TITLE

ENABLING ENHANCED PATIENT CARE AIDED BY ARTIFICIAL INTELLIGENCE HEALTHAI CONNECT

MAJOR PROJECT


Abdul Rahman Hussain Siddique (1604-20-737-084)


Syed Rahmath (1604-20-737-095)


Omar Mohammed Khan (1604-20-737-113)

Under the guidance of :

Dr. MD Asrar Ahmed Sir
~Assistant Professor

ABSTRACT

Artificial Intelligence (AI) is revolutionizing healthcare, significantly enhancing patient care and diagnosis. Our project explores the vital role of AI and Machine Learning in healthcare through 'HealthAI Connect,' a platform that offers personalized patient guidance, predictive analytics, and improved healthcare accessibility.

PROBLEM STATEMENT

In the rapidly advancing technological era, there is a critical need for innovative solutions to enhance patient care, streamline diagnosis, and improve accessibility in healthcare. Traditional methods often fall short in providing rapid accessibility and timely detection of diseases.

LITERATURE SURVEY

PART 1

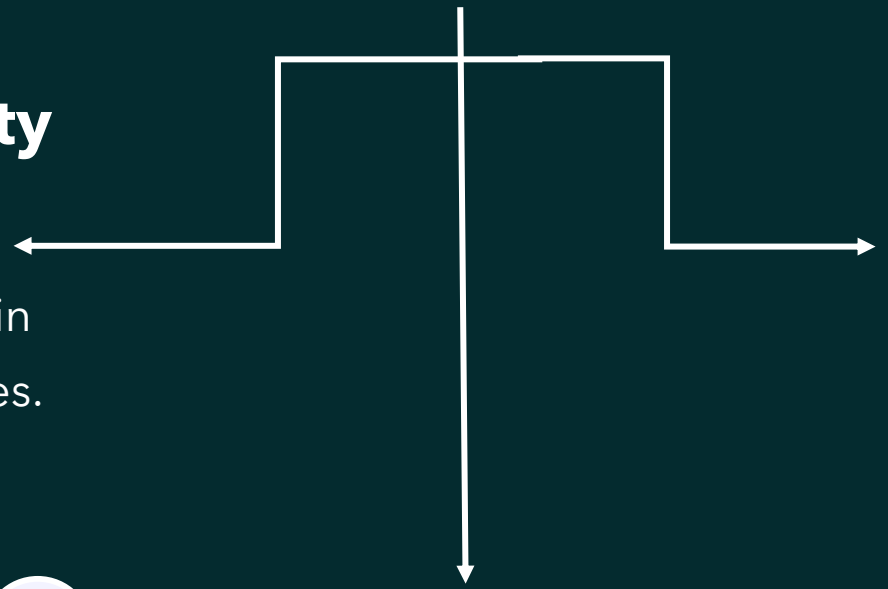
S.No	Title	Strategy	Advantage	Limitation
1.	**"Human Disease Prediction based on Symptoms," 2023**	User symptoms + ML algorithms predict new, potentially fatal diseases.	Early detection, accessibility, adaptability.	Incomplete info, limited scope, no medical guidance.
2.	**"Diseases Prediction based on Symptoms using Database and GUI" 2022**	Train ML with symptoms to predict diseases (Random Forest).	Convenient disease prediction based on user inputs.	Single algorithm, lacks comprehensive info (meds, precautions).
3.	**"A Deep Language Model for Symptom Extraction From Clinical Text“ 2022**	Deep NLP extracts symptoms from clinical text.	Outperforms rivals in detail & clarity.	Single disease, no meds or precautions.
4.	**"An Intelligent Disease Prediction and Drug Recommendation Prototype” 2023**	Use data mining for personalized drug recommendations in healthcare.	Enhances treatment outcomes with quick, tailored recommendations.	Relies on accurate data, potential biases.
5.	**"Automating Information Retrieval from Faculty Guidelines: Designing a PDF-Driven Chatbot powered by OpenAI ChatGPT," 2023**	Use e-books for comprehensive education, offering searchability and link integration.	Enhances academic understanding with technical details and broader frameworks.	Time-intensive word embeddings creation
6.	**"An AI-Based Medical Chatbot Model for Infectious Disease Prediction," 2022**	Utilize deep feedforward multilayer perceptron for medical chatbots in infectious disease prevention	Enhances interaction, provides accurate solutions.	It focuses only on infectious diseases, excluding all medical information.

LITERATURE SURVEY

PART 2

S.No	Title	Strategy	Advantage	Limitation
7.	**Dynamic NLP Enabled Chatbot for Rural Health Care in India**	Uses Google dialog flow software for NLP	Multilingual NLP Models	Old technologies
8.	**Interpretable Disease Prediction from Clinical Text by Leveraging Pattern Disentanglement**	Feature Extraction (TFIDF) and Pattern Discovery and Disentanglement (PDD)	Collaboration with health care professional	Complexity of clinical language, Ethical and privacy concern
9.	**Mobile Application for Doctor Appointment Scheduling**	Medical appointments and consultations, Real-time Patient choice, live video appointment with a doctor	Adaptive web apps, accessible to every device	Complexity limits accessibility, Potential for misuse, only available to mobile users
10.	**Detection of Pneumonia using Chest X-Ray Images and Convolutional Neural Network**	Convolutional Neural Network, Chest X-Ray, Machine Learning, Detection	It gives HQ images even when using low quality input	Potential overfitting, Data quality and variability
11.	**An Analysis of Image Segmentation Methods for Brain Tumour Detection**	Image processing, MRI images, Brain Tumour, Image Segmentation	Improved accuracy	Less accuracy in tumour detection
12.	**Disease prediction from various symptoms using machine learning**	Disease prediction using machine learning algorithms like KNN Naïve bayes	Ensemble methods	Handling of multiclass classification.

DISADVANTAGES OF EXISTING SYSTEM



1 Limited Accessibility

Existing systems struggle with geographical barriers, resulting in limited access to medical services.

2 Delayed Diagnosis

Timely diagnosis is a challenge, leading to delays in providing accurate medical care to patients.

3 Inadequate Health Guidance

Patients struggle to find reliable, understandable health information.

PROPOSED PLAN

Demand for Innovative Healthcare Solutions

AI integration

Word embeddings, Vector databases, Open AI

Machine Learning

DT, RF, NB, PAC, NLP, Computer Vision

Robust Communication

Appointment Booking System, Web Chat Services

FEATURES

PART 1

Personalized Dashboards

Dashboards offer patients appointment scheduling, health recommendations, and online consultations, while doctors get KPIs, task tracking, and a drug suggestions.

Health Description based Disease Predictor

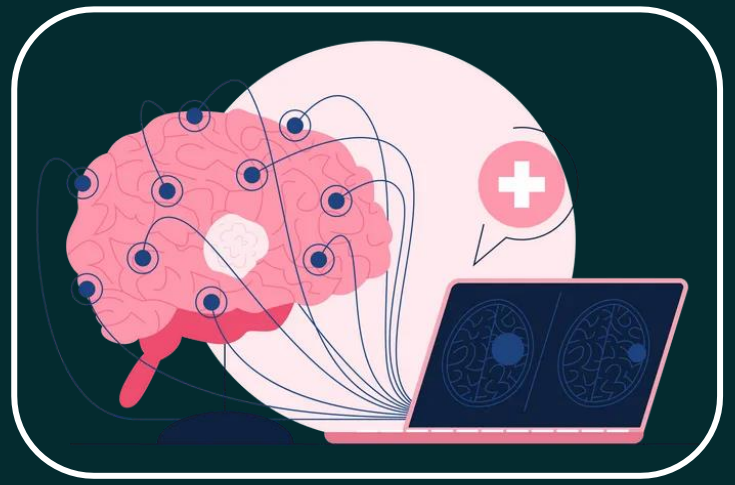
Enhances the predictive power by combining the strengths of NB and PAC, resulting in a more robust and accurate disease prediction model.

Symptoms based Disease Predictor

Harnessing the power of ensemble learning with RF and the interpretability of DT to improve accuracy and provide insights into feature importance

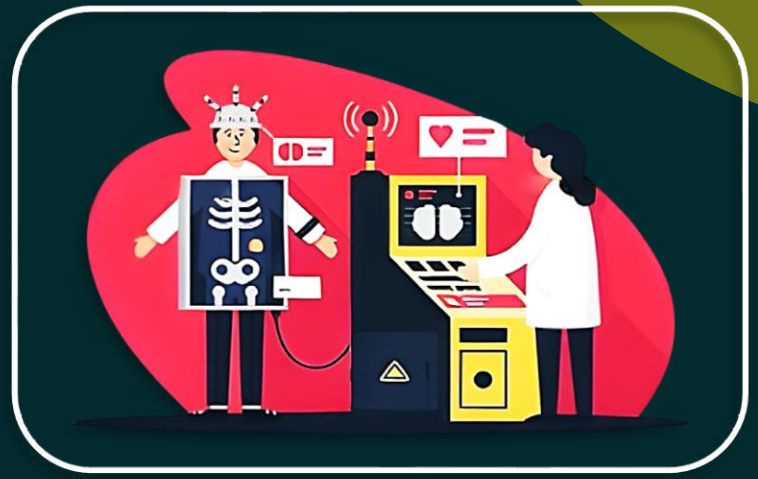
FEATURES

PART 2



Brain Tumor Detection

Brain Tumor Detection uses transfer learning with CNN models to accurately identify brain tumors in MRI Scan images, enhancing early diagnosis and treatment.



Pneumonia Detection

Pneumonia Detection uses the VGG16 CNN model, pre-trained on ImageNet, to accurately predict pneumonia from chest X-ray images.

NutriVision

NutriVision uses the Gemini Pro Vision API to analyze food images and queries, providing detailed nutritional content and dietary insights.

FEATURES

PART 3

RAG Medical Chatbot

Chatbot created using LangChain Framework, Hugging Face embeddings for enhanced comprehension, vector databases, OpenAI for coherent generation.

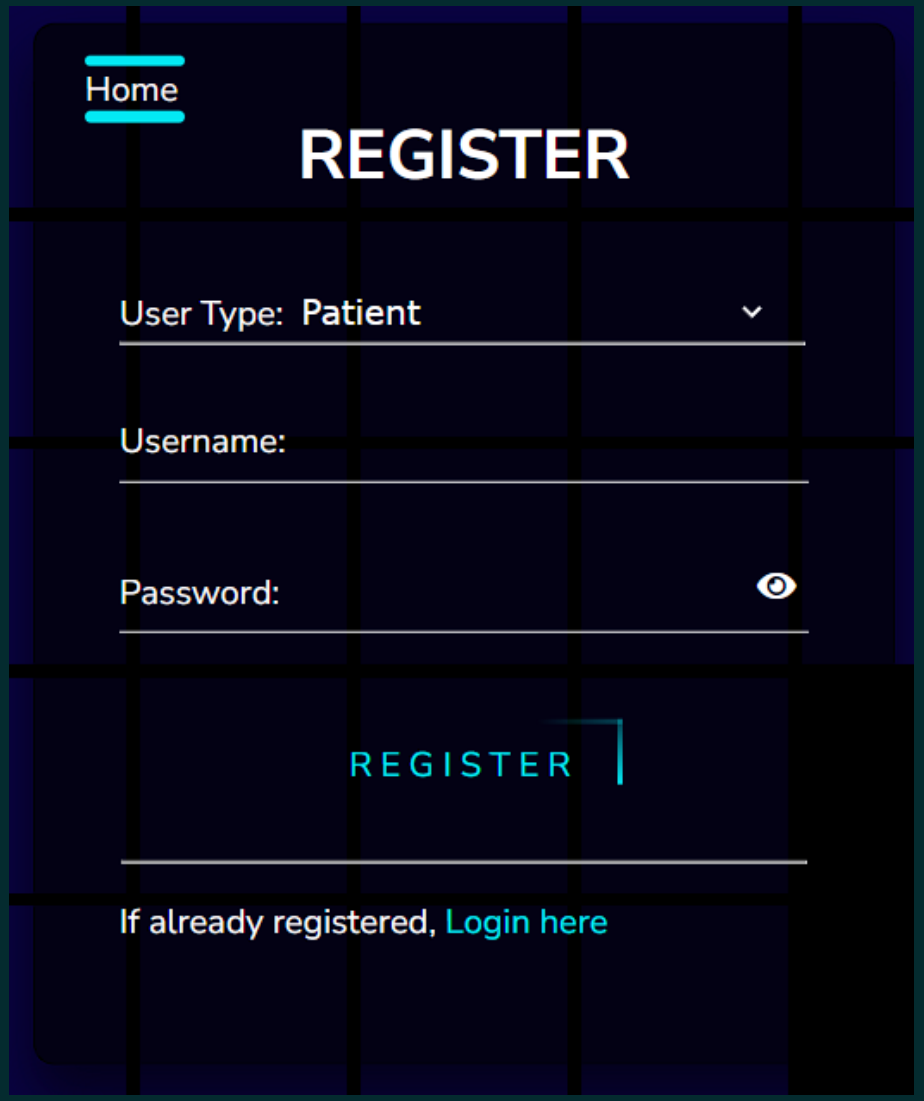
Appointment Booking System

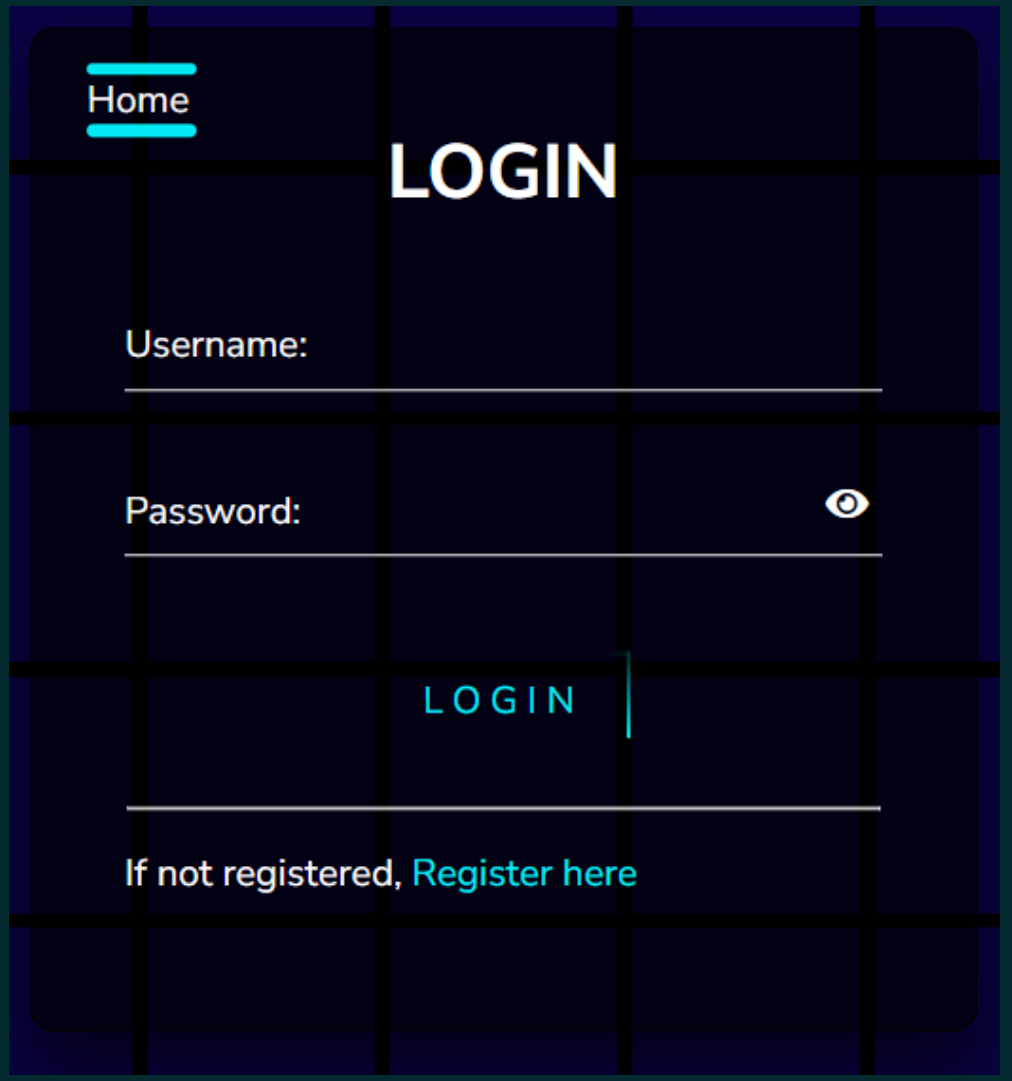
Incorporates secure login and separate dashboards for both patients and doctors. The appointment booking process for improved communication and accessibility.

Web Chat Consultation

Implements web sockets for real-time communication. Chats are securely stored in a SQL Lite database.

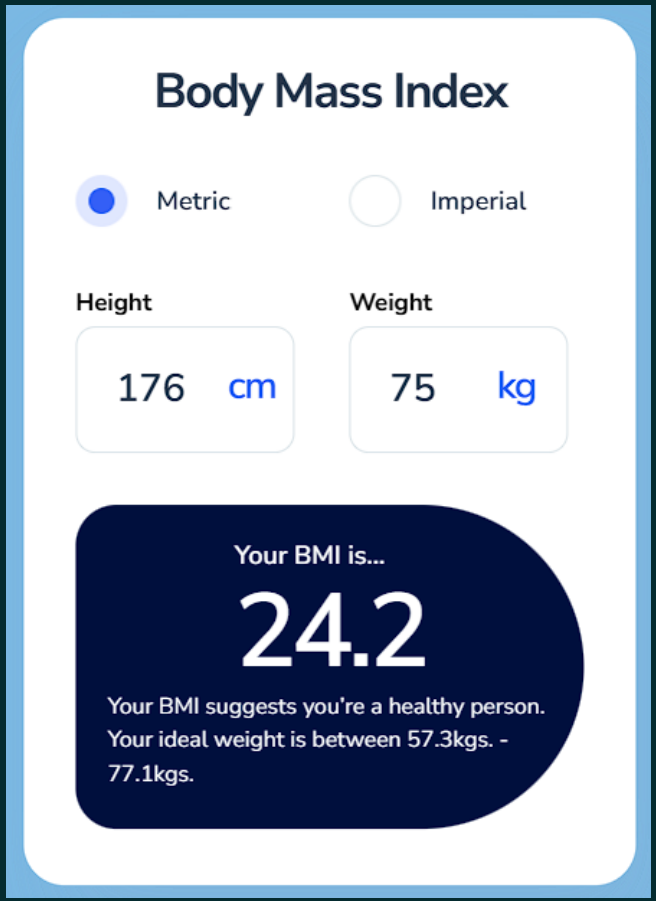
REGISTER & LOGIN

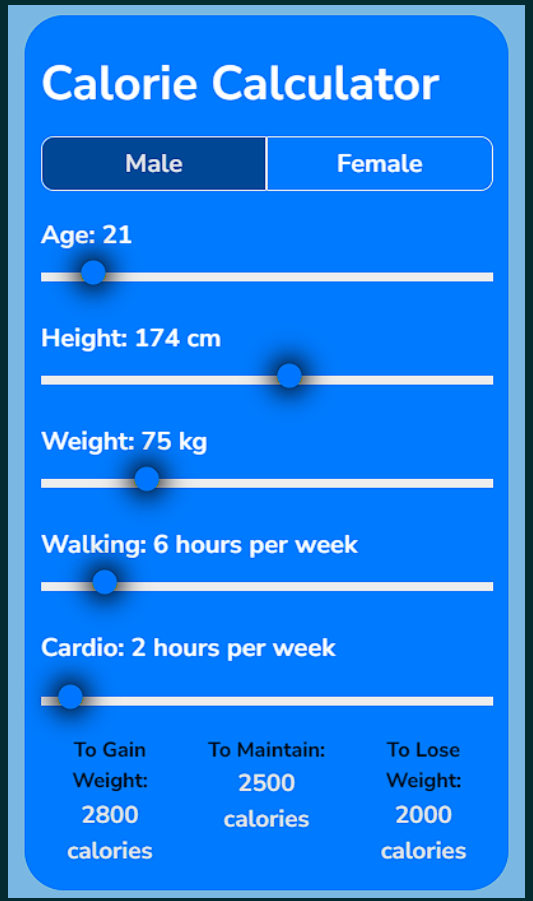


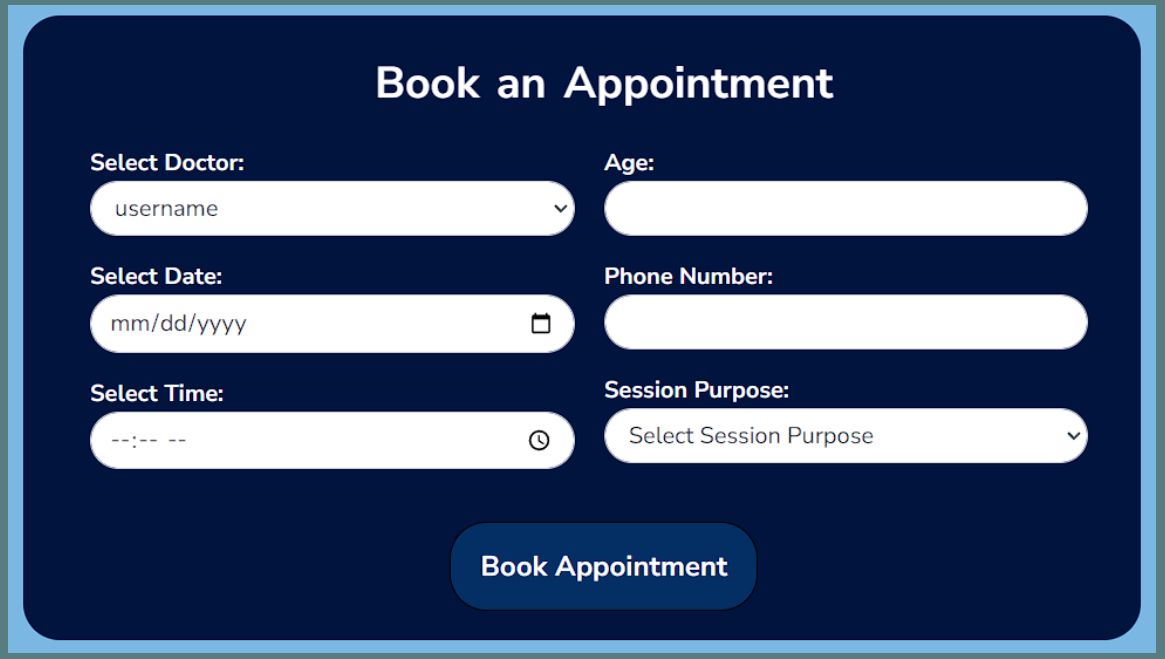


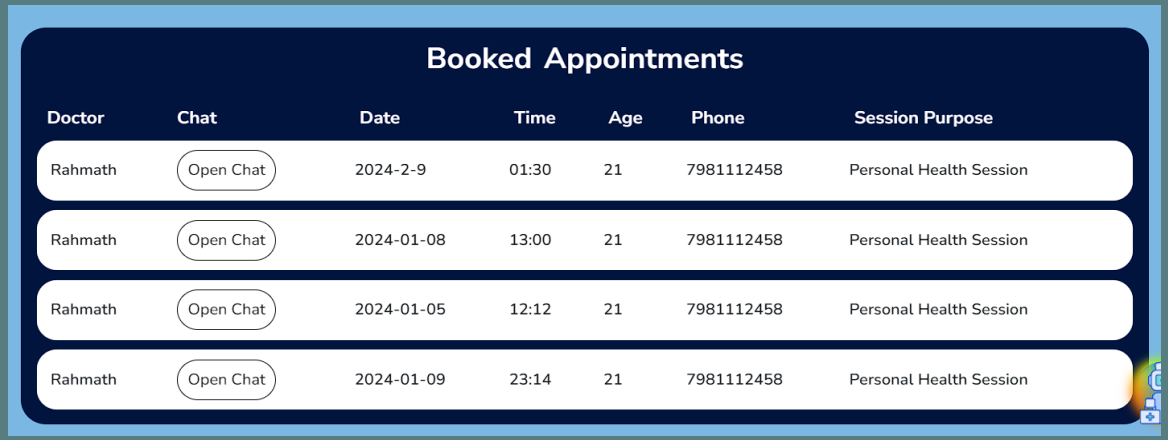
PATIENT DASHBOARD

- BMI and Calorie Calculators



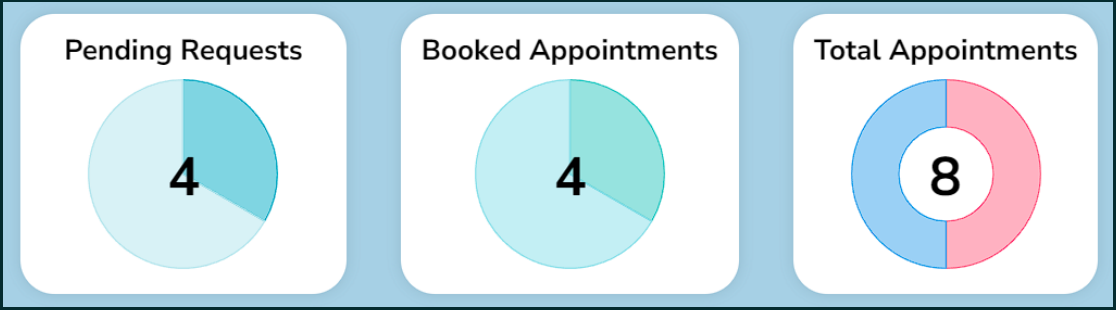






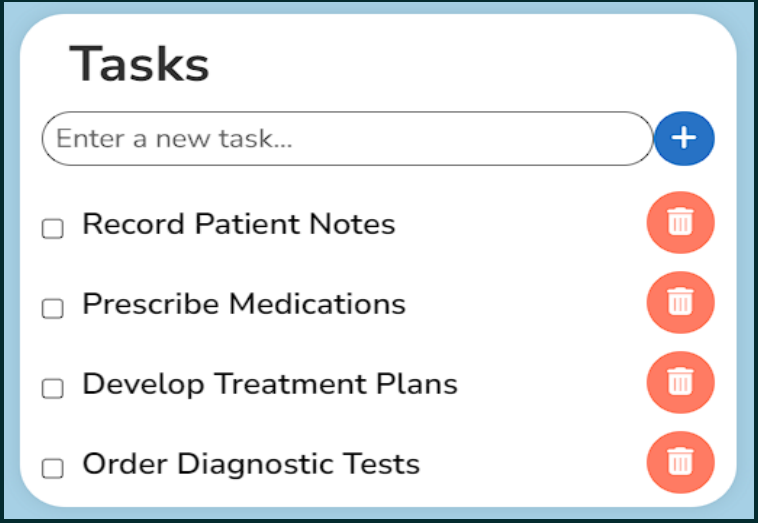
DOCTOR DASHBOARD

- KPIs, Tasks Lists, Appt System



Booked Appointments

Patient	Chat	Date	Time	Age	Phone	Session Purpose	Action
Mateen	Open Chat	2024-2-9	01:30	21	7981112458	Personal Health Session	Done
Mateen	Open Chat	2024-01-08	13:00	21	7981112458	Personal Health Session	Done
Mateen	Open Chat	2024-01-05	12:12	21	7981112458	Personal Health Session	Done
Mateen	Open Chat	2024-01-09	23:14	21	7981112458	Personal Health Session	Done



Appointment Requests

Patient	Date	Time	Age	Phone	Session Purpose	Action	
Mateen	2024-01-04	13:11	21	7981112458	Personal Health Session	Accept	Reject
Mateen	2024-04-25	13:33	21	7981112458	Physical Therapy Session	Accept	Reject
Mateen	2024-04-20	17:59	21	7981112458	Wellness Coaching	Accept	Reject
Mateen	2024-04-19	13:28	22	7981112458	Health Education Session	Accept	Reject

SYMPTOMS BASED DISEASE PREDICTOR

```
print("Number of symptoms used to identify the disease ",len(df1['Symptom'].unique()))
print("Number of diseases that can be identified ",len(df['Disease'].unique()))
```

```
Number of symptoms used to identify the disease  132
Number of diseases that can be identified  41
```

Get the names of diseases from data

```
df['Disease'].unique()
```

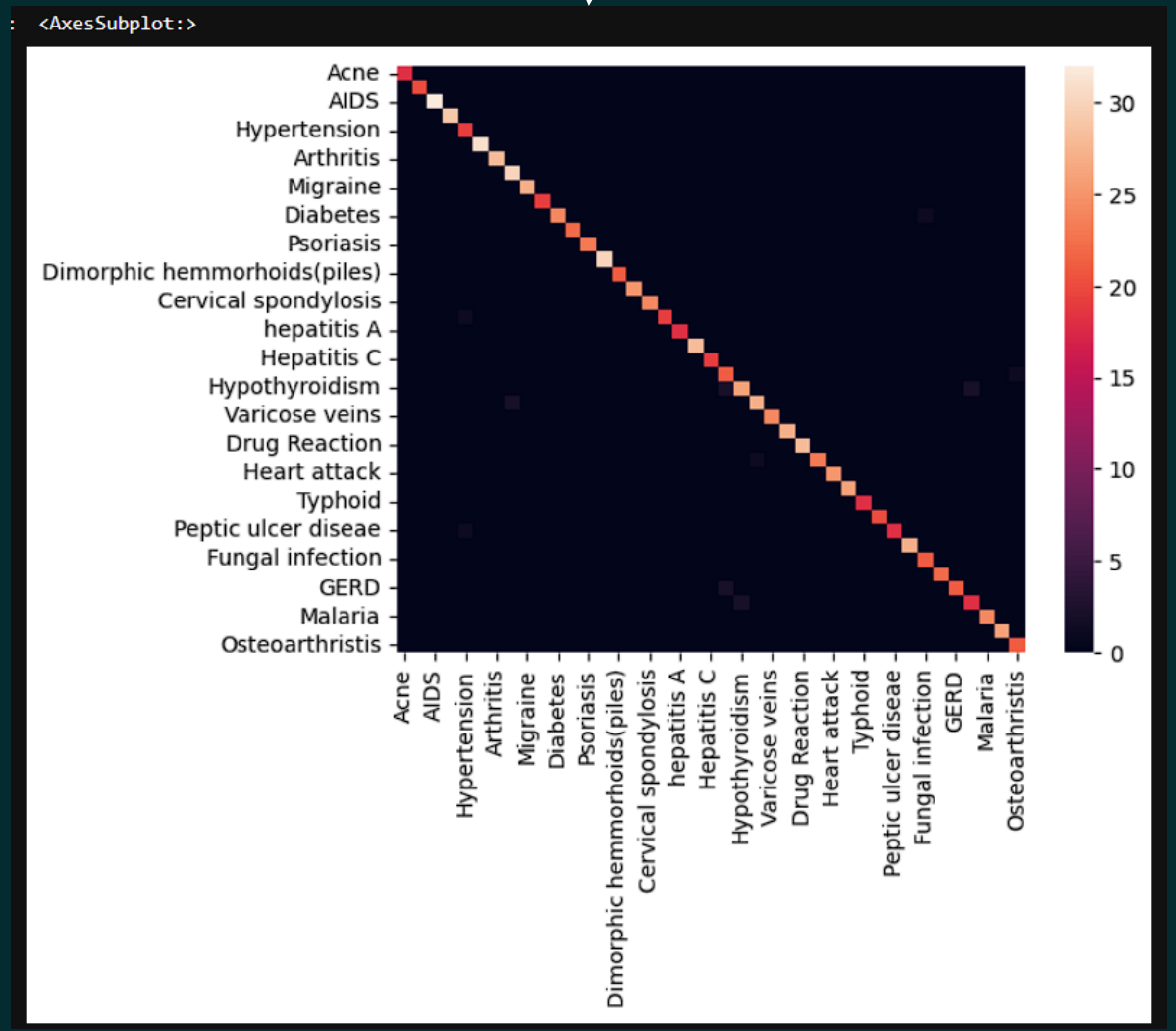
```
array(['Acne', 'Hyperthyroidism', 'AIDS', 'Chronic cholestasis',
       'Hypertension', 'Hypoglycemia', 'Arthritis', 'Hepatitis B',
       'Migraine', 'Urinary tract infection', 'Diabetes', 'Hepatitis D',
       'Psoriasis', 'Alcoholic hepatitis', 'Dimorphic hemmorhoids(piles)',
       'Hepatitis E', 'Cervical spondylosis', 'Bronchial Asthma',
       'hepatitis A', 'Allergy', 'Hepatitis C', 'Pneumonia',
       'Hypothyroidism', 'Gastroenteritis', 'Varicose veins', 'Jaundice',
       'Drug Reaction', '(vertigo) Paroymsal  Positional Vertigo',
       'Heart attack', 'Tuberculosis', 'Typhoid', 'Common Cold',
       'Peptic ulcer diseae', 'Paralysis (brain hemorrhage)',
       'Fungal infection', 'Impetigo', 'GERD', 'Dengue', 'Malaria',
       'Chicken pox', 'Osteoarthristis'], dtype=object)
```

- Data collection: Kaggle
- Data Processing: EDA
- Data Splitting: Training-80%, Testing-20%
- Machine Learning Models:- Decision Tree & Random Forest

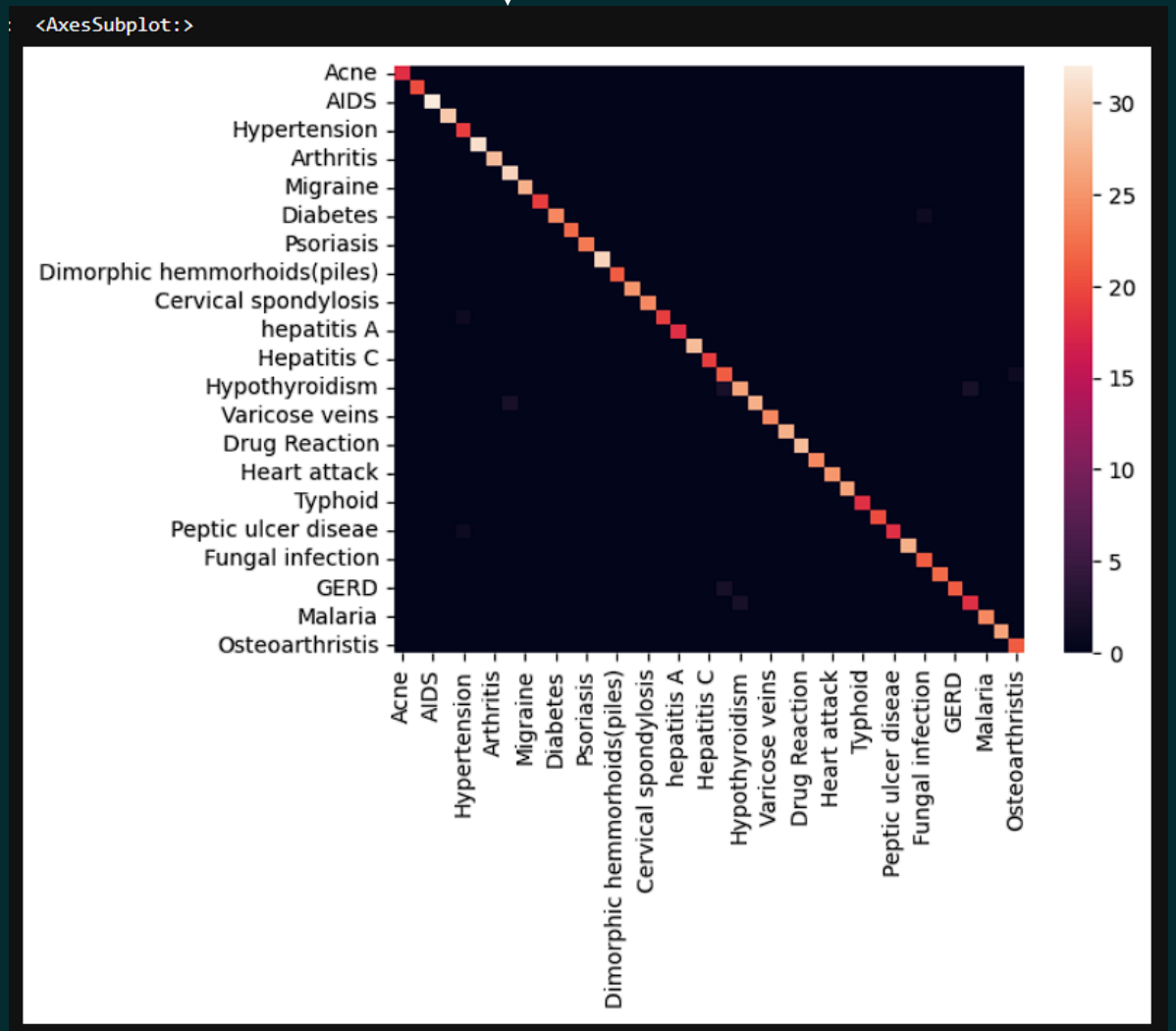
Accuracies and Heat Maps

HEALTHAI CONNECT

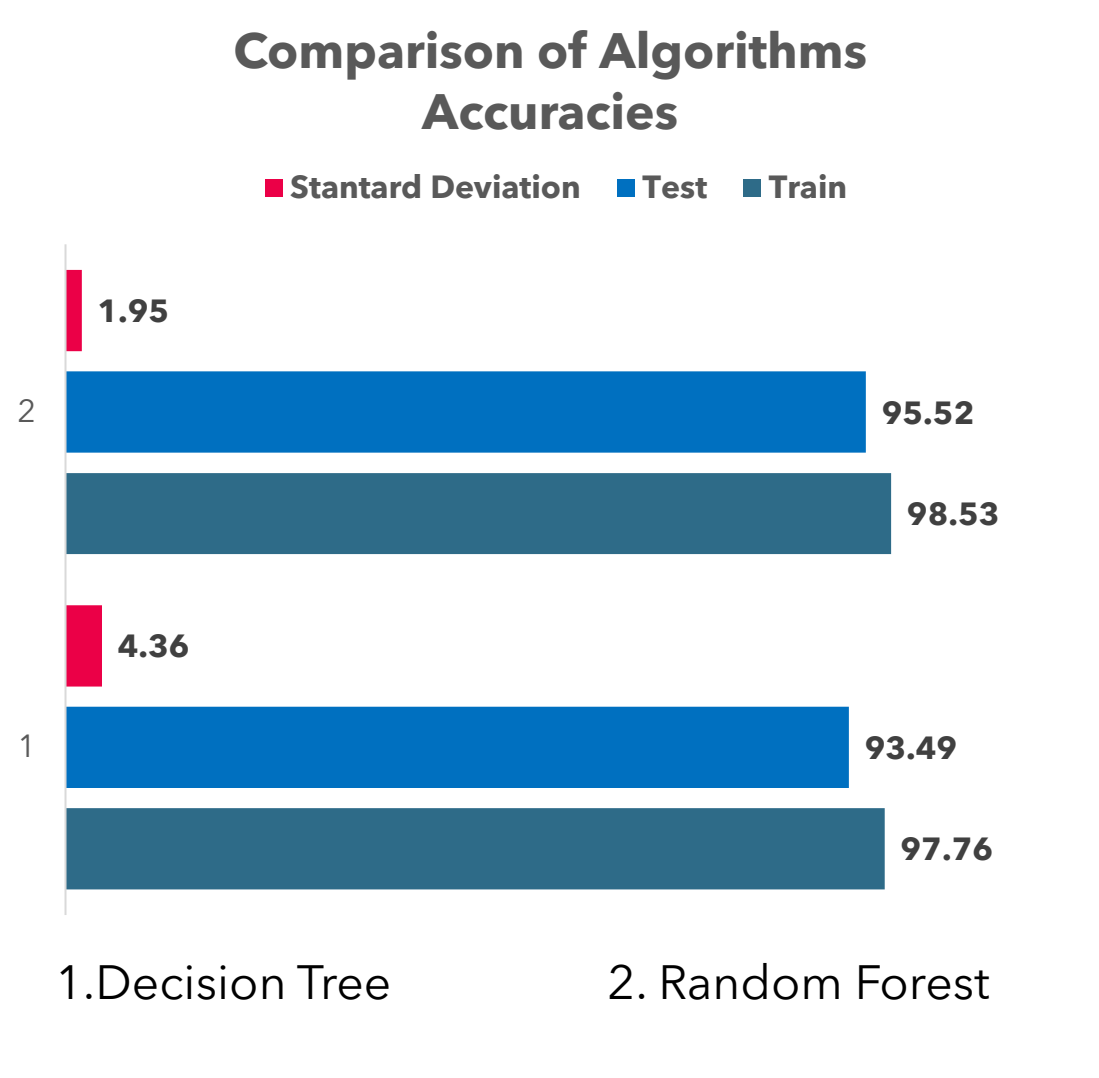
Decision Tree

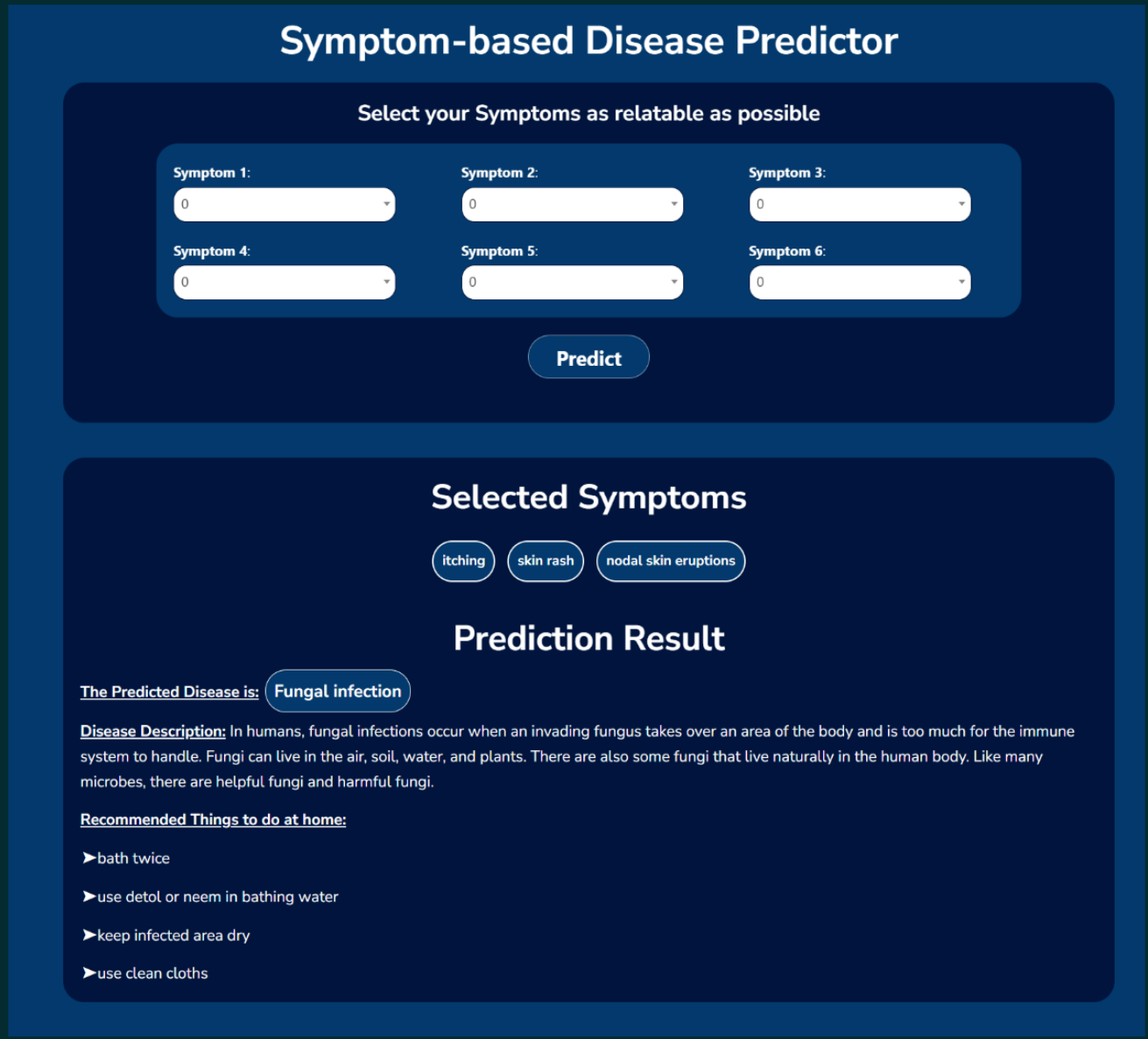


Random Forest



Output Screenshot of Symptoms Based Disease Predictor



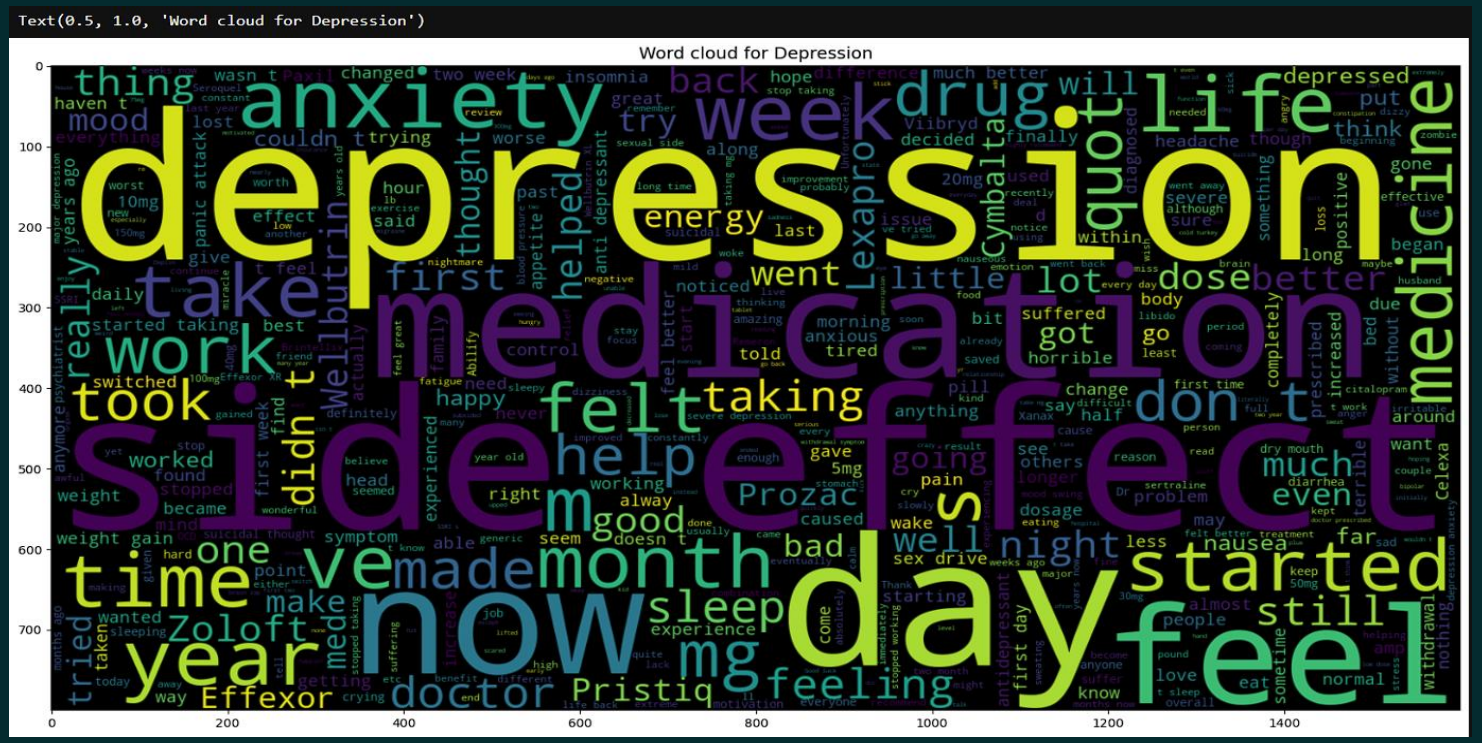


DESCRIPTION BASED DISEASE PREDICTOR

HEALTHAI CONNECT

- Data collection: UCI
- Data Processing : EDA
- Data Splitting : Train-80%, Test-20%
- Machine Learning Models :
  -Passive Aggressive Classifier
  -Naïve Bayes

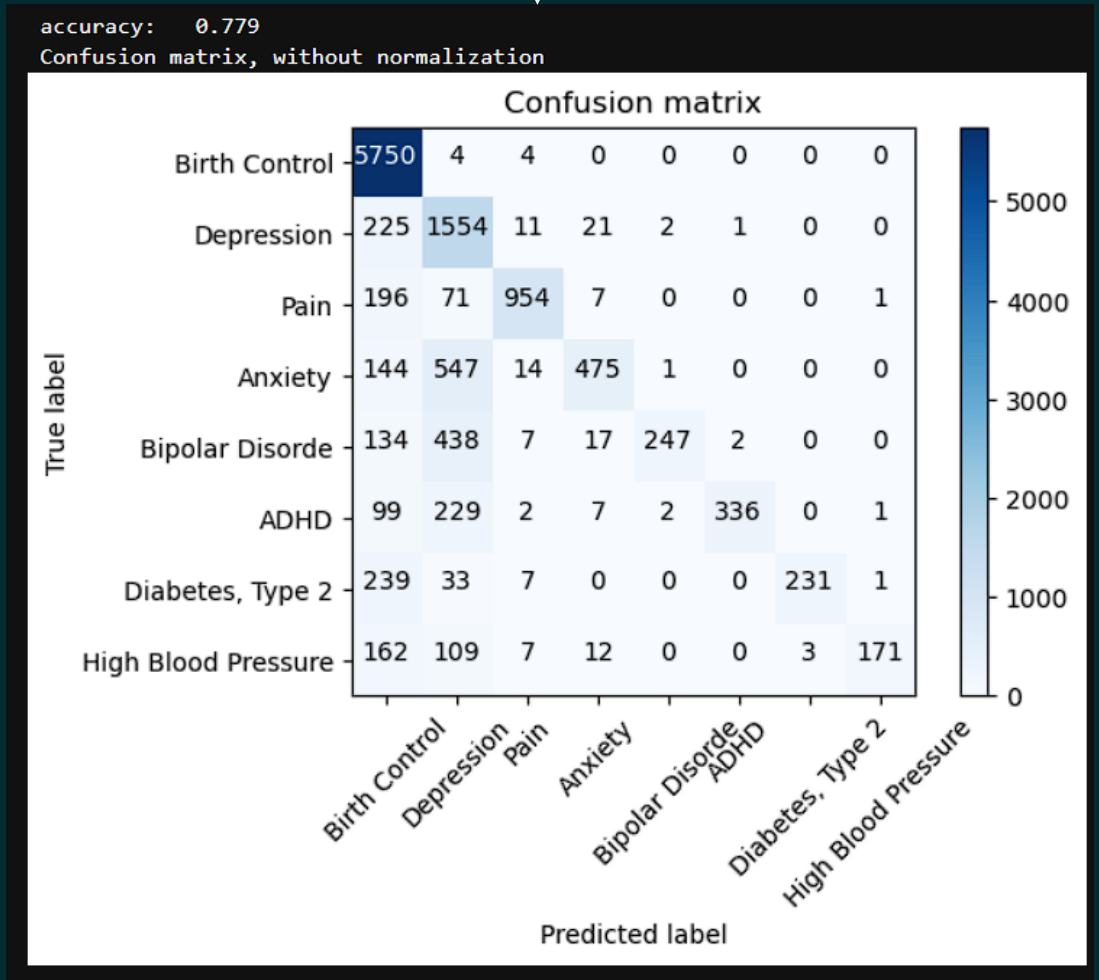
Word Cloud for Depression →



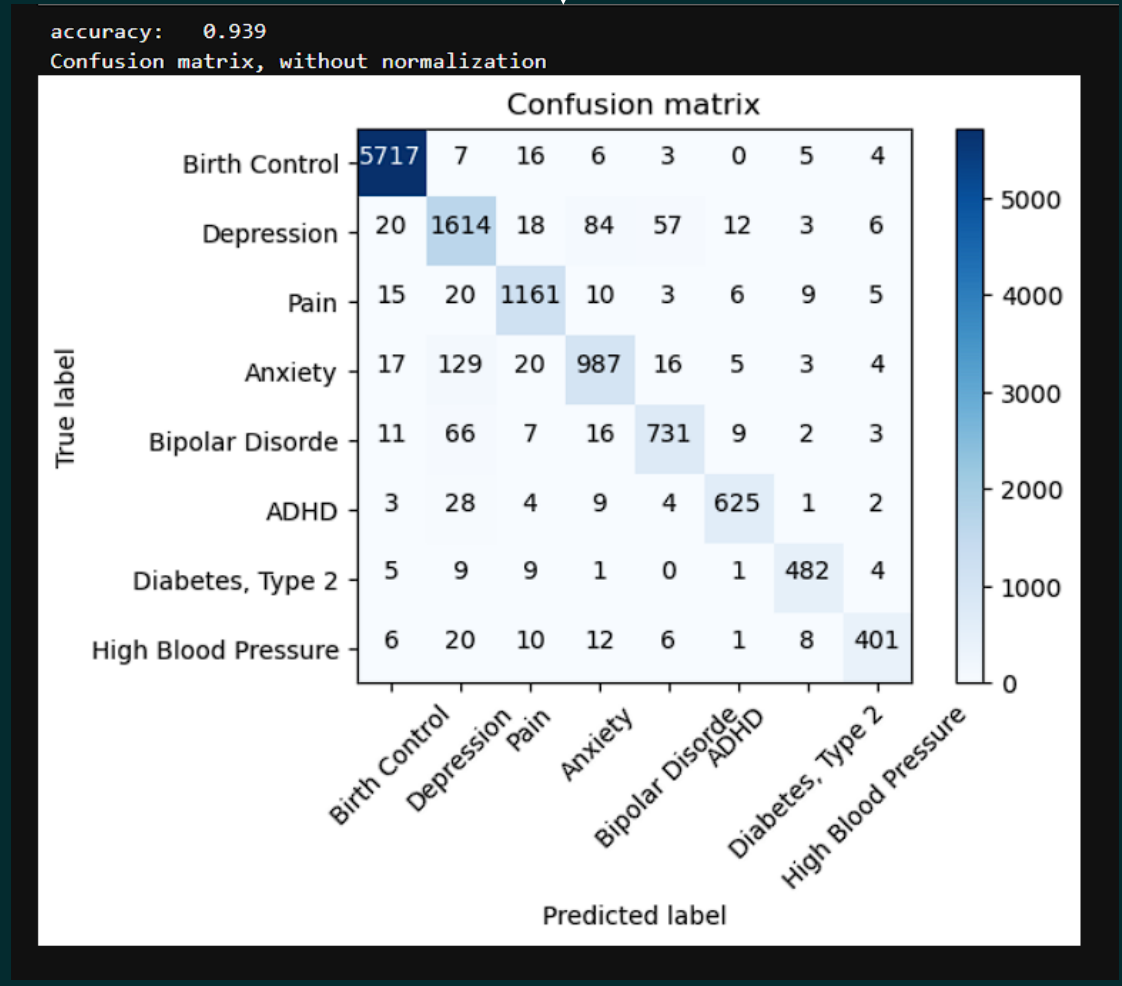
Accuracies and Confusion Matrix

HEALTHAI CONNECT

Navie Bayes



Passive Aggressive Classifier



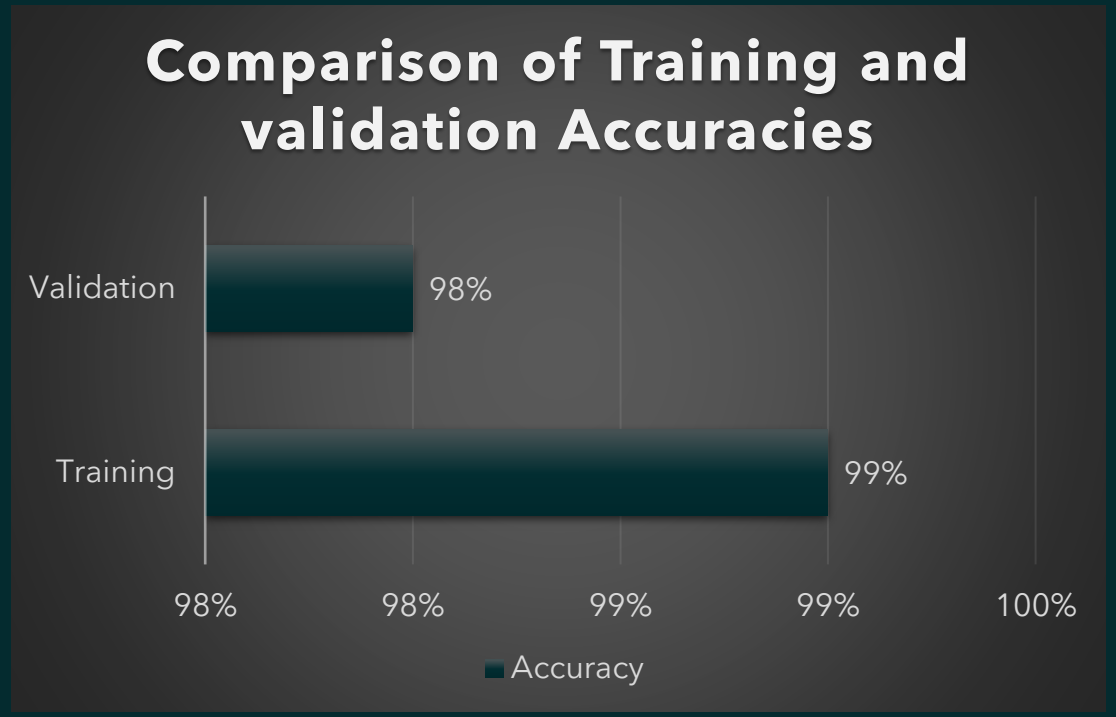
Output Screenshot of Description Based Disease Predictor

HEALTHAI CONNECT

BRAIN TUMOR DETECTION

- Data collection: Kaggle, three folders: "yes," "no," and "pred," containing 3060 Brain MRI Images.
- Data Processing: images resized to 64x64 pixels using PIL library
- Model Building: CNN
- Model Training: Model is fitted for 15 epochs (Batch size - 16)

HEALTHAI CONNECT



Training Epochs

```
150/150 [==============================] - 5s 24ms/step - loss: 0.5671 - accuracy: 0.7096 - val_loss: 0.4736 - val_accuracy: 0.7900
Epoch 2/15
150/150 [==============================] - 3s 22ms/step - loss: 0.4191 - accuracy: 0.8188 - val_loss: 0.3514 - val_accuracy: 0.8450
Epoch 3/15
150/150 [==============================] - 3s 21ms/step - loss: 0.3339 - accuracy: 0.8558 - val_loss: 0.2960 - val_accuracy: 0.8700
Epoch 4/15
150/150 [==============================] - 3s 22ms/step - loss: 0.2707 - accuracy: 0.8863 - val_loss: 0.2432 - val_accuracy: 0.8967
Epoch 5/15
150/150 [==============================] - 3s 22ms/step - loss: 0.2147 - accuracy: 0.9204 - val_loss: 0.1928 - val_accuracy: 0.9250
Epoch 6/15
150/150 [==============================] - 3s 22ms/step - loss: 0.1526 - accuracy: 0.9442 - val_loss: 0.1535 - val_accuracy: 0.9483
Epoch 7/15
150/150 [==============================] - 3s 21ms/step - loss: 0.1120 - accuracy: 0.9617 - val_loss: 0.1533 - val_accuracy: 0.9500
Epoch 8/15
150/150 [==============================] - 3s 22ms/step - loss: 0.0772 - accuracy: 0.9696 - val_loss: 0.1328 - val_accuracy: 0.9583
Epoch 9/15
150/150 [==============================] - 3s 22ms/step - loss: 0.0663 - accuracy: 0.9800 - val_loss: 0.1125 - val_accuracy: 0.9667
Epoch 10/15
150/150 [==============================] - 3s 22ms/step - loss: 0.0514 - accuracy: 0.9833 - val_loss: 0.1196 - val_accuracy: 0.9683
Epoch 11/15
150/150 [==============================] - 3s 22ms/step - loss: 0.0315 - accuracy: 0.9900 - val_loss: 0.1235 - val_accuracy: 0.9750
Epoch 12/15
150/150 [==============================] - 3s 22ms/step - loss: 0.0288 - accuracy: 0.9912 - val_loss: 0.1120 - val_accuracy: 0.9783
Epoch 13/15
150/150 [==============================] - 3s 22ms/step - loss: 0.0194 - accuracy: 0.9933 - val_loss: 0.1016 - val_accuracy: 0.9783
Epoch 14/15
150/150 [==============================] - 3s 22ms/step - loss: 0.0098 - accuracy: 0.9975 - val_loss: 0.1385 - val_accuracy: 0.9783
Epoch 15/15
150/150 [==============================] - 3s 21ms/step - loss: 0.0158 - accuracy: 0.9942 - val_loss: 0.0947 - val_accuracy: 0.9833
```

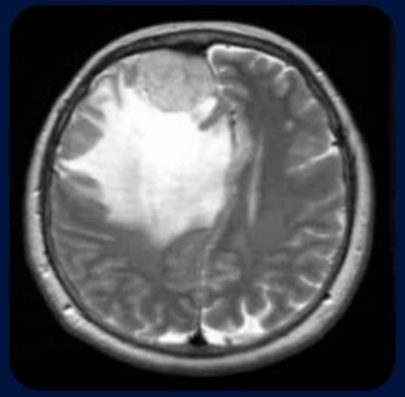
TUMOR

Brain Tumor Detection

Upload an Axial orientation MRI scan, as they provide detailed cross-sectional images of the brain.

Choose File | pred5.jpg

Uploaded Image



Result: Brain tumor detected. We strongly advise you to consult with a doctor immediately for further evaluation and treatment options.

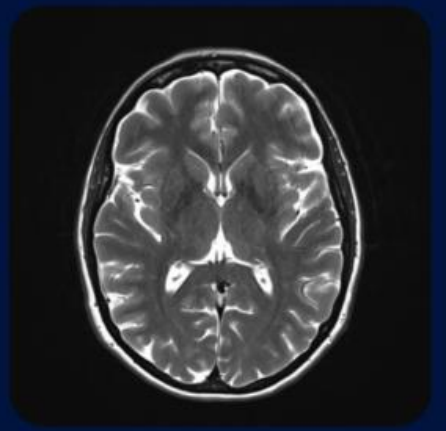
NO TUMOR

Brain Tumor Detection

Upload an Axial orientation MRI scan, as they provide detailed cross-sectional images of the brain.

Choose File | pred50.jpg

Uploaded Image

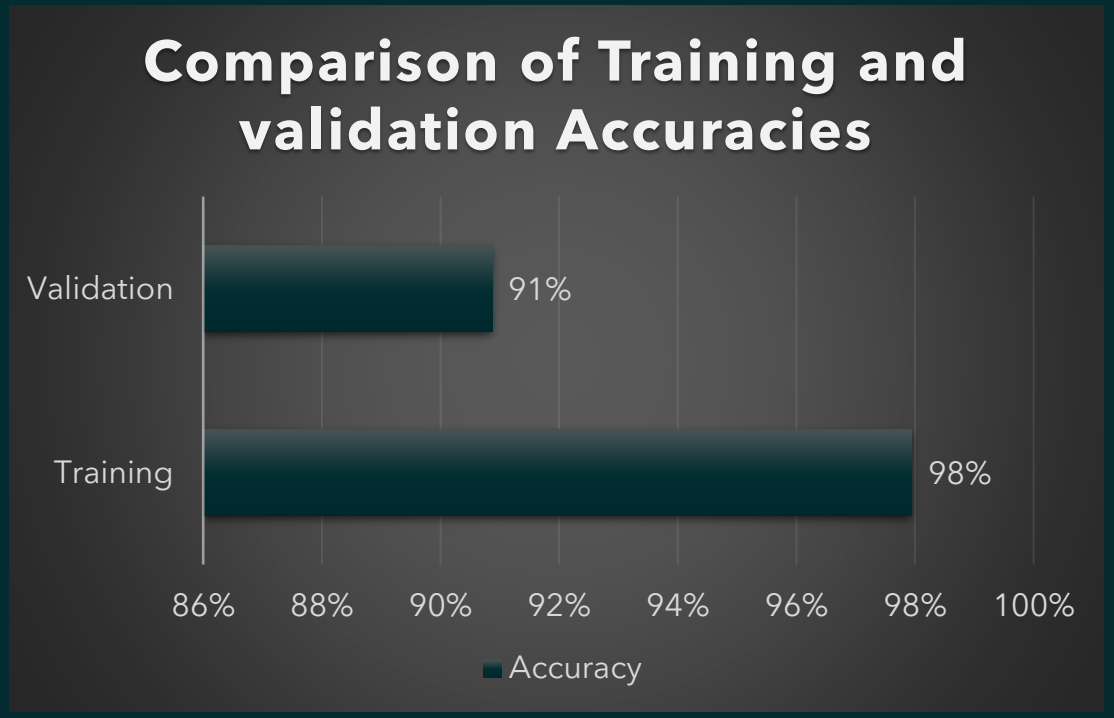


Result: No Brain Tumor Detected.

HEALTHAI CONNECT

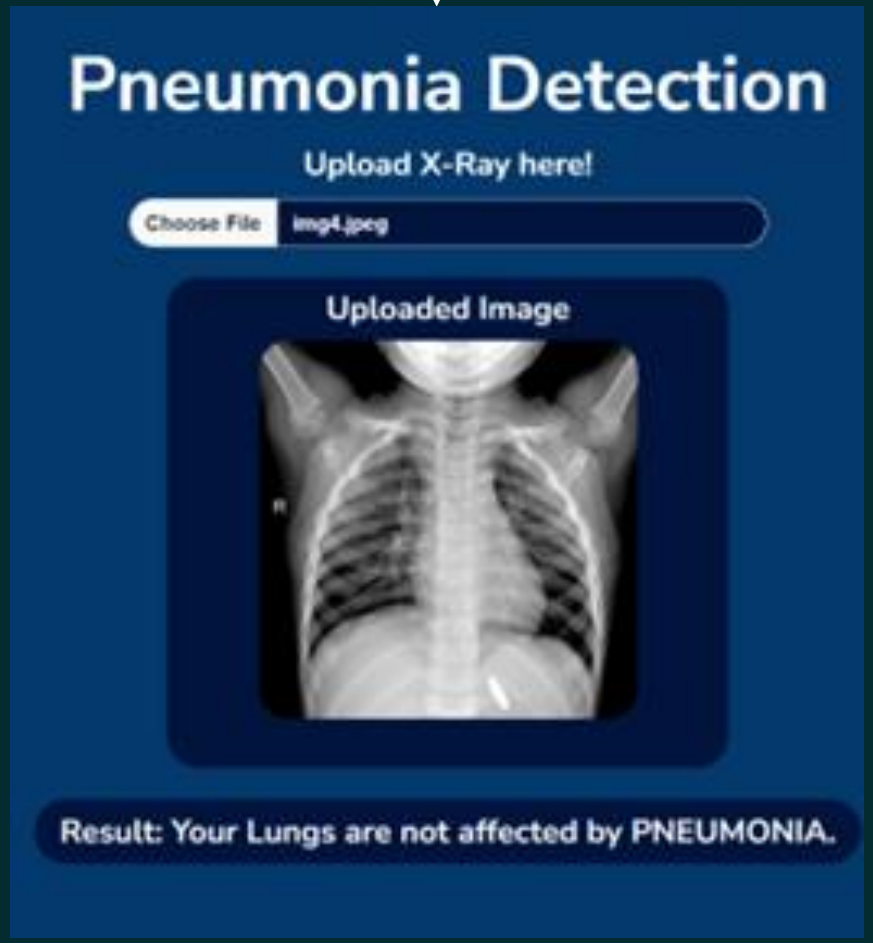
PNEUMONIA DETECTION

- Data collection: Kaggle, 3 folders (train, test, val) containing 5,863 X-Ray images (JPEG) and 2 categories (Pneumonia/Normal)
- Model Building: CNN (VGG16 Pretrained model)
- Model Training: Model is fitted for 25 epochs

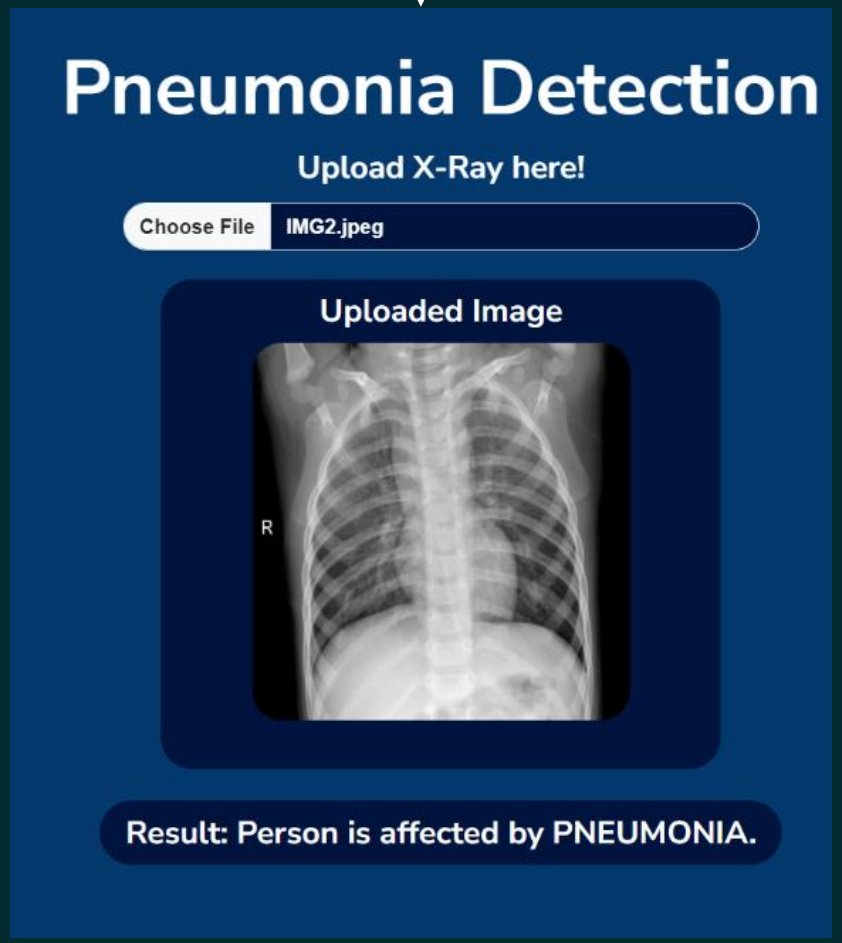


HEALTHAI CONNECT

NORMAL



PNEUMONIA



HEALTHAI CONNECT

NUTRIVISION

NutriVision

Upload your food image and write down your query!

Is the food is healthy for my age of 21 years old?
give the nutritional information also

Choose File | 1.jpg

Result:

The food items in the image are two slices of toast, one with avocado and one with tomatoes and eggs. The avocado toast has 160 calories, 14 grams of fat, 10 grams of carbohydrates, and 4 grams of protein. The tomato and egg toast has 200 calories, 16 grams of fat, 12 grams of carbohydrates, and 10 grams of protein.

For a 21-year-old, the recommended daily intake is 2,000 calories. The food items in the image provide 360 calories, which is about 18% of the recommended daily intake.

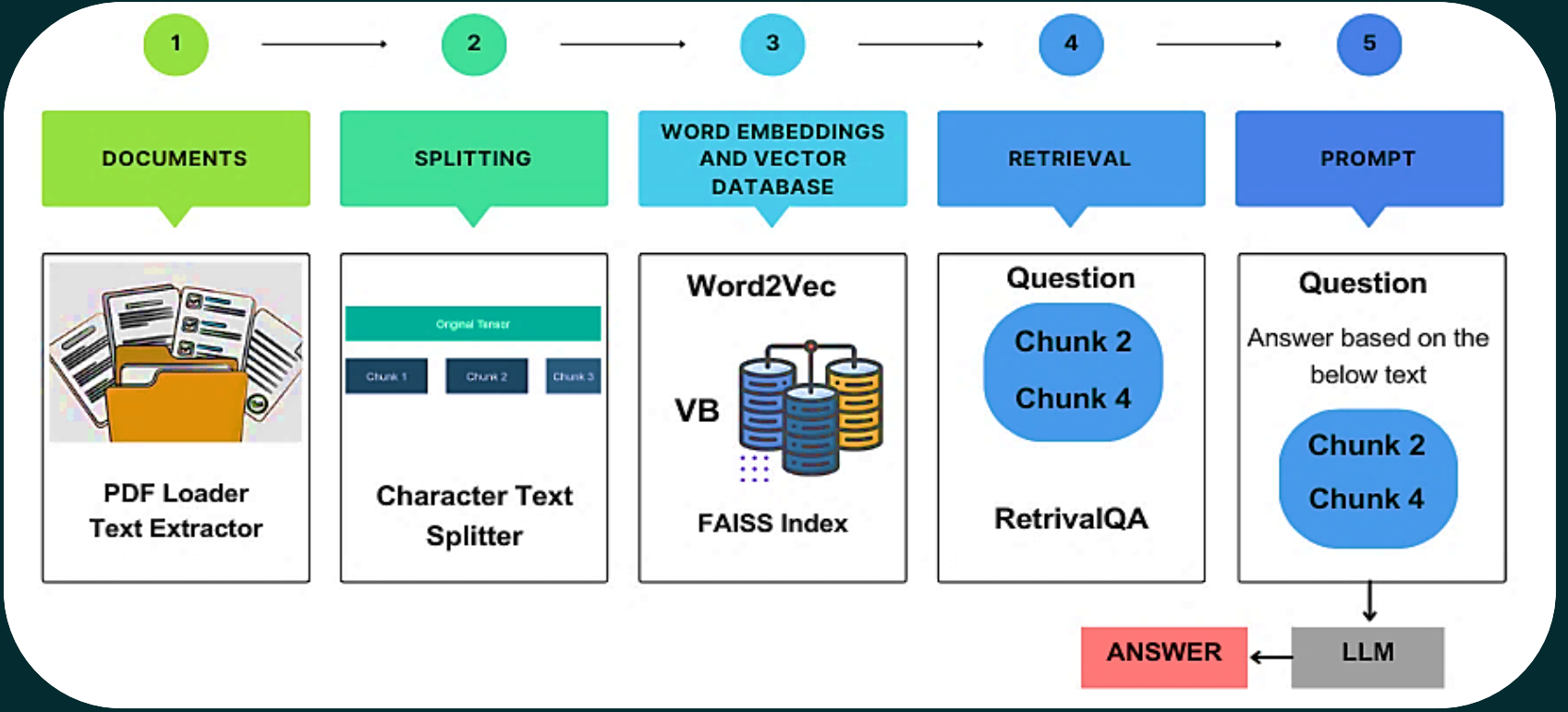
The food items in the image are healthy for a 21-year-old. They are both low in calories and fat and high in protein and fiber. The avocado toast is a good source of healthy fats, and the tomato and egg toast is a good source of protein and vitamins.

Overall, the food items in the image are a healthy choice for a 21-year-old. They are both low in calories and fat and high in protein and fiber.

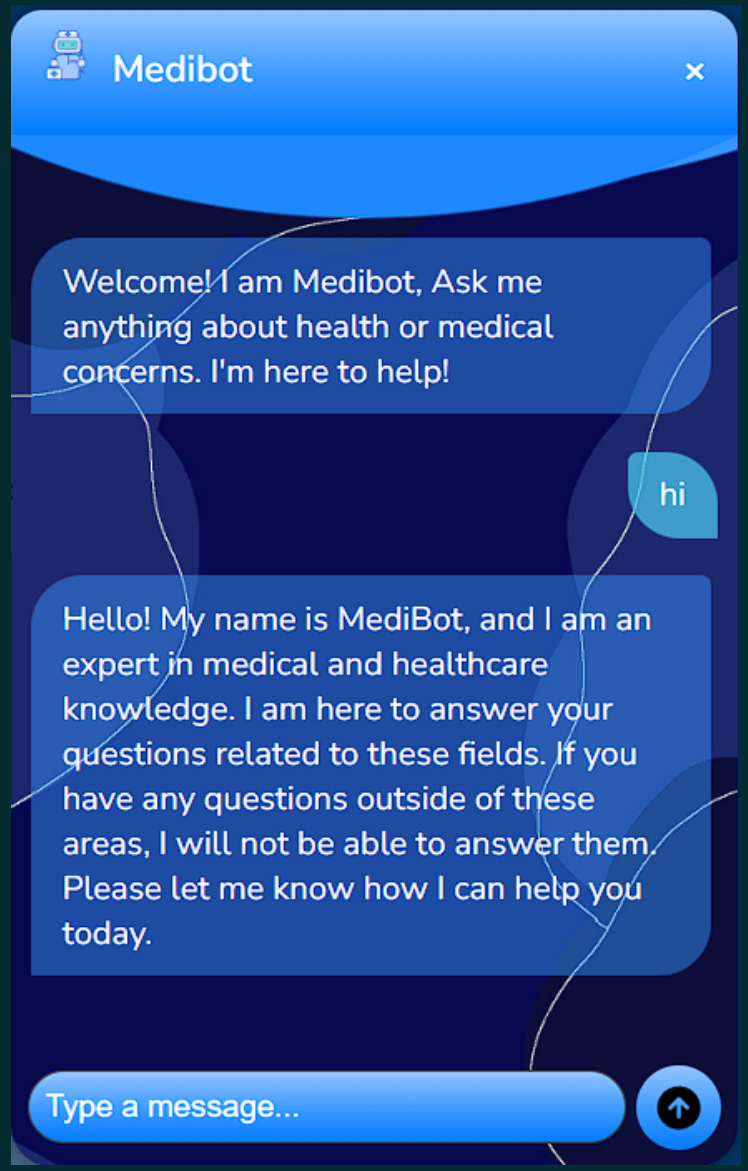
HEALTHAI CONNECT

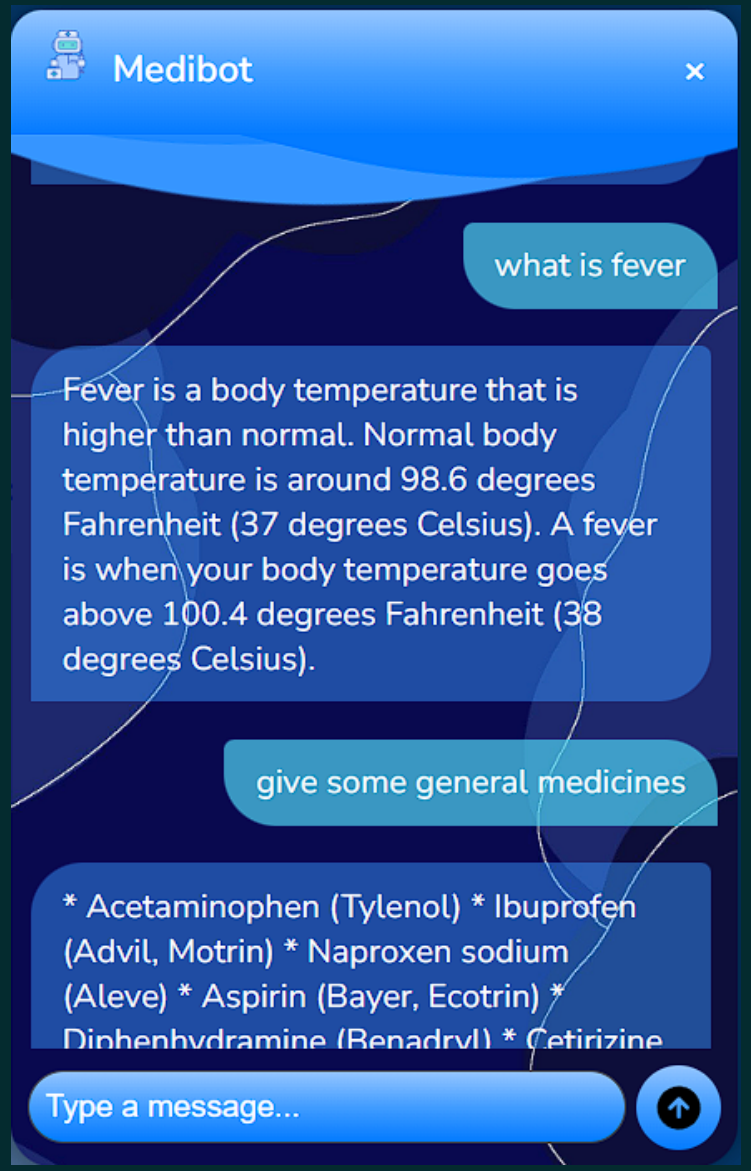
RAG MEDICAL CHATBOT

- Data collection: Medical textbooks from InfoBooks
- Data Processing: Word Embeddings (Word2Vec) HuggingFace Model (Deepset_sentence_bert)



CHATBOT OUTPUT'S





HEALTHAI CONNECT

REFERENCES

PART 1

1. U. K. Kommineni, D. P. P. Kowthavarapu, G. S. M. Polukonda and K. C. Yelavarti, "**Human Disease Prediction based on Symptoms,**" 2023 7th International Conference on Computing Methodologies and Communication (ICCMC), Erode, India, 2023, pp. 677-682, doi: 10.1109/ICCMC56507.2023.10083702.

2. K. S. Kumar, M. Sai Sathya, A. Nadeem and S. Rajesh, "**Diseases Prediction based on Symptoms using Database and GUI**," 2022 6th International Conference on Computing Methodologies and Communication (ICCMC), Erode, India, 2022, pp. 1353-1357, doi: 10.1109/ICCMC53470.2022.9753707.

3. X. Luo, P. Gandhi, S. Storey and K. Huang, "**A Deep Language Model for Symptom Extraction From Clinical Text and its Application to Extract COVID-19 Symptoms From Social Media**," in IEEE Journal of Biomedical and Health Informatics, vol. 26, no. 4, pp. 1737-1748, April 2022, doi: 10.1109/JBHI.2021.3123192.

4. S. K. Nayak, M. Garanayak, S. K. Swain, S. K. Panda and D. Godavarthi, "**An Intelligent Disease Prediction and Drug Recommendation Prototype by Using Multiple Approaches of Machine Learning Algorithms,**" in IEEE Access, vol. 11, pp. 99304-99318, 2023, doi: 10.1109/ACCESS.2023.3314332.

5. M. A. Khadija, A. Aziz and W. Nurharjadmo, "**Automating Information Retrieval from Faculty Guidelines: Designing a PDF-Driven Chatbot powered by OpenAI ChatGPT**," 2023 International Conference on Computer, Control, Informatics and its Applications (IC3INA), Bandung, Indonesia, 2023, pp. 394-399, doi: 10.1109/IC3INA60834.2023.10285808.

6. S. Chakraborty, Sanjay and Paul, Hrithik and Ghatak, Sayani and Pandey, Saroj Kumar and Kumar, Ankit and Singh, Kamred Udham and Shah, Mohd Asif et al., "**An AI-Based Medical Chatbot Model for Infectious Disease Prediction**," in IEEE Access, vol. 10, pp. 128469-128483, 2022, doi: 10.1109/ACCESS.2022.3227208.

REFERENCES

PART 2

7. A. S, N. R. Rajalakshmi, V. P. P and J. L, "**Dynamic NLP Enabled Chatbot for Rural Health Care in India**," 2022 Second International Conference on Computer Science, Engineering and Applications (ICCSEA), Gunupur, India, 2022, pp. 1-6, doi: 10.1109/ICCSEA54677.2022.9936389.

8. M. Ehghaghi, P. -Y. Zhou, W. Y. Cheng, S. Rajabi, C. -H. Kuo and E. -S. A. Lee, "**Interpretable Disease Prediction from Clinical Text by Leveraging Pattern Disentanglement,**" 2023 IEEE EMBS International Conference on Biomedical and Health Informatics (BHI), Pittsburgh, PA, USA, 2023, pp. 1-7, doi: 10.1109/BHI58575.2023.10313408.

9. S. Usharani, S. Prithivi, S. Sharmila, P. M. Bala, T. Ananth Kumar and R. Rajmohan, "**Mobile Application for Doctor Appointment Scheduling**," 2021 International Conference on System, Computation, Automation and Networking (ICSCAN), Puducherry, India, 2021, pp. 1-6, doi: 10.1109/ICSCAN53069.2021.9526398.

10. T. Nag, S. S. Rajawat and A. Rana, **"Detection of Pneumonia using Chest X-Ray Images and Convolutional Neural Network,**" 2021 9th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO), Noida, India, 2021, pp. 1-4, doi: 10.1109/ICRITO51393.2021.9596172.

11. N. M. Dipu, S. A. Shohan and K. M. A. Salam, "**Deep Learning Based Brain Tumor Detection and Classification**," 2021 International Conference on Intelligent Technologies (CONIT), Hubli, India, 2021, pp. 1-6, doi: 10.1109/CONIT51480.2021.9498384.

12. A. Goswami and M. Dixit, "**An Analysis of Image Segmentation Methods for Brain Tumour Detection on MRI Images**," 2020 IEEE 9th International Conference on Communication Systems and Network Technologies (CSNT), Gwalior, India, 2020, pp. 318-322, doi: 10.1109/CSNT48778.2020.9115791.

HEALTHAI CONNECT

THANK YOU