COSC 310

Group – 23

Assignment 2

Project Report

Introduction

The goal of this project is to create an interactive conversational agent, or a 'chat bot' using an object-oriented programming language. The chat bot needs to be assigned a role and is expected to respond to and hold a conversation with the user for thirty or more turns of dialogue. To create the chat bot, our team decided to make use of the Python programming language along with the help of some Natural Language Processing (NLP) frameworks and toolkits. We decided to assign the bot the role of Justin Trudeau, the current Prime Minister of Canada, with whom the user can interact with and ask questions about his personal and political interests in the past, present and the future, along with a few general questions and greetings. The GitHub Repository for this project can be found here: https://github.com/COSC310Group23/COSC310-Interactive-Conversational-Agent

Choice of Software Development Life Cycle (SDLC)

After some discussion, our team decided on using the **Waterfall Model** for developing the Interactive Chat Bot. Our choice was based on a few key points: Small Team size, small project size, a clear set of unchanging requirements, and familiarity with the software used for making the project. Along with these key points, we felt that organizing the workflow with the help of distinctive phases will help some of our members become used to developing software in a team environment, as opposed to having to go back on forth between development phases in other SDLCs such as the Agile model.

Phases of Development

Requirements Analysis

- **Software**: Interactive Chat Bot that can respond to user input with appropriate messages.
    - Must be created using an object-oriented programming language.

- **Role Assignment**: Chat Bot must be assigned the role of a specific person and must answer questions within the given context.

- **User Input**: User must be able to converse with the Chat Bot by entering general greetings or questions specific to the bot's assigned role.
    - User must be able to quit the software by entering a command, which must be provided to the user at the beginning of the conversation.

- **Goal**: User must be able to hold a complete and coherent conversation with the Chat Bot for a minimum of 30 turns of dialogue.

System Design

- **Programming Language**: Python will be used to develop the Interactive Chat Bot.
    - Frameworks and Toolkits such as Natural Language Toolkit (NLTK) and TensorFlow will be used to process user input and 'train' the bot's responses.

- **Role**: Chat Bot will be assigned the role of 'Justin Trudeau', Prime Mister of Canada.

- **Dialogue**: Possible variations of all possible questions and the Bot's responses will be stored in a text file.

- **I/O**: User will type their inputs into the console. The Chat Bot's response will also be printed out to the console.
    - User will be able to end the conversation by entering a command such as 'quit' into the console.

Implementation

- Create text file that contains 'patterns' that the Bot should understand and 'responses' that the Bot should output based on the most appropriate pattern.

- Implement a class that uses the NLP algorithms to get a probability for a matching tag based on a user's input

- Implement a method to take in user input, check which pattern it has the highest similarity to from all the pre-written dialogue.
    - Output a random response from the list of responses pertaining to the pattern on the console.

- Create a README file containing a brief explanation of the project and the libraries used.

- Document the code by adding comments explaining the features of various classes/methods, etc.

Testing

- Test for bot's responses by entering existing questions or 'patterns' from the text file containing all the dialogue.
    - Check if any of the existing patterns fails to generate an appropriate response.

- Test for an appropriate response when an unrecognizable pattern is entered by user.

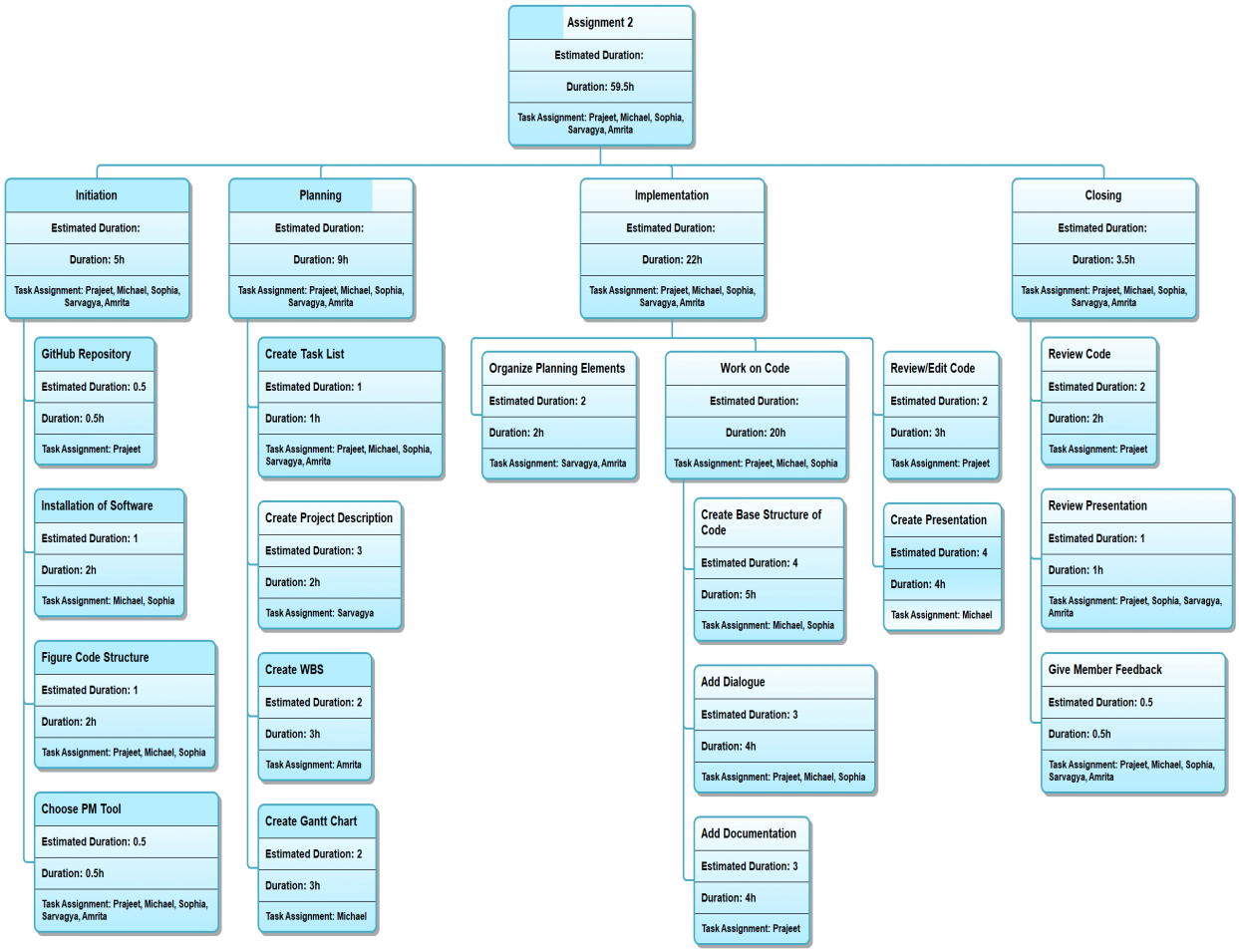
- Test 'quit' command that ends conversation on input.

- Review Code and Documentation.
    - Check for possible grammar/language errors in the dialogue file.
    - Check for redundancies/logic errors in code.

- Check for exceptions and crashes on abnormal input.

Project Breakdown

Work Breakdown Structure



	WBS	Name	Task Assignment	Estimated Task Duration (h)	Actual Task Duration (h)	Start	Finish
0	**0**	**Assignment 2**	**Prajeet, Michael, Sophia, Sarvagya, Amrita**		**59.5h**	**2021-02-22**	**2021-03-04**
1	**1**	**Initiation**	**Prajeet, Michael, Sophia, Sarvagya, Amrita**		**5h**	**2021-02-22**	**2021-02-22**
2	1.1	GitHub Repository	Prajeet	0.5	0.5h	2021-02-22	2021-02-22
3	1.2	Installation of Software	Michael, Sophia	1	2h	2021-02-22	2021-02-22
4	1.3	Figure Code Structure	Prajeet, Michael, Sophia	1	2h	2021-02-22	2021-02-22
5	1.4	Choose PM Tool	Prajeet, Michael, Sophia, Sarvagya, Amrita	0.5	0.5h	2021-02-22	2021-02-22
6	**2**	**Planning**	**Prajeet, Michael, Sophia, Sarvagya, Amrita**		**9h**	**2021-02-23**	**2021-02-24**
7	2.1	Create Task List	Prajeet, Michael, Sophia, Sarvagya, Amrita	1	1h	2021-02-23	2021-02-23
8	2.2	Create Project Description	Sarvagya	3	2h	2021-02-24	2021-02-24
9	2.3	Create WBS	Amrita	2	3h	2021-02-24	2021-02-24
10	2.4	Create Gantt Chart	Michael	2	3h	2021-02-24	2021-02-24
11	**3**	**Implementation**	**Prajeet, Michael, Sophia, Sarvagya, Amrita**		**22h**	**2021-02-26**	**2021-03-04**
12	3.1	Organize Planning Elements	Sarvagya, Amrita	2	2h	2021-02-26	2021-02-26
13	**3.2**	**Work on Code**	**Prajeet, Michael, Sophia**		**20h**	**2021-02-26**	**2021-02-27**
14	3.2.1	Create Base Structure of Code	Michael, Sophia	4	5h	2021-02-26	2021-02-26
15	3.2.2	Add Dialogue	Prajeet, Michael, Sophia	3	4h	2021-02-27	2021-02-27
16	3.2.3	Add Documentation	Prajeet	3	4h	2021-02-26	2021-02-26
17	3.3	Review/Edit Code	Prajeet	2	3h	2021-03-01	2021-03-01
18	3.4	Create Presentation	Michael	4	4h	2021-03-04	2021-03-04
19	**4**	**Closing**	**Prajeet, Michael, Sophia, Sarvagya, Amrita**		**3.5h**	**2021-03-02**	**2021-03-04**
20	4.1	Review Code	Prajeet	2	2h	2021-03-02	2021-03-03
21	4.2	Review Presentation	Prajeet, Sophia, Sarvagya, Amrita	1	1h	2021-03-03	2021-03-04
22	4.3	Give Member Feedback	Prajeet, Michael, Sophia, Sarvagya, Amrita	0.5	0.5h	2021-03-03	2021-03-04

Gantt Chart

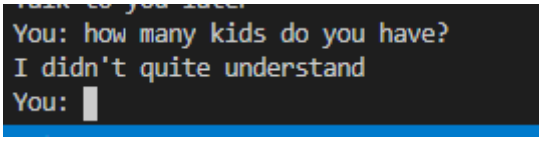
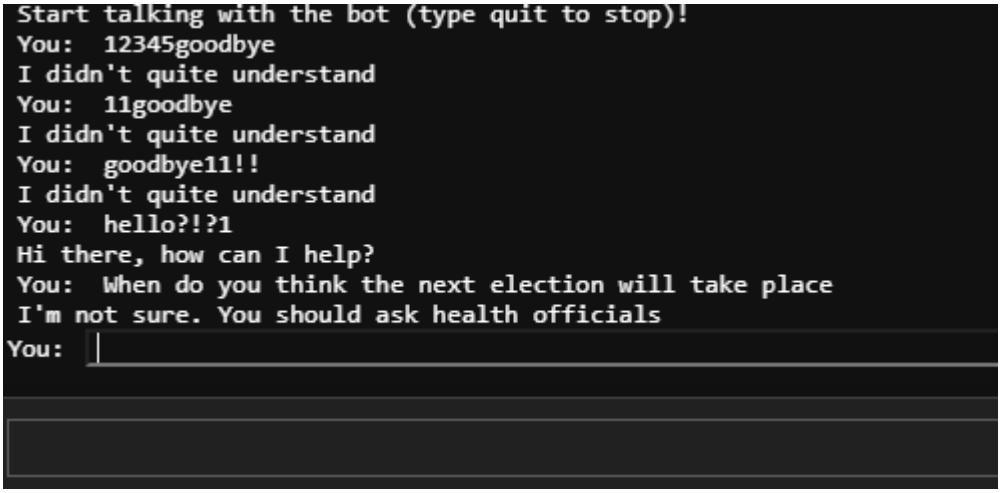
TASK NUMBER	WBS NUMBER	TASK TITLE	TASK PARTICIPANTS	START DATE	DUE DATE	DURATION	PREDECESSORS	WEEK 1 (Feb 22 - Mar 28)							WEEK 2 (Mar 1 - Mar 7)						
								M	T	W	TH	F	SA	SU	M	T	W	TH	F	SA	SU
1	1	Initiation				1 day															
2	1.1	GitHub Repository	Prajeet	2/22/21	2/23/21	1 day	-														
3	1.2	Installation of software	Michael, Sophia	2/22/21	2/23/21	1 day	-														
4	1.3	Figure Code Structure	Prajeet, Michael, Sophia	2/22/21	2/23/21	1 day	-														
5	1.4	Choose PM Tool	Prajeet, Michael, Sophia, Sarvagya, Amrita	2/22/21	2/23/21	1 day	-														
6	2	Planning				3 days															
7	2.1	Create List of Tasks	Prajeet, Michael, Sophia, Sarvagya, Amrita	2/23/21	2/24/21	1 day	2;3;4;5														
8	2.2	Create Project Description	Sarvagya	2/24/21	2/26/21	2 days	7														
9	2.3	Create WBS	Amrita	2/24/21	2/26/21	2 days	7														
10	2.4	Create Gantt Chart	Michael	2/24/21	2/26/21	2 days	7														
11	3	Implementation				6 days															
12	3.1	Organize Planning Elements	Sarvagya, Amrita	2/26/21	2/27/21	1 day	8;9;10														
13	3.2	Work on Code	Prajeet, Michael, Sophia	2/26/21	2/28/21	2 days	8;9;10														
14	3.2.1	Create Base Structure of Code	Michael, Sophia	2/26/21	2/27/21	1 day	8;9;10														
15	3.2.2	Add Dialogue	Prajeet, Michael, Sophia	2/27/21	2/28/21	1 day	14														
16	3.2.3	Add Documentation	Prajeet	2/26/21	2/28/21	1 day	14														
17	3.3	Review/Edit Code	Prajeet	2/28/21	3/2/21	2 days	15;16														
18	3.4	Create Presentation	Michael, Sophia, Amrita	3/2/21	3/4/21	2 days	17														
19	4	Closing				2 days															
20	4.1	Review Code	Prajeet, Sarvagya	3/4/21	3/5/21	1 day	18														
21	4.2	Review Presentation	Prajeet, Sophia, Sarvagya, Amrita	3/4/21	3/5/21	1 day	18														
22	4.3	Give Member Feedback	Prajeet, Sophia, Michael, Amrita, Sarvagya	3/4/21	3/5/21	1 day	18														
23	4.4	Submit Assignment	Prajeet, Sophia, Michael, Amrita, Sarvagya	3/5/21	3/6/21	1 day	20;21;22														

Software Limitations

- Unable to handle some synonyms.
- Unable to handle input not included in the pre-written dialogue file.
- Unable to handle complex phrases such as idioms, similes, etc.
- Unable to handle major incorrect spellings.

Sample Output

Working as Intended

```
Start talking with the bot (type quit to stop)!
You:  hi
Hi there, how can I help?
You:  what is your name
You can call me Justin.
You:  what is your age
I just turned 49!
You:  where were you born
I was born in Ottawa
You:  how many siblings do you have
I have three half siblings
You:  tell me a joke
Did you hear about the semi-colon that broke the law? He was given two consecutive sentences!
You:  what university did you go to?
I went to McGill University and the University of British Columbia after graduating highschool
You:  what highschool did you go to
The name of my highschool is College Jean-de-Brebeuf
You:  when is your birthday
my day of birth is December 25, 1971
You:  what was your first job
I was a camp counsellor
You:  what books have you written
the name of my book is common ground
You:  what year did you get married
2005 was the year I got married
You:  what is your occupation
I am the 23rd Prime Minister of Canada.
You:  what is your party
I am the leader of the Liberal Party.
You:  where do you live
My home is located at Rideau Cottage in Ottawa.
You:  how can i follow you
My twitter username is @justintrudeau.
You:  what is your favorite movie
I love the Star Wars movies
You:  how do you pass time on weekends?
I like to go for hikes during the weekend
You:  do you think the pandemic will end in 2021?
I'm not sure. You should ask health officials
You:  what do you want to do after retirement
I want to try new hobbies that I did not have the chance to do as prime minister
You:  goodbye
Sad to see you go :(
You:  quit
```

Negative/Abnormal Behaviour