A Final Report

on

HEALTHCARE CHATBOT

carried out as part of the course CSE CS3270 Submitted by

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VI-CSE

in partial fulfilment for the award of the degree

of

BACHELOR OF TECHNOLOGY

In

Computer Science & Engineering

Department of Computer Science & Engineering,
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MANIPAL UNIVERSITY JAIPUR
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CERTIFICATE

This is to certify that the project entitled "***HealthCare Chatbot***" is a bonafide work carried out as

Minor Project Midterm Assessment (Course Code: CS3270) in partial fulfilment for the award of the

degree of Bachelor of Technology in Computer Science and Engineering, under my guidance by

Kushagra Singh bearing registration number **209301327** and **Sheenam Gupta** bearing registration

number **209301520** during the academic semester *VI of year 2022-23.*

Place: Manipal University Jaipur, Jaipur

Name of the project guide: **Mr. Satpal Singh Kushwaha**

Signature of the project guide: _____

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INTRODUCTION

Healthcare chatbots are becoming increasingly popular as a means of providing patients with quick and easy access to medical information and advice. These chatbots use machine learning algorithms to understand and respond to user queries in a natural and conversational manner. This report will explore the use of machine learning in healthcare chatbots and the potential benefits and challenges associated with their implementation.

Machine learning is a subset of artificial intelligence that enables computers to learn from data without being explicitly programmed. In the context of healthcare chatbots, machine learning algorithms are used to analyze large amounts of data from previous interactions with patients to improve the chatbot's ability to understand and respond to user queries. This allows the chatbot to provide more accurate and personalized responses over time.

The use of machine learning in healthcare chatbots has several potential benefits. For one, it can improve the accessibility of healthcare information and advice for patients. By providing patients with a convenient and easy-to-use platform for accessing medical information, healthcare chatbots can help reduce the burden on healthcare providers and improve patient outcomes. Additionally, machine learning algorithms can help healthcare chatbots provide more personalized and accurate responses to user queries, which can improve patient satisfaction and trust in the healthcare system.

However, there are also several challenges associated with the use of machine learning in healthcare chatbots. One major challenge is ensuring the privacy and security of patient data. Healthcare chatbots must comply with strict regulations regarding the handling of sensitive medical information, and any breaches of patient privacy could have serious consequences. Additionally, there is a risk that machine learning algorithms could perpetuate existing biases in the healthcare system if they are not carefully designed and monitored.

In conclusion, the use of machine learning in healthcare chatbots has the potential to greatly improve the accessibility and quality of medical information and advice for patients.

1.1 Objective of the project

The purpose of this chatbot is to improve access to healthcare information and services, reduce the burden on healthcare providers and enhance patient engagement and satisfaction.

1.2 Brief Description of the project

Chatbots use machine learning algorithms to understand and respond to user queries in a natural and conversational manner. This report will explore the use of machine learning in healthcare chatbots and the potential benefits associated with their implementation.

1.3 Technology Used

    1.3.1   Software Used

    Machine Learning Libraries like:

1. TensorFlow
2. Pandas
3. NumPy
4. Nltk
5. Tkinter
6. JSON

    1.3.2   Hardware Used

    The general hardware requirements required to implement the model are:

1. Central Processing Unit
2. Random Access Memory
3. Storage space
4. Stable network connection

MOTIVATION

The motivation for creating healthcare chatbots using machine learning is driven by several factors. One major factor is the need to improve the accessibility of healthcare information and advice for patients. With the increasing demand for healthcare services and the growing burden on healthcare providers, there is a need for innovative solutions that can help bridge the gap between patients and medical professionals. Healthcare chatbots provide a convenient and easy-to-use platform for patients to access medical information and advice, which can help reduce the burden on healthcare providers and improve patient outcomes.

Another factor driving the development of healthcare chatbots using machine learning is the potential for these chatbots to provide more personalized and accurate responses to user queries. By analyzing large amounts of data from previous interactions with patients, machine learning algorithms can help healthcare chatbots understand and respond to user queries in a more natural and conversational manner. This can improve patient satisfaction and trust in the healthcare system, as patients are more likely to feel heard and understood when interacting with a chatbot that provides personalized and accurate responses.

In addition to improving accessibility and personalization, the use of machine learning in healthcare chatbots also has the potential to improve the efficiency of the healthcare system. By automating routine tasks such as answering frequently asked questions or providing general medical advice, healthcare chatbots can free up time for healthcare providers to focus on more complex cases that require their expertise. This can help reduce wait times for patients and improve the overall efficiency of the healthcare system.

In conclusion, the motivation for creating healthcare chatbots using machine learning is driven by a combination of factors including the need to improve accessibility, personalization, and efficiency in the healthcare system. By leveraging the power of machine learning algorithms, healthcare chatbots have the potential to revolutionize the way patients access medical information and advice. We hope that with this chatbot we can help increase awareness about breast cancer in India and help women understand about it and help them take measures to avoid serious implications from it.
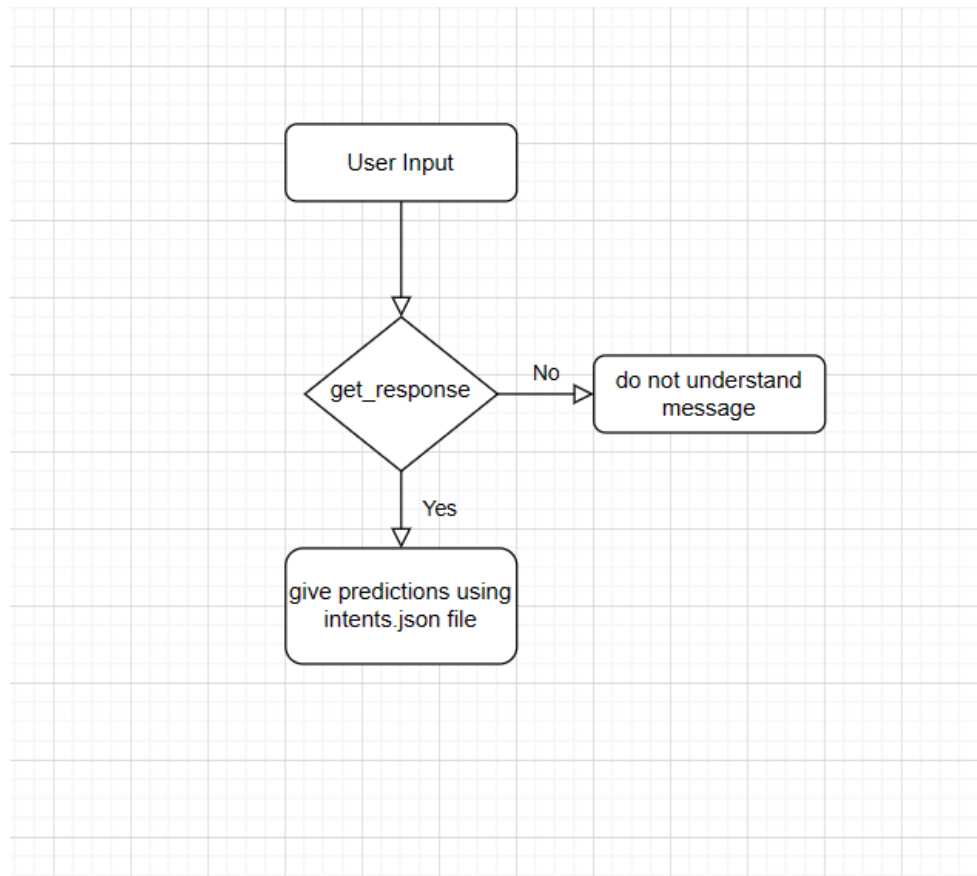
PROJECT DESIGN

2.1 FLOW CHART

Fig 2.1 Flowchart for the chatbot
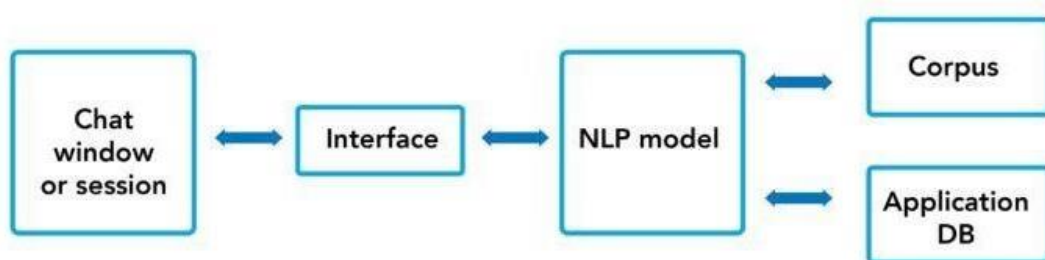
2.2 DATA FLOW DIAGRAM

Fig 2.2 Context Level DFD for our chatbot

PROJECT DESCRIPTION

2.3 DATABASE

There is a need to store various types of information such as commonly asked question and their answers, various types of diseases and their symptoms, cures to various diseases and much more. We have used comma-separated values(csv) file format to store our projects various information.

2.4 DATABASE DESIGN

The Database is stored in a JSON file. The intents.json file used in the project contains a dictionary with tags, patterns and response pairs for various tags.

IMPLEMENTATION AND RESULTS

{"intents":
    [{"tags": "breast cancer", "patterns": ["what is breast cancer", "what precisely is breast cancer", "define breast cancer", "explain breast cancer"], "responses": "Breast cancer is a malignant tumor that develops from the cells of the breast. It is the most common type of cancer among women in the World. It is most often curable when found early.About 80% of breast cancers start in the ducts.For more information https://www.medscape.com/answers/1947145-155238/what-is-breast-cancer"},
    {"tags": "signs symptoms", "patterns": ["what are the signs and symptoms of breast cancer", "what are the indications of breast cancer", "what are the breast cancer signs and symptoms", "what breast cancer symptoms and signs are present"], "responses": "Early breast cancers may be asymptomatic, and pain and discomfort are typically not present. If a lump is discovered, the following may indicate the possible presence of breast cancer: Change in breast size or shape, Skin dimpling or skin changes, Recent nipple inversion or skin change, or nipple abnormalities, Single-duct discharge, particularly if blood-stained, Axillary lumpFor more information https://www.medscape.com/answers/1947145-155239/what-are-the-signs-and-symptoms-of-breast-cancer"},
    {"tags": "evaluation", "patterns": ["what is included in the evaluation of breast cancer", "what is included in a breast cancer evaluation", "what is considered in the assessment of breast cancer", "what aspects of breast cancer are evaluated"], "responses": "Evaluation of breast cancer includes the following:\r\n\r\nClinical examination\r\nImaging\r\nNeedle biopsyFor more information https://www.medscape.com/answers/1947145-155240/what-is-included-in-the-evaluation-of-breast-cancer"},
    {"tags": "indicative indicators", "patterns": ["which physical findings suggest breast cancer", "which physical signs point to breast cancer", "which physical signs are indicative of breast cancer", "which physical indicators point to breast cancer"], "responses": "The following physical findings should raise concern:\r\n\r\nLump or contour change\r\nSkin tethering\r\nNipple inversion\r\nDilated veins\r\nUlceration\r\nPaget disease\r\nEdema or peau d\u2019orangeFor more information https://www.medscape.com/answers/1947145-155241/which-physical-findings-suggest-breast-cancer"},
    {"tags": "lump palpable", "patterns": ["what features of a palpable lump suggest breast cancer", "what is lump", "what characteristics of a palpable lump indicate breast cancer", "what characteristics of a palpable lump signify breast cancer"], "responses": "If a palpable lump is found and possesses any of the following features, breast cancer may be present:\n\nHardness\nIrregularity\nFocal nodularity\nFixation to skin or muscleFor more information https://www.medscape.com/answers/1947145-155242/what-features-of-a-palpable-lump-suggest-breast-cancer"},
    {"tags": "screening", "patterns": ["how is breast cancer screening performed", "how is breast cancer screening carried out", "what is the procedure for screening for breast cancer", "how is breast cancer screening done", "how are breast cancer exams conducted"], "responses": "Early detection remains the primary defense in preventing breast cancer. Screening modalities include the following:\n\nBreast self-examination\nClinical breast examination\nMammography\nUltrasonography\nMagnetic resonance imagingFor more information https://www.medscape.com/answers/1947145-155243/how-is-breast-cancer-screening-performed"},
    {"tags": "biopsy diagnosis", "patterns": ["what is the role of biopsy in the workup of breast cancer", "what function does a biopsy have in the diagnosis of breast cancer", "what role does a biopsy play in the treatment of breast cancer", "what part does a breast cancer biopsy play in the treatment plan"], "responses": "Core biopsy with image guidance is the recommended diagnostic approach for newly diagnosed breast cancers. This is a method for obtaining breast tissue without surgery and can eliminate the need for additional surgeries. Open excisional biopsy is the surgical removal of the entire lump.For more information https://www.medscape.com/answers/1947145-155244/what-is-the-role-of-biopsy-in-the-workup-of-breast-cancer"},
    {"tags": "treatment ", "patterns": ["how is breast cancer treated", "what is the treatment for breast cancer", "what are the treatment options for breast cancer", "in what ways is breast cancer treated"], "responses": "Surgery and radiation therapy, along with adjuvant hormone or chemotherapy when indicated, are considered primary treatment. Surgical therapy may consist of lumpectomy or total mastectomy. Radiation therapy may follow surgery in an effort to eradicate residual disease while reducing recurrence rates. There are 2 general approaches for delivering radiation therapy: External-beam radiotherapy (EBRT), Partial-breast irradiation (PBI).For more information https://www.medscape.com/answers/1947145-155245/how-is-breast-cancer-treated"},
    {"tags": "chemotherapy regimens", "patterns": ["what are the chemotherapy regimens used to treat breast cancer", "what chemotherapy regimens are used to treat breast cancer", "what are the breast cancer chemotherapy regimens", "what chemotherapy protocols are used to treat breast cancer"], "responses": "Hormone therapy and chemotherapy are the 2 main interventions for treating metastatic breast cancer. Common chemotherapeutic regimens include the following:\r\n\r\nDocetaxel\r\nCyclophosphamide\r\nDoxorubicin\r\nCarboplatin\r\nMethotrexate\r\nTrastuzumabFor more information https://www.medscape.com/answers/1947145-155246/what-are-the-chemotherapy-regimens-used-to-treat-breast-cancer"},
    {"tags": "medicine medication", "patterns": ["what is the role of drug treatment for breast cancer", "what is the role of breast cancer medicine treatment", "what function does medication treatment play in breast cancer treatment", "what part does medication play in breast cancer treatment"], "responses": "In patients receiving adjuvant aromatase inhibitor therapy for breast cancer who are at high risk for fracture, the monoclonal antibody denosumab or either of the bisphosphonates zoledronic acid and pamidronate may be added to the treatment regimen to increase bone mass. These agents are given along with calcium and vitamin D supplementation.For more information https://www.medscape.com/answers/1947145-155247/what-is-the-role-of-drug-treatment-for-breast-cancer"},
    {"tags": "fundamentals", "patterns": ["what are basic facts about breast cancer", "what are the fundamentals of breast cancer", "basic information about breast cancer"], "responses": "Many early breast carcinomas are asymptomatic; pain or discomfort is not usually a symptom of breast cancer. Breast cancer is often first detected as an abnormality on a mammogram before

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Fig 2.3: Intents.Json File

Tokenizing data

```python
tokenizer = Tokenizer(num_words=3000)
tokenizer.fit_on_texts(data['inputs'])
train = tokenizer.texts_to_sequences(data['inputs'])

from tensorflow.keras.utils import pad_sequences
x_train = pad_sequences(train)

from sklearn.preprocessing import LabelEncoder
le = LabelEncoder()
y_train = le.fit_transform(data['tags'])
```
[6] ✓ 0.0s   Python

```python
input_shape = x_train.shape[1]
input_shape
```
[7] ✓ 0.0s   Python

27

```python
vocabulary = len(tokenizer.word_index)
print('Number of unique words: ',vocabulary)
output_length = le.classes_.shape[0]
print('Output Lenght: ', output_length)
```
[8] ✓ 0.0s   Python

```
Number of unique words:  463
Output Lenght:  172
```

Fig 2.4: Tokenization of data

Prediction Function

```python
def get_response(msg):
    texts_pred = []
    prediction_input = msg

    prediction_input = [letters.lower() for letters in prediction_input if letters not in string.punctuation]
    prediction_input = ''.join(prediction_input)
    texts_pred.append(prediction_input)

    prediction_input = tokenizer.texts_to_sequences(texts_pred)
    prediction_input = np.array(prediction_input).reshape(-1)
    prediction_input = pad_sequences([prediction_input], input_shape)

    output = model.predict(prediction_input)
    output = output.argmax()

    response_tag = le.inverse_transform([output])[0]
    return responses[response_tag]
```

[14] ✓ 0.0s   Python

Fig 2.5: Function to get prediction to user query

```python
def _setup_main_window(self):
    self.window.title("Breast-Cancer-Bot")
    self.window.resizable(width=False, height=False)
    self.window.configure(width=600, height=750, bg=BG_COLOR)
    # head label
    head_label = Label(self.window, bg=BG_COLOR, fg=TEXT_COLOUR,
                       text="Chat-With-Us", font=FONT_BOLD, pady=10)
    head_label.place(relwidth=1)
    #tiny divider
    line = Label(self.window, width=450, bg=BG_GRAY)
    line.place(relwidth=1, rely=0.07, relheight=0.012)
    #text widget
    self.text_widget = Text(self.window, width=20, height=2, bg=BG_COLOR, fg=TEXT_COLOUR,
                           font=FONT, padx=5, pady=5)
    self.text_widget.place(relheight=0.745, relwidth=1, rely=0.08)
    self.text_widget.configure(cursor="arrow", state=DISABLED)
    #bottom label
    bottom_label = Label(self.window, bg=BG_GRAY, height=80)
    bottom_label.place(relwidth=1, rely=0.825)
    #message entry box
    self.msg_entry = Entry(bottom_label, bg="#2C3E50", fg=TEXT_COLOUR, font=FONT)
    self.msg_entry.place(relwidth=0.74, relheight=0.06, rely=0.008, relx=0.011)
    self.msg_entry.focus()
    self.msg_entry.bind("<Return>", self._on_enter_pressed)
    #send button
    send_button = Button(bottom_label, text="Send", font=FONT_BOLD, width=20, bg=BG_GRAY,
                        command= lambda: self._on_enter_pressed(None))
    send_button.place(relx=0.77, rely=0.008, relheight=0.06, relwidth=0.22)

def _on_enter_pressed(self, event):
    msg = self.msg_entry.get()
    self._insert_message(msg, "You")
def _insert_message(self, msg, sender):
    if not msg:
        return
```

Fig 2.6: Tkinter window creation
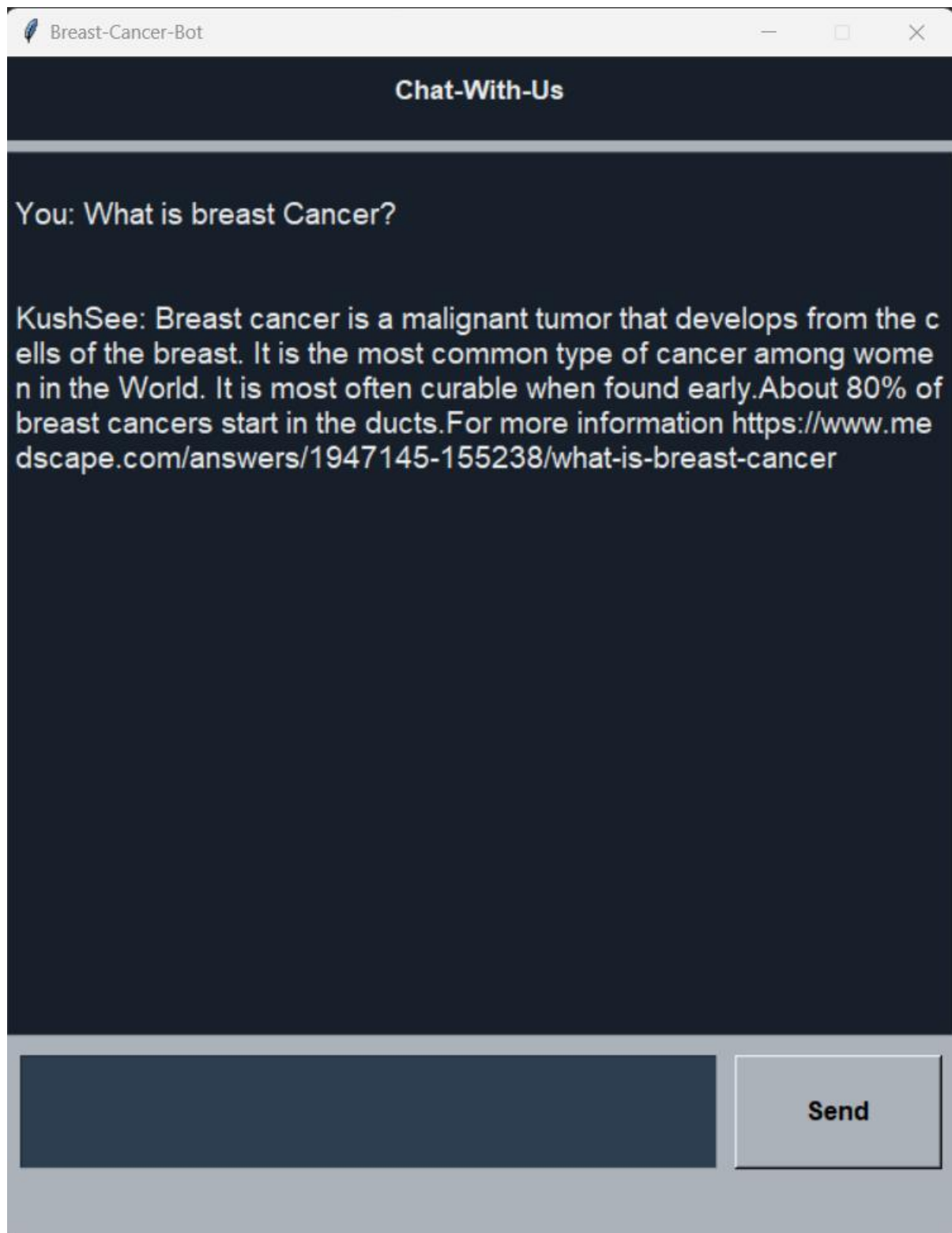
Fig 2.7: Chat interface to the chatbot

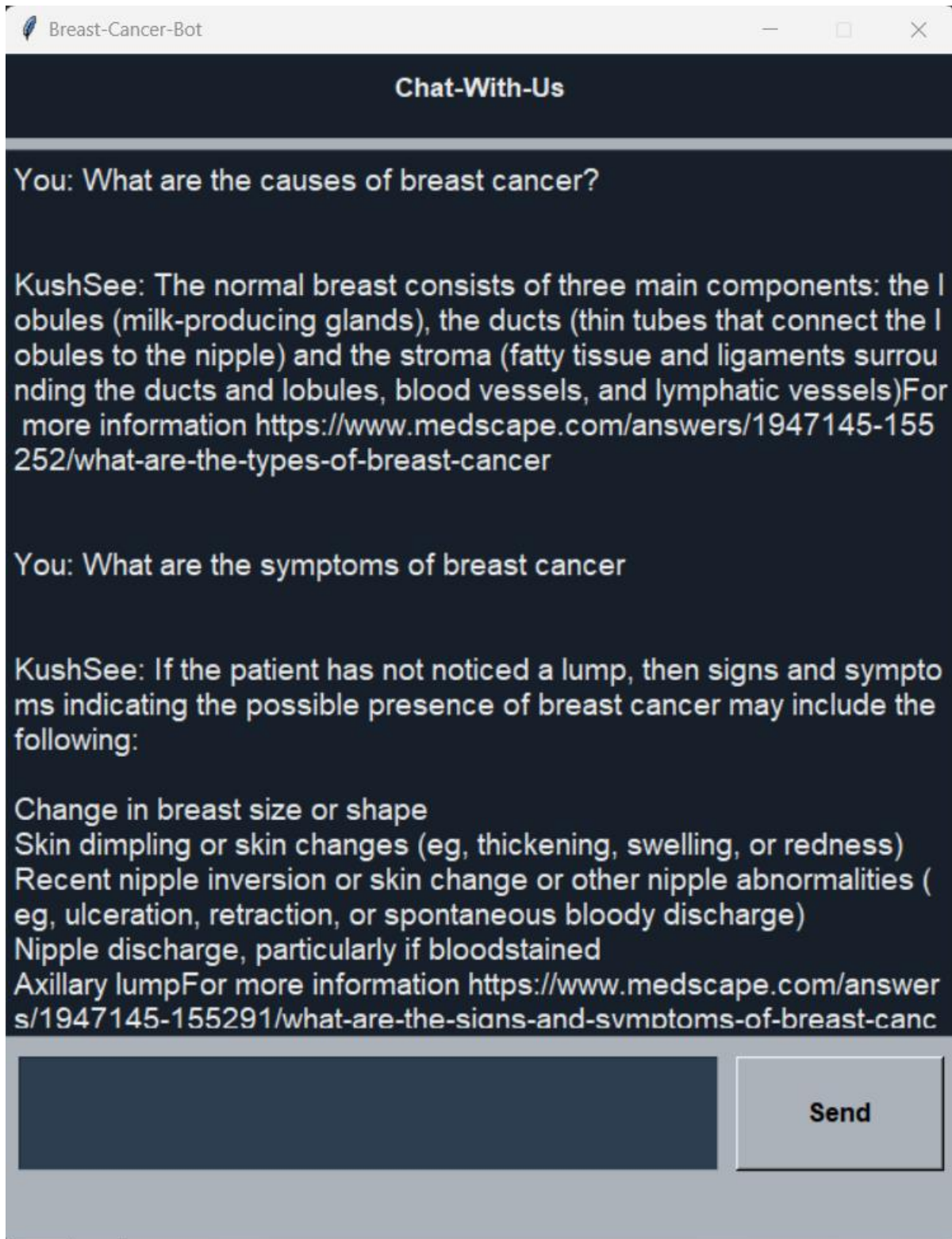**Fig 2.8: Chatbot with a user query and it's answer**

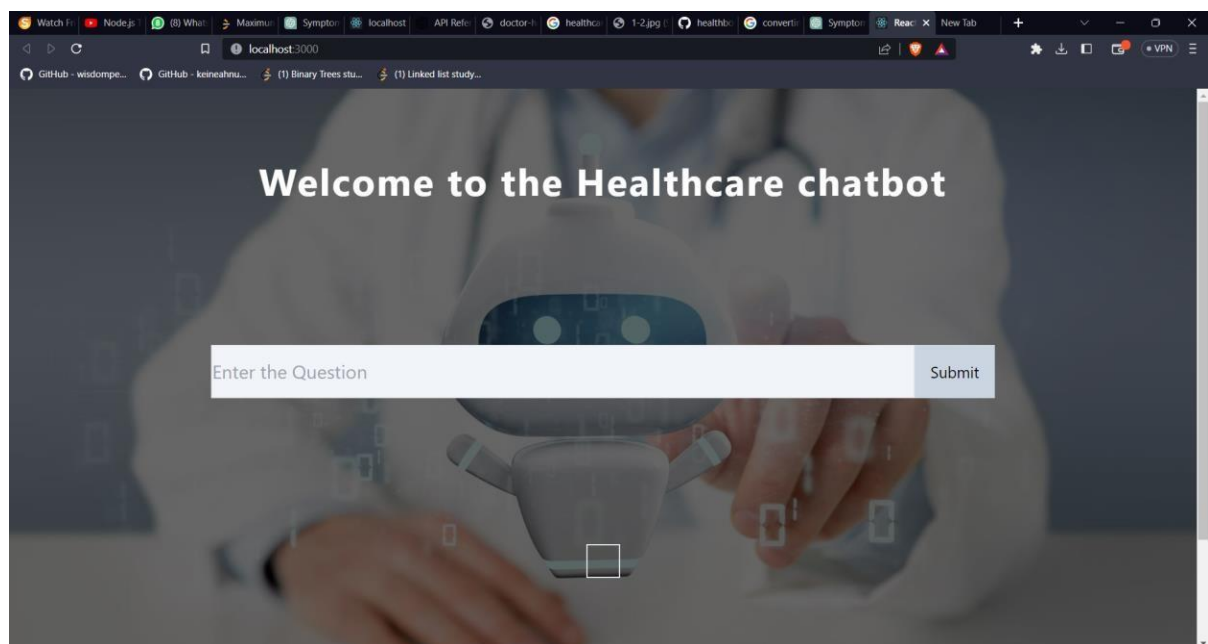**Fig 2.9: A snapshot of conversation with the chatbot**

Figure 2.10: React UI previously made

FUTURE SCOPE

As the demand for healthcare services and solutions continue to grow, new technologies constantly emerging, there is a lot that can be done to improve the bot.

1. We can integrate the chatbot with wearable devices
2. Allow speech recognition to answer to queries
3. Personalizing the chatbot to meet specific needs of individual patients based on lifestyle, goals etc.
4. Integrating module to allow patients to contact hospitals and book appointments.
5. Having Chatbot predict certain health conditions and suggestive preventive solutions.

CONCLUSION

This project aimed to develop and build a conversational chatbot that can interact with users and provide them with healthcare information and services. The chatbot designed is user friendly and pretty accurate and achieves an accuracy of about 99%. The chatbot is also able to provide answers to a range of user questions related to breast Cancer, including health education content.

Overall, the healthcare chatbot project is a solution to the growing healthcare challenges faced by healthcare providers and patients alike. By leveraging the power of Artificial Intelligence and conversational AI, our chatbot can help improve healthcare access, quality and ultimately contribute to better health outcomes for patients.

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