

**COSC 310 - Team 15**  
***Software Engineering***  
**2020 Winter Term 2**  
**Assignment 3 Documentation**

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## Additions to the ReadMe File in Our Repository

Here is a link to our ReadMe file in our public repository:

[https://github.com/sroarty/COSC310\\_Team15/blob/main/README.md](https://github.com/sroarty/COSC310_Team15/blob/main/README.md)

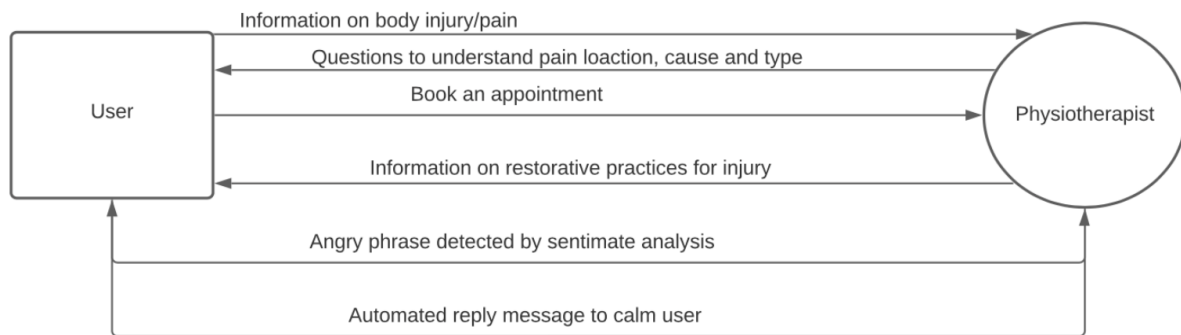
Here is a direct link to our explanation of features including demonstrations of each feature:

[https://github.com/sroarty/COSC310\\_Team15/blob/main/COSC310-%20Features%20Explanation.pdf](https://github.com/sroarty/COSC310_Team15/blob/main/COSC310-%20Features%20Explanation.pdf)

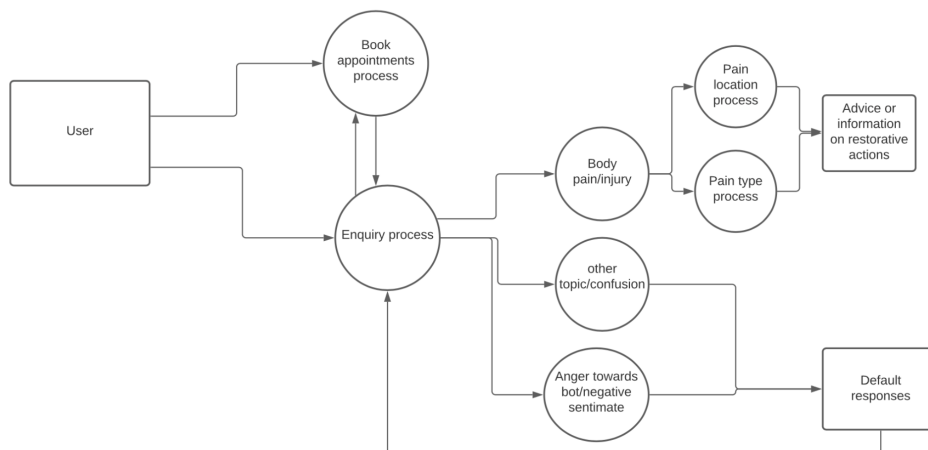
Here is a direct link to the bonus portion completed for this assignment:

[https://github.com/sroarty/COSC310\\_Team15/blob/main/testing/index-test.js](https://github.com/sroarty/COSC310_Team15/blob/main/testing/index-test.js)

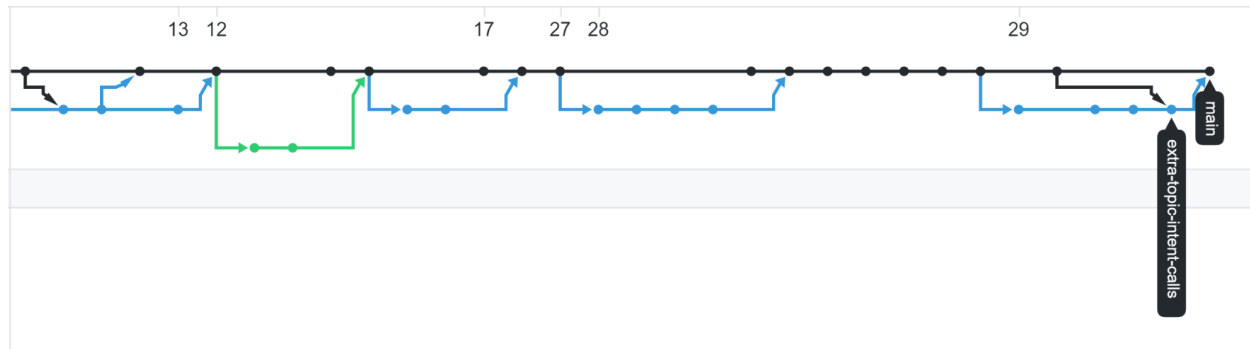
## Level 0 Data Flow Diagram



## Level 1 Data Flow Diagram



## Submission of GitHub Repository



This network graph shows the activity on our github repository for the A3 portion of the project. The branch in green represents small changes made to the index.js file in order to improve the intent matching capabilities of the bot. The branch in blue is the branch made to support commits for the extra topic of conversation. As discussed with Professor Du, the bulk of our features and implementations came through the use of our dialogFlow API and weren't able to be added to our github repository. As such, many of the changes are not present in this diagram and have been documented in other places in this report.

Here is a link to our public repository: [https://github.com/sroarty/COSC310\\_Team15](https://github.com/sroarty/COSC310_Team15)

## Sample Output

In this dialogue, I have demonstrated the ability for the physio bot to respond to user queries about physiotherapy related topics (i.e injuries, body pain etc.) I have also demonstrated the agent's default responses for when the agent does not understand the query. I demonstrated the agent's ability to recognize synonyms; for example, the agent responded similarly to the user's request for core/abdomen exercises. Sentiment analysis is briefly demonstrated when the user expresses annoyance, and the agent is able to pick out the sentiment and respond appropriately. By misspelling ankle, I demonstrated the agent's ability to recognize words or intentions despite spelling mistakes. The physio bot is able to match the word "triceps" to the entity "arm" and respond accurately. Near the end of the dialogue I tested the agent's ability to handle random queries or messages and it was able to respond reasonably.

I've also included two situations in which the agent's response is notable. The first being when the user expresses that they have a stabbing pain in their head. This interaction is more complicated and shows the agent's capacity for storing information from the user and responding to it. Another notable interaction is when the user wishes to book an appointment. The agent is able to communicate smoothly and ask for information that it is then able to hold in its memory and reiterate to confirm the appointment.

## Physiobot

- AC** **Amelia Col** 18:51  
hello
- P** **Physiobot** 18:51  
Hello! I'm Physiobot. I'm here to give you information on how to manage pain, injuries, and to assist you in scheduling appointments with a physiotherapist. How can I help you today?
- AC** **Amelia Col** 18:51  
I hurt my hand
- P** **Physiobot** 18:51  
How would you describe the pain?
- AC** **Amelia Col** 18:51  
a burn
- P** **Physiobot** 18:51  
Is this pain the result of a recent injury?
- AC** **Amelia Col** 18:52  
yes
- P** **Physiobot** 18:52  
There are many causes of pain in the hand. For a list of general symptoms and diagnoses here is a helpful link <https://www.verywellhealth.com/hand-pain-causes-treatment-and-when-to-see-a-doctor-4178830> Is there anything else I can help you with today?

## Physiobot

- P** **Physiobot** 18:52  
There are many causes of pain in the hand. For a list of general symptoms and diagnoses here is a helpful link <https://www.verywellhealth.com/hand-pain-causes-treatment-and-when-to-see-a-doctor-4178830> Is there anything else I can help you with today?
- AC** **Amelia Col** 18:52  
thank you. I also have pain in my elbow
- P** **Physiobot** 18:52  
Sorry, I didn't get that. Can you rephrase?
- AC** **Amelia Col** 18:52  
I have pain in my elbow
- P** **Physiobot** 18:52  
Is this pain the result of a recent injury?
- AC** **Amelia Col** 18:52  
no
- P** **Physiobot** 18:52  
There are many different sources of elbow pain. I've provided a list of symptoms and diagnoses here <https://www.webmd.com/pain-management/elbow-pain-symptoms-and-causes> Is there anything else I can help you with?

## Physiobot

- P** **Physiobot** 18:53  
Is the pain localized behind one of your eyes?
- AC** **Amelia Col** 18:53  
yes
- P** **Physiobot** 18:53  
Okay. Would you describe this pain as mild, moderate, or severe?
- AC** **Amelia Col** 18:53  
moderate
- P** **Physiobot** 18:53  
Headaches behind the eye might be a symptom of either a migraine, or a sinus headache. Would you like more information on both of these conditions?
- AC** **Amelia Col** 18:53  
yes
- P** **Physiobot** 18:53  
Sure thing. Here you go: <https://www.webmd.com/migraines-headaches/sinus-headaches> and <https://www.webmd.com/migraines-headaches/migraines-headaches-migraines>. Is there anything else I can help you with?

## Physiobot

- P** **Physiobot** 18:53  
Sure thing. Here you go: <https://www.webmd.com/migraines-headaches/sinus-headaches> and <https://www.webmd.com/migraines-headaches/migraines-headaches-migraines>. Is there anything else I can help you with?
- AC** **Amelia Col** 18:53  
Thank you
- P** **Physiobot** 18:53  
Anytime. That's what I'm here for.
- AC** **Amelia Col** 18:54  
I want to exercise my abdomen
- P** **Physiobot** 18:54  
Here is a chest workout for you! <https://www.goldsgym.com/blog/20-minute-chest-workout/>. Is there anything else that I can help you with?
- AC** **Amelia Col** 18:54  
I want to exercise my core
- P** **Physiobot** 18:54  
If you want to strengthen your abdomen I recommend this list of [avaricae](https://www.coachman.co.uk/avaricae/abc-avaricae) <https://www.coachman.co.uk/avaricae/abc-avaricae> <https://www.coachman.co.uk/avaricae/abc-avaricae>

## Physiobot

- AC** **Amelia Col** 18:54  
Okay
- P** **Physiobot** 18:54  
Great!
- AC** **Amelia Col** 18:55  
My ankle hurts
- P** **Physiobot** 18:55  
Is this pain the result of a recent injury?
- AC** **Amelia Col** 18:55  
yes
- P** **Physiobot** 18:55  
Perform ankle ABC's. Is there anything else that I can help you with?
- AC** **Amelia Col** 18:56  
My arm hurts
- P** **Physiobot** 18:56  
Can you be more specific about where you're experiencing the pain?
- AC** **Amelia Col** 18:56

## Physiobot

- P** **Physiobot** 18:56  
Can you be more specific about where you're experiencing the pain?
- AC** **Amelia Col** 18:56  
my tricep
- P** **Physiobot** 18:56  
Is this pain the result of a recent injury?
- AC** **Amelia Col** 18:56  
no
- P** **Physiobot** 18:56  
There are a few reasons why tricep pain occurs. Here is a list of potential diagnoses <https://www.buoyhealth.com/learn/tricep-pain>. Is there anything else that I can help you with?
- AC** **Amelia Col** 18:56  
Can I book an appointment?
- P** **Physiobot** 18:56  
Sure thing. I'll schedule a call-back. When would you like to be reached?
- AC** **Amelia Col** 18:57

## Physiobot

|    |   |       |
|----|---|-------|
| P  | Physiobot   | 18:56 |
|    | Sure thing. I'll schedule a call-back. When would you like to be reached? |       |
| AC | Amelia Col  | 18:57 |
|    | tonight at 8pm  |       |
| P  | Physiobot   | 18:57 |
|    | Which phone number would you like to be reached at?                       |       |
| AC | Amelia Col  | 18:57 |
|    | 1234567   |       |
| P  | Physiobot   | 18:57 |
|    | May I have your name?   |       |
| AC | Amelia Col  | 18:57 |
|    | Sara  |       |
| P  | Physiobot   | 18:57 |
|    | Thank you, Sara. We'll contact you on tonight at 8pm at 1234567.          |       |
| AC | Amelia Col  | 18:57 |
|    | thanks!   |       |

## Physiobot

|    |   |       |
|----|---|-------|
| AC | Amelia Col  | 18:57 |
|    | thanks!   |       |
| P  | Physiobot   | 18:57 |
|    | It's my pleasure to help.                         |       |
| AC | Amelia Col  | 18:57 |
|    | It was nice to meet you                           |       |
| P  | Physiobot   | 18:57 |
|    | Likewise. I'm looking forward to helping you out. |       |
| AC | Amelia Col  | 18:58 |
|    | Do you like being a physiotherapist?              |       |
| P  | Physiobot   | 18:58 |
|    | I didn't get that. Can you say it again?          |       |
| AC | Amelia Col  | 18:58 |
|    | nevermind   |       |
| P  | Physiobot   | 18:58 |
|    | Cancelled! What would you like to do next?        |       |

## Physiobot

|    |   |       |
|----|---|-------|
| AC | Amelia Col  | 18:57 |
|    | It was nice to meet you                           |       |
| P  | Physiobot   | 18:57 |
|    | Likewise. I'm looking forward to helping you out. |       |
| AC | Amelia Col  | 18:58 |
|    | Do you like being a physiotherapist?              |       |
| P  | Physiobot   | 18:58 |
|    | I didn't get that. Can you say it again?          |       |
| AC | Amelia Col  | 18:58 |
|    | nevermind   |       |
| P  | Physiobot   | 18:58 |
|    | Cancelled! What would you like to do next?        |       |
| AC | Amelia Col  | 18:58 |
|    | Good bye!   |       |
| P  | Physiobot   | 18:58 |
|    | Bye.  |       |

## **Limitations**

The agent has limited conversational skills and memory. It is unable to answer “follow-up” questions once it has given its advice to the user. It also has trouble when unnecessary words are added into the conversation, or if the user expresses more than one query in the same sentence/message. The agent also is not programmed to answer questions or messages outside of the topics of physiotherapy or exercise queries. The agent is able to recognize words despite spelling mistakes when the words are part of entities, however when the words are not part of entities, the agent has trouble recognizing words with spelling mistakes. Similarly for synonym recognition, not all synonyms are recognized, however most are.

## **List of 5 features**

1. We could extract our preset responses to certain injuries which could be used by others in an API. This includes how we handle certain injuries.
2. We can extract our QueryHandler for an API. The QueryHandler handles user queries and allows the bot to understand what the intention of the user is and give a response.
3. We could extract synonym matching for an API. Our QueryHandler understands synonyms and therefore our bot can give the user the correct response regardless of what synonyms the user enters to describe their pain and pain location.
4. Sentiment analysis can be extracted from our bot for an API. The sentiment analysis could be used by other bots to analyze the user sentiment and if the user is angry the bot will respond with a calming default phrase.
5. The whole bot can be used as an API for a doctor's office website. The bot can be integrated on a website for patients to ask FAQ's instead of calling the office.

## **Summarizing Test Cases For Major Functions and Methods**

**Test Case 1:** User enquires about pain, giving only a general location (no specific location, no pain type)

### **Summary of case:**

In this case the agent would detect that the user is experiencing pain, and it should detect the general location of the pain. With this information taken to the query handler which is our major intent that ensures the correct event is called from our index.js file. The agent would either respond with a default response or prompt the user to rephrase what they are saying. This response depends on the wording of the users prompt to the agent.

Example 1.

User Input: *“I have a headache”*

Agent Response: “Sorry, can you say that again?”

Example 2.

User Input: *“I am experiencing a headache”*

Agent Response: *“If you're feeling down, how about drawing or painting something?”*

**Test Case 2:** User enquires about something completely unrelated to the two topics the agent is trained to respond to.

**Summary of case:**

The agent in this case would not be able to recognize a pain type or specific location so instead of going to the query handler would trigger the default fallback intent. The default fallback intent is another major intent with training phrases to help the agent ask the user for more information to better understand how to respond. The agent would respond with a default response which is likely to be asking the user to rephrase or restate what they are trying to say.

Example 1.

User Input: *"What is the weather like today?"*

Agent Response: *"I didn't get that. Can you repeat?"*

Example 2.

User Input: *"How is traffic today?"*

Agent Response: *"Sorry, I didn't get that. Can you rephrase?"*

**Test Case 3:** User enquires about pain, misspelling the location of pain

**Summary of case:**

Since our agent is enabled with the feature to handle spelling mistakes (this is not hardcoded) the agent's response is with approximate entity matching rather than exact. In a general enquiry from the user with correct spelling there is exact entity matching. Again, in this case the agent would still detect that the user is experiencing pain, and it should detect the general location of the pain triggering the query handler which matches an event in the index.js file.

Example 1.

User Input: *"I have sharp pain in my **ankl**"*

Agent Response: *"Is this pain the result of a recent injury?"*

User Input: *"yes"*

Agent Response: *"Perform ankle ABC's. Is there anything else that I can help you with?"*

Note: Misspelling in specific location of pain "**ankl**" - agent recognizes that the user means to say "**ankle**".

Example 2.

User Input: *"I have pain in my **rist**"*

Agent Response: *"Is this pain the result of a recent injury?"*

User Input: *"yes"*

Agent Response: *"There are multiple factors that cause wrist pain. Here is a list of the symptoms and diagnoses*

*<https://www.mayoclinic.org/diseases-conditions/wrist-pain/symptoms-causes/syc-20366213> Is there anything else that I can assist you with today?"*

Note: Misspelling in specific location of pain "**rist**" - agent recognizes that the user means to say "**wrist**".

**Test Case 4:** User enquires about pain, giving only a specific location

**Summary of case:**

Through this test case, the agent detects the specific location and asks the user if the pain is the result of a recent injury. From there the agent matches an event as it typically would through triggering the query handler and matching an event in the index.js file.

Example 1.

User Input: *"My forearm hurts"*



Agent Response: *"Is this pain the result of a recent injury?"*

User Input: *"yes"*

Agent Response: *"There are many different causes of forearm pain. Here is a list of some of the causes of pain and their symptoms"*

*<https://www.healthgrades.com/right-care/bones-joints-and-muscles/forearm-pain#:~:text=What%20causes%20forearm%20pain%3F,nerve%20problem%2C%20or%20even%20cancer>. IS there anything else that I can help you with today?"*

Example 2.

User Input: *"My shoulders are in pain"*

Agent Response: *"Is this pain the result of a recent injury?"*

User Input: *"yes"*

Agent Response: *"There are many different factors that cause shoulder pain. See the list provided for more info here"*

*<https://orthoinfo.aaos.org/en/diseases--conditions/shoulder-pain-and-common-shoulder-problems> / Is there anything else that I can help you with today?"*

**Test Case 5:** User enquires about pain, giving only a specific pain type

**Summary of case:**

Through this test case, the agent detects the specific pain type and asks the user to be more specific about where they are experiencing the pain. The agent is trained to ask the user for information that is missing. With this missing information the agent is able to match an event as it typically would through triggering the query handler and matching an event in the index.js file.

Example 1.

User Input: *"My body is aching"*

Agent Response: *"Can you be more specific about where you're experiencing the pain?"*

Note: The agent recognizes the pain type - "aching".

Example 2.

User Input: *"I am experiencing sharp pain"*

Agent Response: *"Can you be more specific about where you're experiencing the pain?"*

**Test Case 6:** User enquires about pain, providing both a specific pain type and a specific location.

**Summary of case:**

Given this case, the agent is able to respond as it typically would. The agent would detect that the user is experiencing pain, and it should detect the general location of the pain. With this information taken to the query handler which is our major intent that ensures the correct event is called from our index.js file.

Example 1.

User Input: *"My shoulders are in aching pain"*

Agent Response: *"Is this pain the result of a recent injury?"*

User Input: *"yes"*

Agent Response: *"There are many different factors that cause shoulder pain. See the list provided for more info here"*

*<https://orthoinfo.aaos.org/en/diseases--conditions/shoulder-pain-and-common-shoulder-problems> / Is there anything else that I can help you with today?"*

Note: The agent recognizes the specific location and pain type - "shoulders" and "aching".

## Example 2.

User Input: *"I have stabbing pain in my wrist"*

Agent Response: *"Is this pain the result of a recent injury?"*

User Input: *"yes"*

Agent Response: *"There are multiple factors that cause wrist pain. Here is a list of the symptoms and diagnoses*

*<https://www.mayoclinic.org/diseases-conditions/wrist-pain/symptoms-causes/syc-20366213> Is there anything else that I can assist you with today?"*

Note: The agent recognizes the specific location and pain type - "wrist" and "stabbing pain".

**Test Case 7:** User asks follow up questions regarding treatment.

### Summary of case:

Considering this case, the agent is not trained to respond beyond giving example exercises given a specific injury. Although the agent responds as it typically would up until this point. The follow up questions in this case would trigger a default response. The agent would ask the user to rephrase what they are saying. As the agent is trained to gather information about specific location of pain and pain type, the agent would ask the user to rephrase until it has the user input that it can recognize.

## Example 1.

User Input: *"My shoulders are in aching pain"*

Agent Response: *"Is this pain the result of a recent injury?"*

User Input: *"yes"*

Agent Response: *"There are many different factors that cause shoulder pain. See the list provided for more info here*

*<https://orthoinfo.aaos.org/en/diseases--conditions/shoulder-pain-and-common-shoulder-problems> / Is there anything else that I can help you with today?"*

User Input: *"Is that a liable source?"*

Agent Response: *"Sorry, I didn't get that. Can you rephrase?"*

**Test Case 8:** User enquires about pain, misspelling the type of pain

### Summary of case:

Since our agent is enabled with the feature to handle spelling mistakes (this is not hardcoded) the agent's response is with approximate entity matching rather than exact. In a general enquiry from the user with correct spelling there is exact entity matching. Again, in this case the agent detects the specific location and asks the user if the pain is the result of a recent injury. From there the agent matches an event as it typically would through triggering the query handler and matching an event in the index.js file.

## Example 1.

User Input: *"My shoulders are in **aking** pain"*

Agent Response: *"Is this pain the result of a recent injury?"*

User Input: *"yes"*

Agent Response: *"There are many different factors that cause shoulder pain. See the list provided for more info here*

*<https://orthoinfo.aaos.org/en/diseases--conditions/shoulder-pain-and-common-shoulder-problems> / Is there anything else that I can help you with today?"*

Note: Misspelling of pain type "aking" - agent recognizes that the user means to say "aching".

**Test Case 9:** User enquires about pain, misspelling both the type of pain and specific location of pain.

**Summary of case:**

Since our agent is enabled with the feature to handle spelling mistakes (this is not hardcoded) the agent's response is with approximate entity matching rather than exact. In a general enquiry from the user with correct spelling there is exact entity matching. Again, in this case the agent detects the specific location and asks the user if the pain is the result of a recent injury. From there the agent matches an event as it typically would through triggering the query handler and matching an event in the index.js file. Since this is not hardcoded and the spelling mistake in this case is in both the specific location of the pain and the pain type, the matched entity is not always exact.

Example 1.

User Input: *"My **sholders** are in **aking** pain"*

Agent Response: *"Is this pain the result of a recent injury?"*

User Input: *"yes"*

Agent Response: *"There are many different factors that cause shoulder pain. See the list provided for more info here*

*<https://orthoinfo.aaos.org/en/diseases--conditions/shoulder-pain-and-common-shoulder-problems>  
/ Is there anything else that I can help you with today?"*

Note: Misspelling of the specific location of pain "**sholders**" and pain type "**aking**" - agent recognizes that the user means to say "**shoulders**" as the specific location and "**aching**" as the pain type.

**Test Case 10:** User wants to book an appointment, however they do not correctly spell the word.

**Summary of case:**

In this case, the user misspelled the word "appointment", however Appointment is not an entity, and therefore there is no fuzzy matching associated with that word. Therefore, the user does not understand the intention and the word "appointment" must be correctly spelled in order for the agent to match the intention of the user to booking an appointment. This is a limitation of our program. In order to change this, there would have to be a way to include appointment as an entity so that fuzzy matching can be enabled.

Example 1.

User Input: *"Can I book an apoyntment?"*

Agent Response: *"I missed what you said. What was that?"*

Example 2.

User Input: *"I want to book an appontment."*

Agent Response: *"Can you say that again?"*

**Test Case 11:** User wants to make an appointment for someone else.

**Summary of case:**

The agent should recognize the intention to book an appointment, whether it is for the user themselves or on behalf of someone else. No matter what the circumstances are, the agent is programmed to respond the same way to the intention of booking an appointment. Once the intent has been matched, the agent will proceed to ask for a name, number and time to call the user back and finalize the day and time of the appointment, as well as the purpose for the appointment.

Example 1.

User input: *"Can I book an appointment for my son tomorrow?"*

Agent Response: *“Sure thing. I’ll schedule a call-back. When would you like to be reached?”*

**Test Case 12:** User inquires about booking an appointment, without giving a day or time.

**Summary of case:**

The agent should match the intention to book an appointment and respond with the appropriate response for booking an appointment. Afterwards, the agent will ask for a name, number and time to call the user back in order to proceed with booking the appointment.

Example 1.

User input: *“I’d like to book an appointment.”*

Agent Response: *“Sure thing. I’ll schedule a call-back. When would you like to be reached?”*

**Test Case 13:** User inquires about booking an appointment, giving a day and a time.

**Summary of case:**

In this case, the agent should match the intention to book an appointment and respond with the appropriate response for booking an appointment. Afterwards, the agent will ask for a name, number and time to call the user back in order to proceed with booking the appointment.

Example 1.

User Input: *“Can I book an appointment at 2pm on Tuesday?”*

Agent Response: *“Sure thing. I’ll schedule a call-back. When would you like to be reached?”*

**Test Case 14:** User inquires about booking an appointment, giving only a day.

**Summary of case:**

In this case, the user does not give a specific time to book an appointment, however the chatbot responds with a generic response to the query for booking an appointment. The chatbot tells the user they will give them a call and then proceeds to ask for a name, number and time at which to call.

Example 1.

User Input: *“I would like to book an appointment on Friday.”*

Agent Response: *“Sure thing. I’ll schedule a call-back. When would you like to be reached?”*

**Test Case 15:** User inquires about booking an appointment, giving only a time.

**Summary of case:**

In this case, the user gives a time but not a day for booking an appointment. Depending on the way the query is phrased, the agent will either give a default response or it will give the appropriate response for wanting to book an appointment. Once the agent matches the user’s intention to book an appointment, it should then ask for a name, number and time to call the user back to follow up with booking the appointment.

Example 1.

User Input: *“Book an appointment for 5pm.”*

Agent Response: *“Sure thing. I’ll schedule a call-back. When would you like to be reached?”*

