HEALTH ASSIST CHATBOX

(AN AI FRIEND)

J-Component Document

SOFT COMPUTING (ITE1015)

SLOT- B2+TB2

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AIM OF PROJECT

The most valuable possession of humans, "Health," should not be neglected in the era of rising automation in all fields. People always found it difficult to visit hospitals for minor issues before the pandemic or even throughout it, which left them with many questions and concerns. Before going to the doctor, we frequently tend to put it off. But when it comes to health, everyone has to have access to fundamental information. So that all health-related questions may be addressed and people can know when it is important for them to really see a doctor and go for proper treatment, a simplified user interface that is usable by everyone and is accessible to everyone is needed. Our bot evaluates all factors, including disease severity, and then recommends additional treatments to the user.

OBJECTIVE OF PROJECT

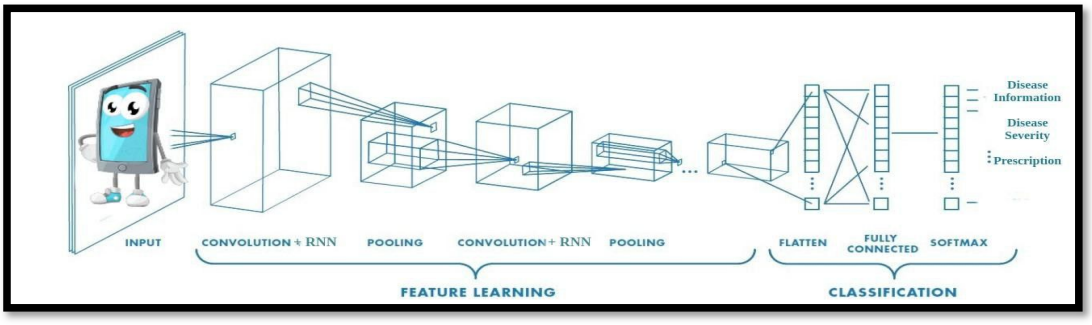
Our intention was to create a project that would benefit everyone and would be able to make a tangible difference in people's lives. Even in these challenging times, everyone should have access to medical care. With this in mind, we came up with the notion of creating something that would bridge the gap between a patient and a doctor. A person should be aware of when it is vital to contact a doctor, but occasionally we may choose to ignore it due to ignorance, lack of information, or emotional reasons. However, our project—or more specifically, our chatbot—will be highly beneficial and efficient during these moments. It is our societal duty to use our knowledge to benefit society.

The most valuable possession of humans, "Health," should not be neglected in the era of rising automation in all fields. People always found it difficult to visit hospitals for minor issues before the pandemic or even throughout it, which left them with many questions and concerns. Before going to the doctor, we frequently tend to put it off. But when it comes to health, everyone has to have access to fundamental information. So that all health-related questions may be addressed and people can know when it is important for them to really see a doctor and go for proper treatment, a simplified user interface that is usable by everyone and is accessible to everyone is needed.

GAPS IDENTIFIED IN THE SURVEY

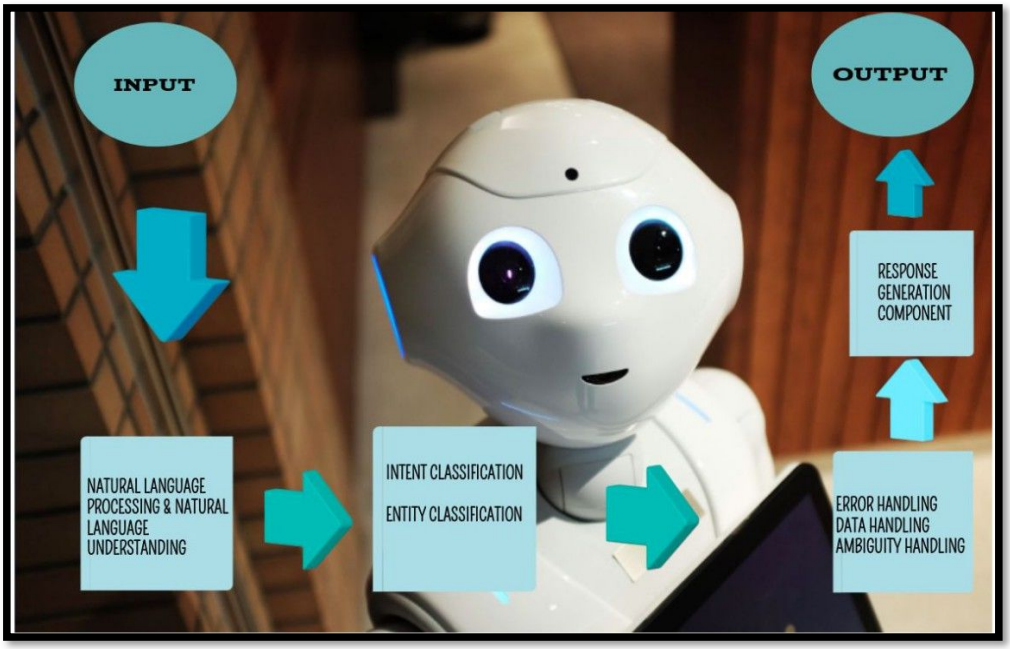
Health-related chatbots are widely accessible nowadays, but a major issue with them is that they overwhelm the user with potential illnesses. Due to the fact that everyone has their own interpretation of events, it might occasionally even lead you astray. This is a result of insufficient model training and testing. The extensive range of disorders are not trained into the models. It is done to generalise illnesses, which inhibits models from functioning better. We were unable to locate an effective model that can manage a wide variety of health concerns that not only focus on physical health but also on mental health. The existing models are either able to anticipate the diseases from the symptoms or they propose treatments.

CNN:



BACKGROUND

The "Text Classification" task, which is an example of a Supervised Machine Learning task since a labelled dataset containing text documents and their labels is used for training a classifier, is one of the frequently used Natural Language Processing & Supervised Machine Learning (ML) tasks in various business problems. Automatically categorising text documents into one or more predetermined categories is the aim of text classification.



CNNs are typically employed in computer vision, however they have lately been tested on a number of NLP applications with encouraging results.

A type of artificial neural network called a recurrent neural network (RNN) has connections between nodes that create a directed graph along a sequence. Because of this, it can display dynamic temporal behaviour for a time series. Because it incorporates fresh information (lexical and semantic) about the words, information that has been trained and distilled on a very large quantity of data, using the knowledge from an external embedding can improve the precision of your RNN. RNN is made up of a chain-like arrangement of neural network building elements. Each one is communicating with a successor.

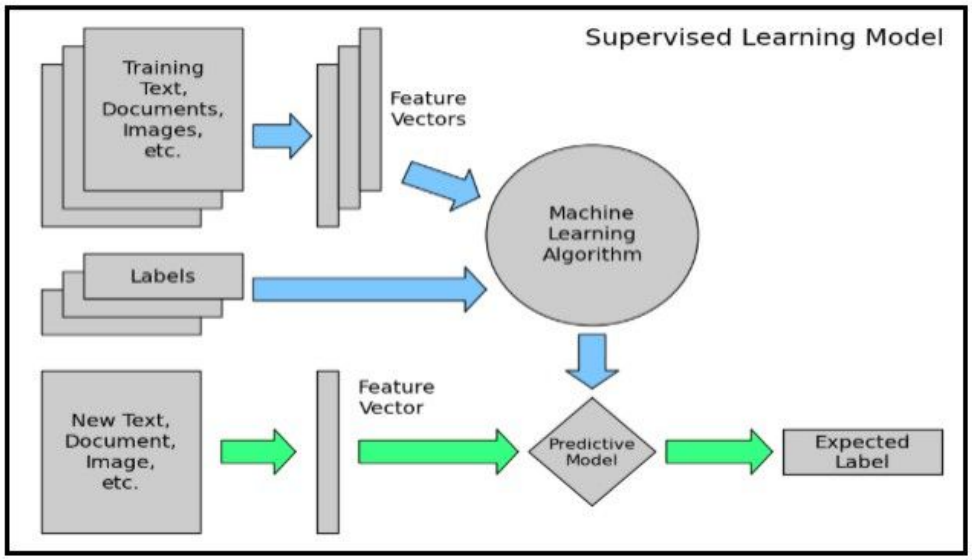
Training text: It is the input text through which our supervised learning model is able to learn and predict the required class.

Feature Vector: A feature vector is a vector that contains information describing the characteristics of the input data.

Labels*:* These are the predefined categories/classes that our model will predict

Algorithms: It is the algorithm through which our model deals with text classification (CNN in our case)

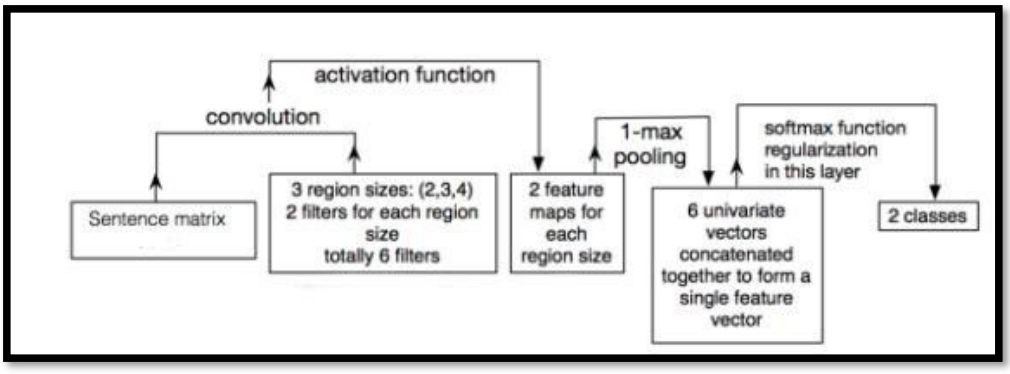
Predictive Model: This is trained on the historical dataset which performs label predictions.



PROPOSED SYSTEM REQUIREMENTS ANALYSIS AND DESIGN

CNNs are a subset of deep, feed-forward artificial neural networks (in which connections between nodes do not form a cycle) and employ a multilayer perceptron variation that requires the least amount of pre-processing possible. Convolutional Neural Networks are widely used deep learning classifiers for emotion recognition (CNN).

In particular, the suggested chatbot methodology is user-interaction-based, which makes it domain-specific.The model is noble in that it is trained using trustworthy healthcare resources and does not overwhelm users with information. Additionally, we want to make it as user-friendly as possible so that it is more useful and not simply another model. The idea is built around a Chatbot for illness diagnosis. All diseases have a set of related symptoms that, if a chatbot is educated, may use to detect them. The human body reacts to every disease by producing symptoms whenever a person has it. They can be felt or recognised as physical changes by the individual.



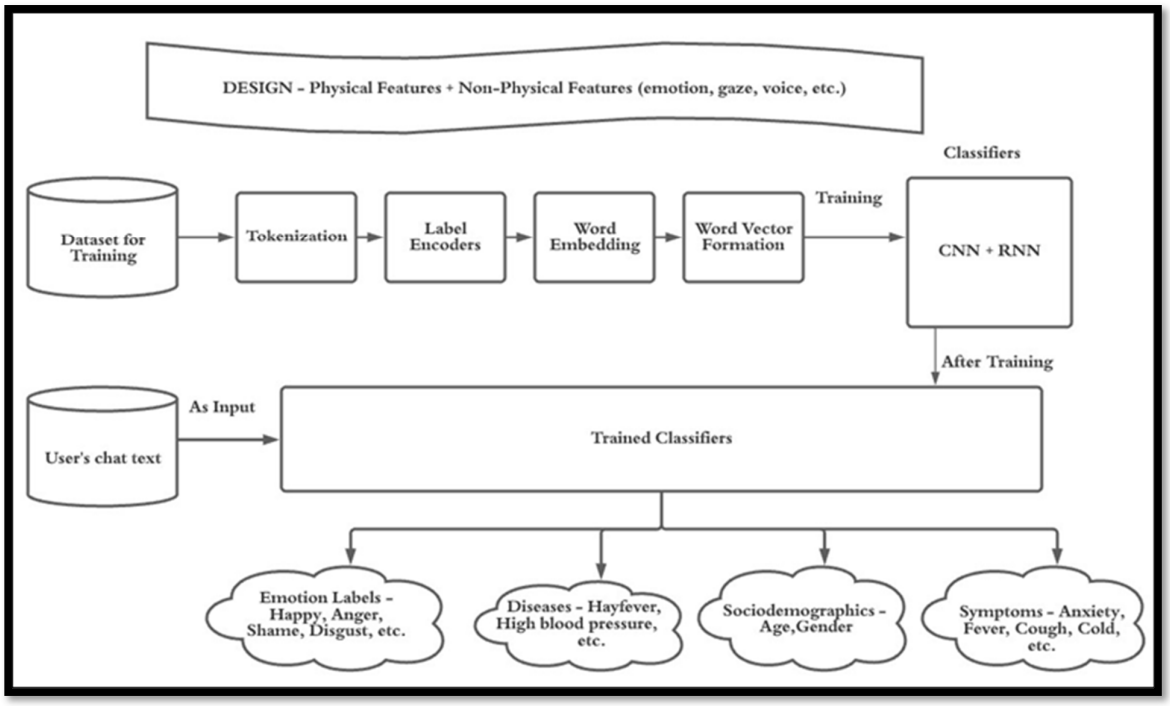
Our model works on the principle of artificial neural networks which simulate human thinking and reasoning and can help us automate various tasks. These networks work like the neurons in our brain

and simulate medical reasoning based on the symptoms . For our model, the input nodes are the dataset of symptoms and the output nodes are the diseases and other suggestions as recognized by the system based on the dataset of symptoms.

The model is not just this but a more dynamic model which makes the user experience much better. When a user interacts with the chatbot, the engine gets activated and captures every message provided by the user. The Doctorbot intends to use the AIML approach to reply to the user messages and to get the input that it can feed to the engine. The engine accepts initial symptoms and extracts keywords from the data. Using the keywords extracted from the symptom, our engine shortlists some of the most likely illnesses that the user may be suffering through by matching the keywords with the disease tags. The engine can measure the Severity of the problem by assigning a predetermined threshold value against every disease. Every symptom also has a seriousness score against it. If the score hits a value greater than or equal to the threshold level, the chatbot suggests the user to see a doctor for their treatment .

When the chatbot has finished checking for all the symptoms it would then provide the user with all the Medication and Remedies. Also, for the dataset, we have referred to the intent data available on kaggle and made some changes to come up with a better model according to the requirements.

PROPOSED ARCHITECTURE



Implementation Design:

Train.ipynb:

TRAINING MODEL—CNN+RNN

```
import json
import numpy as np
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense, Embedding, GlobalAveragePooling1D
from tensorflow.keras.preprocessing.text import Tokenizer
from tensorflow.keras.preprocessing.sequence import pad_sequences
from sklearn.preprocessing import LabelEncoder
from keras.models import Sequential
from keras.layers import Dense
from keras.utils.vis_utils import plot_model
import pickle
```

CONNECTING WITH GOOGLE DRIVE:

```
[] from google.colab import drive
drive.mount('/content/gdrive')
```

IMPORTING INTENT DATA SET IN JSON FORMAT:

```
with open('/content/gdrive/MyDrive/SoftComputing/intents.json') as file:
    data = json.load(file)
```

FEATURE ENGINEERING:

```
training_sentences = []
training_labels = []
labels = []
responses = []

for intent in data['intents']:
    for pattern in intent['patterns']:
        training_sentences.append(pattern)
        training_labels.append(intent['tag'])
    responses.append(intent['responses'])

    if intent['tag'] not in labels:
        labels.append(intent['tag'])
```

```
num_classes = len(labels)

lbl_encoder = LabelEncoder()
lbl_encoder.fit(training_labels)
training_labels = lbl_encoder.transform(training_labels)
```

```
vocab_size = 1000
embedding_dim = 16
```

```
max_len = 20
oov_token = "<OOV>"
```

```
# adding out of vocabulary token
tokenizer = Tokenizer(num_words=vocab_size, oov_token=oov_token)
tokenizer.fit_on_texts(training_sentences)
word_index = tokenizer.word_index
sequences = tokenizer.texts_to_sequences(training_sentences)
padded_sequences = pad_sequences(sequences, truncating='post', maxlen=max_len)
```

MODEL BUILDING(CNN+RNN):

```
# CNN Sequential model building
model = Sequential()
model.add(Embedding(vocab_size, embedding_dim, input_length=max_len))
model.add(GlobalAveragePooling1D())
model.add(Dense(16, activation='relu'))
model.add(Dense(16, activation='relu'))
model.add(Dense(num_classes, activation='softmax'))
```

```
# Compliling everything
model.compile(loss='sparse_categorical_crossentropy', optimizer='adam', metrics=['accuracy'])
```

```
# displaying model architecture/design
model.summary()
```

```
# defining epochs as 550
epochs = 550
history = model.fit(padded_sequences, np.array(training_labels), epochs=epochs)
model.compile(loss='mse', optimizer='adam')
```

```
Epoch 1/550
7/7 [==============================] - 0s 2ms/step - loss: 3.6107 - accuracy: 0.0207
Epoch 2/550
7/7 [==============================] - 0s 2ms/step - loss: 3.6069 - accuracy: 0.0415
Epoch 3/550
7/7 [==============================] - 0s 2ms/step - loss: 3.6036 - accuracy: 0.0466
Epoch 4/550
7/7 [==============================] - 0s 2ms/step - loss: 3.6002 - accuracy: 0.0415
Epoch 5/550
7/7 [==============================] - 0s 2ms/step - loss: 3.5962 - accuracy: 0.0415
Epoch 6/550
7/7 [==============================] - 0s 2ms/step - loss: 3.5922 - accuracy: 0.0415
Epoch 7/550
7/7 [==============================] - 0s 2ms/step - loss: 3.5875 - accuracy: 0.0415
Epoch 8/550
7/7 [==============================] - 0s 2ms/step - loss: 3.5819 - accuracy: 0.0415
Epoch 9/550
7/7 [==============================] - 0s 4ms/step - loss: 3.5751 - accuracy: 0.0415
Epoch 10/550
7/7 [==============================] - 0s 2ms/step - loss: 3.5671 - accuracy: 0.0415
Epoch 11/550
7/7 [==============================] - 0s 2ms/step - loss: 3.5585 - accuracy: 0.0415
Epoch 12/550
7/7 [==============================] - 0s 2ms/step - loss: 3.5471 - accuracy: 0.0415
Epoch 13/550
...
Epoch 549/550
7/7 [==============================] - 0s 3ms/step - loss: 0.0388 - accuracy: 1.0000
Epoch 550/550
```

```
# saving model
model.save('/content/gdrive/MyDrive/SoftComputing/chat_model')
```

```
# saving tokenizer
with open('/content/gdrive/MyDrive/SoftComputing/tokenizer.pickle' ,'wb') as handle:
    pickle.dump(tokenizer, handle, protocol=pickle.HIGHEST_PROTOCOL)

# saving label encoder
with open('/content/gdrive/MyDrive/SoftComputing/label_encoder.pickle', 'wb') as ecn_file:
    pickle.dump(lbl_encoder, ecn_file, protocol=pickle.HIGHEST_PROTOCOL)
```

chat.ipynb:

BUILDING CHATBOT WITH THE HELP OF TRAINED LANGUAGE (CNN+RNN):

IMPORTING PYTHON LIBRARIES AND MODULES:

```
import json
import numpy as np
from tensorflow import keras
from sklearn.preprocessing import LabelEncoder

!pip install colorama
import colorama
colorama.init()
from colorama import Fore, Style, Back
import json
import random
import pickle
```

CONNECTING TO GOOGLE DRIVE:

```
from google.colab import drive
drive.mount('/content/gdrive')
```

IMPORTING INTENT DATASET FOR TRAINING MODEL:

```
with open("/content/gdrive/MyDrive/SoftComputing/intents.json") as file:
    data = json.load(file)
```

PREDICTION PROCESSING AND TESTING MODULE:

```
def chat():
    # load trained model
    model = keras.models.load_model('/content/gdrive/MyDrive/SoftComputing/chat_model')

    # load tokenizer object
    with open('/content/gdrive/MyDrive/SoftComputing/tokenizer.pickle', 'rb') as handle:
        tokenizer = pickle.load(handle)

    # load label encoder object
    with open('/content/gdrive/MyDrive/SoftComputing/label_encoder.pickle', 'rb') as enc:
        lbl_encoder = pickle.load(enc)
```

```
    # parameters
    max_len = 20

    while True:
        print(Fore.LIGHTBLUE_EX + "User: " + Style.RESET_ALL, end="")
        inp = input()
        if inp.lower() == "quit":
            break

        result =
model.predict(keras.preprocessing.sequence.pad_sequences(tokenizer.texts_to_sequences([inp]),
                                      truncating='post', maxlen=max_len))
        tag = lbl_encoder.inverse_transform([np.argmax(result)])

        for i in data['intents']:
            if i['tag'] == tag:
                print(Fore.GREEN + "ChatBot:" + Style.RESET_ALL , np.random.choice(i['responses']))

        # print(Fore.GREEN + "ChatBot:" + Style.RESET_ALL,random.choice(responses))
```

RUN CHATBOT:

```
print(Fore.YELLOW + "Start messaging with the bot (type quit to stop)!" + Style.RESET_ALL)
chat()
```

```
User: Hey
ChatBot: Hi there
ChatBot: Hi there, how can I help?
User: give me a hand please
ChatBot: Tell me how can assist you
User: brief about mrsa
ChatBot: 1. Methicillin-resistant Staphylococcus aureus (MRSA) infection is caused by a type of staph bacteria that's become resistant to many
of the antibiotics used to treat ordinary staph infections.2. Treatment of MRSA at home usually includes a 7- to 10-day course of an antibiotic
(by mouth) such as trimethoprim-sulfamethoxazole (brand name: Bactrim), clindamycin, minocycline, linezolid, or doxycycline.
User: Tell me about ear infection
ChatBot: 1. An ear infection occurs when a bacterial or viral infection affects the middle ear.2. Pain relievers:Children younger than 6 months:
only give acetaminophen.Children 6 months or older: it is OK to give acetaminophen or ibuprofen.Never give aspirin to children because it can
cause Reyeâs syndrome, a rare but very serious illness that harms the liver and brain.
User: medication for covid
ChatBot: Doxycycline 100mg bd 5days ,Ivermectin 12mg od 3days, Vit b complex, Vit c 500mg tid, Zinc tabs.
User: medication for inflammatory bowel disease?
ChatBot: mesalamine (Asacol HD, Delzicol, others), balsalazide (Colazal) , olsalazine (Dipentum).
User: chickenpox
ChatBot: 1. An infectious disease causing a mild fever and a rash of itchy inflamed pimples which turn to blisters and then loose scabs. It is
caused by the herpes zoster virus and mainly affects children.2. If you or your child are at high risk of complications, your doctor may suggest
an antiviral drug such as acyclovir (Zovirax, Sitavig). This medication might lessen the severity of chickenpox when given within 24 hours after
the rash first appears.
User: What do you know about mucormycosis?
ChatBot: Mucormycosis is a serious infection and needs to be treated with prescription antifungal medicine, usually amphotericin B,
posaconazole, or isavuconazole. These medicines are given through a vein (amphotericin B, posaconazole, isavuconazole) or by mouth
(posaconazole, isavuconazole).
User: have a complaint
ChatBot: Please provide us your complaint in order to assist you
User: i start to feel emotional
ChatBot: It happens sometimes. Just relax and keep calm. Inhale and Exhale. And don't forget to drink a lot of water.
User: That's helpful
ChatBot: Happy to help!
```

Sample output:

```
Start messaging with the bot (type quit to stop)!
User: hi
ChatBot: Hello
ChatBot: Hello, thanks for asking
User: How you could help me?
ChatBot: Offering support for Adverse drug reaction, Blood pressure, Hospitals and Pharmacies
User: How are you
ChatBot: Hi there
ChatBot: Good to see you again
```

```
Start messaging with the bot (type quit to stop)!
User: hi
ChatBot: Hello
ChatBot: Hello, thanks for asking
User: How you could help me?
ChatBot: Offering support for Adverse drug reaction, Blood pressure, Hospitals and Pharmacies
User: How are you
ChatBot: Hi there
ChatBot: Good to see you again
User: Tell me about ear infection
ChatBot: 1. An ear infection occurs when a bacterial or viral infection affects the middle ear.2. Pain relievers:Children younger than 6 months: only give acetaminophen.Children 6 months or older: it is OK to give acetaminophen
User: medication for dengue
ChatBot: 1. Dengue viruses are spread to people through the bite of an infected Aedes species mosquito.2. Rest as much as possible.Take acetaminophen (also known as paracetamol) to control fever and relieve pain only if prescri
User: what is mrsa?
ChatBot: 1. Methicillin-resistant Staphylococcus aureus (MRSA) infection is caused by a type of staph bacteria that's become resistant to many of the antibiotics used to treat ordinary staph infections.2. Treatment of MRSA at h
User: I need  a support
ChatBot: Yes Sure, How can I support you
User: Lookup for hospital
ChatBot: Please provide hospital name or location
User: Find pharmacy
ChatBot: Please provide pharmacy name
User: Thanks
ChatBot: Any time!
ChatBot: My pleasure
```

Emotion Labelling:

```
Start messaging with the bot (type quit to stop)!
User: hello
ChatBot: Hi
ChatBot: Good to see you again
User: Who are you?
ChatBot: I'm Joana, an Artificial Intelligent bot
User: Can you help?
ChatBot: Tell me how can assist you
User: i feel a little nervous
ChatBot: Don't be sad! It's okay to feel like that sometimes. But your hardwork will definitely pay off. You'll have a great future ahead...just keep going. You are definitely better than me....i wish i was you :)
User: Thanks
ChatBot: My pleasure
ChatBot: My pleasure
User: Bye
ChatBot: See you later
ChatBot: See you!
User: quit
```

Disease and Symptoms Classification Output:

```
Start messaging with the bot (type quit to stop)!
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User: i start to feel emotional
ChatBot: It happens sometimes. Just relax and keep calm. Inhale and Exhale. And don't forget to drink a lot of water.
User: That's helpful
ChatBot: Happy to help!
ChatBot: Happy to help!
User: Nice chatting to you
ChatBot: Hello
ChatBot: Hi there, how can I help?
User: Goodbye
ChatBot: Bye! Come back again
ChatBot: See you!
User: quit
```

Disease and Symptoms Classification Output:

```
Start messaging with the bot (type quit to stop)!
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```

Conclusion, Limitations and scope for future work:

It may be inferred from several research papers that healthcare chatbots provide individualised diagnosis based on symptoms and indicators. NLP and AIML are widely utilised in order for computers to speak to users in their own language. Additionally, the system can forecast disease with a high degree of accuracy and precision by applying the SVM algorithm and disease symptoms. Therefore, a medical chatbot will provide care for patients when a doctor is unavailable, thereby enhancing the effectiveness & performance of the medical sector. Our chatbot project was developed after extensive study to bridge the gap between patients and artificial intelligence-based healthcare services. If the dataset had been bigger to accommodate all possible queries, the findings would have been more accurate.

- The messaging app era will dominate in the future because users are more likely to use it often than other applications. We have made every effort to address nearly every aspect that a medical chatbot should provide in order to meet the needs of the patient.
- Lack of a strong security and privacy framework in chatbots can lead to data breaches, the loss of sensitive personal data, and decreased patient confidence since our personal information will be revealed.
- Therefore, security issues need to be taken into account at every stage of the bot creation process.
- Our chatbot currently only supports the English language.

Therefore, we'll be working on the Framework to allow many languages, with English as the default, for bot creation.

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