replying back to those reveals will definitely takes more than 5 seconds. Therefore, the application created is much faster compared to manual execution.

8.CONCLUSION AND FUTURE SCOPE

Conclusion

Every day emails, especially in organizations contain a spectrum of data from multiple mediums for example many ecommerce websites receive hundreds of reviews to their sites every day, the application built reads the reviews and reply back to each sender according to their review text. The system provides an automated email response to the customers reviews which reduces human work and completes the task 8 times faster than manual work. System extract the information, bots with cognitive process automation and intelligent decision making after capturing the data, it is processed and analyzed and generates responses. Bots analyses the reviews and answer them automatically. Thus, it aids powerful computing with access anywhere and massive storage. For a positive review reply sent is “Thank you for sharing your review we are delighted to hear you were completely satisfied with our product” And for negative review reply sent is “Thank you for sharing your feedback we apologize that our service did not satisfy your expectations”.

The Bot send the reply to all the customer reviews which tells that for company, customer satisfaction is the most priority task. Which usually takes 1 hour a day is reduced to 15 minutes a day, thereby achieving process efficiency.

Future Scope

- Modification can be done according to the requirements. Application can be used in different organizations. Reusability is possible as required in this application. We can also add new features as and when we require.
- Replies can be categorized based on the type of the products purchased by the customers.

9. REFERENCES

- [1] R. Issac, R. Muni and K. Desai, "Delineated Analysis of Robotic Process Automation Tools," *2018 Second International Conference on Advances in Electronics, Computers and Communications (ICAEECC)*, Bangalore, 2018, pp. 1-5.
URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8479511&isnumber=8479418>
- [2] A. Leshob, A. Bourguoin and L. Renard, "Towards a Process Analysis Approach to Adopt Robotic Process Automation," *2018 IEEE 15th International Conference on e-Business Engineering (ICEBE)*, Xi'an, 2018, pp. 46-53.
URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8592629&isnumber=8592611>
- [3] K P Naveen Reddy , Undavalli Harichandana , T Alekhya , Rajesh S M , " A Study of Robotic Process Automation Among Artificial Intelligence," *International Journal of Scientific and Research Publications, Volume 9, Issue 2, February 2019*
URL: https://www.researchgate.net/publication/331285237_A_Study_of_Robotic_Process_Automation_Among_Artificial_Intelligence/link/5c7024dea6fdcc4715941111/download
- [4] R. Uskenbayeva, Z. Kalpeyeva, R. Satybaldiyeva, A. Moldagulova and A. Kassymova, "Applying of RPA in Administrative Processes of Public Administration," *2019 IEEE 21st Conference on Business Informatics (CBI)*, Moscow, Russia, 2019, pp. 9-12.
URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8807793&isnumber=8807789>
- [5] W. William and L. William, "Improving Corporate Secretary Productivity using Robotic Process Automation," *2019 International Conference on Technologies and Applications of Artificial Intelligence (TAAI)*, Kaohsiung, Taiwan, 2019, pp. 1-5.
URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8959872&isnumber=8959820>
- [6] T. Kobayashi, K. Arai, T. Imai, S. Tanimoto, H. Sato and A. Kanai, "Communication Robot for Elderly Based on Robotic Process Automation," *2019 IEEE 43rd Annual Computer Software and Applications Conference (COMPSAC)*, Milwaukee, WI, USA, 2019, pp. 251-256.
URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8754139&isnumber=8753906>
- [7] S. C. Lin, L. H. Shih, D. Yang, J. Lin and J. F. Kung, "Apply RPA (Robotic Process Automation) in Semiconductor Smart Manufacturing," *2018 e-Manufacturing & Design Collaboration Symposium (eMDC)*, Hsinchu, 2018, pp. 1-3.
URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8514225&isnumber=8514219>
- [8] J. G. Enríquez, A. Jiménez-Ramírez, F. J. Domínguez-Mayo and J. A. García-García, "Robotic Process Automation: a Scientific and Industrial Systematic Mapping Study," in *IEEE Access*. doi: 10.1109/ACCESS.2020.2974934
URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=9001110&isnumber=6514899>

[9] S. Yatskiv, I. Voytyuk, N. Yatskiv, O. Kushnir, Y. Trufanova and V. Panasyuk, "Improved Method of Software Automation Testing Based on the Robotic Process Automation Technology," *2019 9th International Conference on Advanced Computer Information Technologies (ACIT)*, Ceske Budejovice, Czech Republic, 2019, pp. 293-296.

URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8780038&isnumber=8779853>

10. APPENDIX

[A] Glossary

Acronym	Abbreviation
RPA	Robotic Process Automation
AI	Artificial Intelligent
SMTP	Simple Mail Transfer Protocol
ML	Machine Learning

Table 1: Glossary

- RPA: Robotic Process Automation is an emerging approach that automates repetitive human tasks using robots.
- Sentiment analysis: Sentiment analysis is the interpretation and classification of emotions (positive, negative and neutral) within text data using text analysis techniques.
- NLP: Natural language processing, NLP is a branch of artificial intelligence that deals with analyzing, understanding and generating the languages that humans use naturally in order to interface with computers in both written and spoken contexts using natural human languages instead of computer languages.
- NLTK: NLTK is a popular Python library which is used for NLP. Natural language processing (NLP) is about developing applications and services that are able to understand human languages.
- Classifier Models:
 - Multinomial NB Model: Multinomial Naive Bayes is a specialized version of Naive Bayes that is designed more for text documents. Whereas simple naive Bayes would model a document as the presence and absence of particular words, multinomial naive bayes explicitly models the word counts and adjusts the underlying calculations to deal with in.
 - Bernoulli NB Model: The Bernoulli naive Bayes classifier assumes that all our features are binary such that they take only two values.
 - Logistic Regression: Logistic regression is the appropriate regression analysis to conduct when the dependent variable is binary or not. Logistic regression is used to describe data and to explain the relationship between one dependent binary

variable and one or more nominal, ordinal, interval or ratio-level independent variables.

- Customer Reviews: Feedback received by the customers regarding their product.

[B] Description of Tools & Technology used

1. UiPath:

- **UiPath** is a global software company that develops a platform for robotic process automation (RPA).
- It is an advanced tool that enables you to design automation processes visually, through diagrams.
- It also executes the processes built in Studio, as a human would.
- Ui path is a flexible, scalable uses existing infrastructure and processes.
- Helps to deliver faster with a fewer error.
- It allows us to replace repetitive manual work without any interruption.

2. Outlook Mail Services

- To collect customer feedbacks

3. Python IDE-Spyder

- Used for sentimental analysis.

[C] Gantt Chart

