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ACKNOWLEDGEMENT

The success and final outcome of this project required a lot of guidance and assistance from many people. We are extremely fortunate to have got this all along with the completion of our project work. Whatever we have done is only due to such guidance and assistance and we would not forget to thank them.

It is a matter of great pleasure for us to submit the project report on "LearnSBAR", as a part of our curriculum.

First and foremost, we would like to thank our H.O.D. **Ms. Swati Nadkarni** and Principal **Dr. Bhavesh Patel** for giving us an opportunity to do the project work. We want to thank our teachers **Ms. Pramila Shinde** and **Ms. Nutan Dolzake** for their valuable guidance and advice. They inspired us greatly to work on this project. Their willingness to motivate us contributed tremendously to our project.

And last but not least a special thanks goes to my team members, who helped me to assemble the information and gave suggestions to complete our project.

ABSTRACT

The SBAR (Situation-Background-Assessment-Recommendation) technique provides a framework for communication between members of the healthcare team about a patient’s condition.

A Web Based Application was made in this project for nurses to practice and learn SBAR communication technique.

Nurses register an Account within the application to access numerous scenarios and track their progress.

Each Scenario acts as a test case for the nurses in which they'll record their responses to the scenarios and they are assessed on the basis of recordings using Machine Learning Algorithms.

Finally, an explanation video for the given scenario is provided, which nurses can use as a reference.

INTRODUCTION

SYSTEM PURPOSE

The purpose of our project is to create and deploy a learning platform (web app) for nurses to learn SBAR communication techniques which in turn helps them to have an efficient and on point conversation with the doctor during the time of crisis.

SCOPE

The scope of this project can be extended to similar systems which can be used for training other engineers, marketers and other professionals as well. Few of them are:

- It can be used by small associations which can't afford big and expensive systems which are already available.
- It is faster and efficient than the traditional method of learning.
- It is a systematic way to increase the skill level of the users and it can also be used to keep track of user's progress.

FEATURES

- Secure.
- Easy to use.
- Reliable.
- Easy to expand and add functionality.

COMPARATIVE ANALYSIS

Current resources and tools available to learn and practice SBAR include Live training courses such as SBAR Technique Online Course | Vubiz , written material like Articles , Blogs , Research Papers and visual material like Udemy courses and Youtube videos .

These resources have some disadvantages, live training courses are expensive and written material doesn't provide engaging practice

Our software has the following advantages over current system

- It's cheaper and easy to use
- Interactive Practice provided by the application helps learners learn effectively

Literature Survey

Sr. No.	Title	Author	Aim of the paper	Link	Remarks
1.	Detection of Diseases Using Machine Learning Image Recognition Technology in Artificial Intelligence	Gang Yu	In this paper,we get to learn about use of machine learning and artificial intelligence	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9020906/	By reading it we got to know the importance of implementing artificial intelligence techniques and the need for it.
2.	Human Diseases Detection Based On Machine Learning Algorithms: A Review	Nareen . 0 .m.salim	In this paper , machine learning algorithms have been used to study the detection of diseases	https://www.researchgate.net/publication/349054979_Human_Diseases_Detection_Based_On_Machine_Learning_Algorithms_A_Review	By reading it we got to know how important is the concept of machine learning in disease detection
3.	Kassandra: The Automatic Grading System	URS VON MATT	In this paper we get to study the automatic grading system in dept	https://www.researchgate.net/publication/2383498_Kassandra_The_Automatic_Grading_System	It helps us to understand the concept of grading system very deeply and its application

4.	Analysis of an automatic grading system within first year Computer Science programming modules	Dr Aidan Mooney	To understand automatic grading system using programming modules	https://dl.acm.org/doi/10.1145/3437914.3437973	It helps us to understand the grading system efficiently with the help of programming. The paper presents an approach that checks student submissions based on test cases and also analyzes the code they wrote.

DESIGN DETAILS

OVERVIEW

FRONTEND

The frontend of a web application is the part that users interact with directly. It includes the user interface, which is usually built using a combination of HTML, CSS, and JavaScript. The frontend is responsible for rendering the visual elements of the application, such as text, images, and interactive components, and for handling user input and interactions. A well-designed frontend is essential for creating a positive user experience and for ensuring that users can easily navigate and use the application.

We used the following technologies for developing the app:

1. **ReactJS**
2. **Typescript**
3. **HTML**
4. **CSS**

BACKEND

The backend of a web application is the part of the application that runs on the server-side and is responsible for managing data and processing requests from the frontend. It includes the server, the application logic, and the database. The backend is responsible for storing and retrieving data, handling user authentication and authorization, and processing requests from the frontend. A well-designed backend is essential for ensuring the security, scalability, and performance of a web application, as well as for enabling features such as user accounts, data persistence, and server-side processing.

We used the following technologies for developing the app:

1. **NodeJS (Model-View-Controller Framework)**
2. **Express**
3. **Flask**
4. **Google Cloud**
5. **AWS**

FEATURES / FUNCTIONALITIES AND TECHNOLOGIES USED

★ Disease Prediction

Disease prediction is a process of using machine learning algorithms to predict the probability of a person having a particular disease based on their medical history and other risk factors. Disease prediction is an important area of research as it can help healthcare professionals diagnose diseases at an early stage and provide timely treatment, potentially saving lives.

The process of disease prediction typically involves the following steps:

Data Collection: The first step is to collect data from patients, including medical history, symptoms, lab test results, and other risk factors. This data is used to create a dataset that can be used to train machine learning models.

Data Preprocessing: The collected data is then preprocessed to remove missing values, normalize the data, and handle any outliers. This step is crucial as it helps to improve the accuracy of the machine learning models.

Feature Selection: Feature selection involves selecting the most relevant features from the dataset that are most likely to contribute to the prediction of the disease. This step can be done manually or using automated methods.

Model Training: Once the dataset is preprocessed and the relevant features are selected, the next step is to train the machine learning model. The model is trained using the available data to learn the patterns and relationships between the input features and the output variable.

Model Evaluation: After the model is trained, it is evaluated using a separate set of data to test its accuracy and performance. The evaluation metrics used depend on the type of disease being predicted and the specific requirements of the application.

Deployment: Once the model is evaluated and validated, it can be deployed in a real-world application to predict the probability of a person having a particular disease based on their medical history and other risk factors.

Disease prediction is an active area of research and has the potential to revolutionize healthcare by enabling early diagnosis and timely treatment of diseases.

In order to predict the given model we used multiple classification algorithms which are described below:

Classification algorithms are a type of **supervised machine learning model** that are used to predict the categorical or discrete output variable of a given input. In other words, classification algorithms are used to classify data into one of several possible categories based on the features of the data.

Classification algorithms used in our prediction model:

1. **Logistic Regression:**

   Logistic regression is a simple yet powerful algorithm that is widely used for binary classification problems. The model uses a logistic function to model the probability of a binary output variable based on the input features. The logistic function is a sigmoid curve that outputs values between 0 and 1. Logistic regression is widely used in fields such as finance, marketing, and healthcare.

2. **Decision Trees:**

   Decision trees are tree-like models that break down a dataset into smaller subsets based on the input features and create a tree structure of decisions. Each internal node of the tree represents a test on a feature, and each leaf node represents a class label. Decision trees can be used for both binary and multi-class classification problems. Decision trees are easy to understand and interpret, but they may suffer from overfitting and instability.

3. **Random Forest:**

   Random Forest is a type of ensemble learning algorithm that combines multiple decision trees to improve the accuracy and reduce overfitting. Random Forest builds a set of decision trees on random subsets of the input features and samples from the training data. The final output is determined by the majority vote of the individual decision trees. Random Forest is widely used in fields such as finance, healthcare, and marketing.

4. **Naive Bayes:**

   Naive Bayes is a probabilistic algorithm that is based on Bayes' theorem and assumes independence between the input features. Naive Bayes is a simple yet effective algorithm that is widely used for text classification and spam filtering. Naive Bayes can handle large datasets and is computationally efficient.

5. **Support Vector Machines (SVM):**

   SVM is a powerful algorithm that separates the data into classes by finding the best hyperplane that separates the data. The hyperplane is chosen in such a way that it maximizes the margin between the two classes. SVM can handle non-linearly separable data by using kernel functions to transform the input data into a higher dimensional space. SVM is widely used in fields such as image recognition, bioinformatics, and finance.

   These classification algorithms are widely used in various fields such as image recognition, fraud detection, spam filtering, and medical diagnosis. Choosing the appropriate classification algorithm depends on the nature of the data, the complexity of the problem, and the desired level of accuracy.

★ SBAR automated assessment

SBAR stands for Situation, Background, Assessment, and Recommendation, and it is a widely used communication technique in healthcare settings to facilitate effective and efficient communication between healthcare professionals.

The SBAR technique provides a structured framework for conveying critical information, especially during handoffs, transfers, and emergencies, to reduce errors and improve patient safety.

Here's a brief overview of each component of the SBAR communication technique:

Situation: Briefly describe the current situation, including the patient's name, location, and reason for contact.

Background: Provide relevant background information, including the patient's medical history, allergies, medications, and recent vital signs.

Assessment: Share your assessment of the patient's condition, including any pertinent findings or changes.

Recommendation: Offer a clear and concise recommendation for action, such as ordering a test, starting or adjusting a medication, or consulting a specialist.

Using the SBAR technique promotes clear and effective communication and helps to ensure that critical information is conveyed accurately and efficiently, which ultimately enhances patient care and safety.

The SBAR communication technique is particularly useful for nurses during critical times, such as in emergency situations, when transferring a patient to another unit, or when reporting a

change in a patient's condition to a physician. Here are some use cases of SBAR technique by nurses:

Handoffs: During shift changes or when transferring a patient from one unit to another, nurses can use the SBAR technique to provide a concise and comprehensive report on the patient's condition, medications, and any other relevant information.

Emergencies: In emergency situations, quick and clear communication is crucial. Nurses can use the SBAR technique to rapidly convey critical information about the patient's condition, vital signs, and any interventions that have been implemented.

Physician communication: When reporting a change in a patient's condition to a physician, nurses can use the SBAR technique to provide a structured and organized report that includes all relevant information, such as the patient's medical history, current medications, vital signs, and any changes in symptoms.

Interdisciplinary team communication: The SBAR technique can also be used to facilitate communication between members of the interdisciplinary team, such as physical therapists, occupational therapists, and social workers, who may need to collaborate on patient care.

Using the SBAR technique promotes effective communication, reduces the risk of errors, and ensures that critical information is conveyed accurately and efficiently, which ultimately enhances patient care and safety.

In order to create a platform for nurses to learn the SBAR communication technique,

We have utilized multiple pre-trained machine learning models which are described as follows:

1. **Whisper AI**

It is a speech-to-text software that allows users to convert their spoken words into written text. The software works by using advanced artificial intelligence algorithms to recognize the sounds and patterns in a user's voice and convert them into written text.

When a user speaks into the software, the sound is captured by a microphone and processed by the software. The software then uses a complex set of algorithms to analyze the sound waveforms and identify the words and phrases being spoken.

Whisper AI uses a combination of speech recognition, natural language processing, and machine learning algorithms to accurately transcribe the spoken words into text. The software is designed to learn and adapt to the user's voice over time, improving its accuracy and speed.

One of the key advantages of Whisper AI is its ability to work with different accents and dialects, making it a versatile tool for users around the world. The software can also be customized to recognize industry-specific terminology and jargon, making it a valuable tool for professionals in fields such as medicine, law, and finance.

Overall, Whisper AI's speech-to-text technology offers a powerful tool for users who need to convert their spoken words into written text quickly and accurately. The software's advanced algorithms and machine learning capabilities make it a valuable tool for a wide range of industries and applications.

Whisper AI uses a combination of algorithms to accurately transcribe speech into text. Here are some of the key algorithms used by Whisper AI:

Automatic Speech Recognition (ASR): This algorithm is used to convert the audio signal into a sequence of words. ASR involves breaking down the audio signal into smaller segments, identifying phonemes (the individual sounds that make up words), and then mapping those phonemes to words.

Natural Language Processing (NLP): This algorithm is used to understand the meaning of the words being spoken. NLP involves analyzing the grammar, syntax, and context of the spoken words to determine their meaning.

Machine Learning: This algorithm is used to improve the accuracy of the transcription over time. Machine learning involves training the software on large datasets of audio recordings and transcriptions, allowing it to learn from its mistakes and improve its accuracy over time.

Signal Processing: This algorithm is used to clean up the audio signal and improve its quality. Signal processing involves filtering out background noise, removing echoes, and enhancing the clarity of the spoken words.

Overall, Whisper AI uses a sophisticated combination of algorithms to accurately transcribe speech into text. By combining ASR, NLP, machine learning, and signal processing, Whisper AI is able to provide accurate and reliable voice-to-text transcription services for a wide range of applications.

1. **Sentence Transformers Cosine Similarity**

It is a method used to compare the similarity between two or more sentences based on their semantic meaning. It uses advanced natural language processing techniques to encode each sentence into a vector representation that captures the meaning and context of the sentence.

The vector representations are created using deep learning models, such as BERT (Bidirectional Encoder Representations from Transformers), that are trained on large amounts of text data. These models are capable of understanding the context and meaning of words within a sentence, as well as their relationship to other words in the sentence.

Once the vector representations are generated for each sentence, the cosine similarity is used to measure the similarity between them. The cosine similarity is a metric that measures the cosine of the angle between two vectors. It ranges from -1 (completely dissimilar) to 1 (completely similar), with 0 indicating no similarity.

By using sentence transformers cosine similarity, it is possible to compare the semantic meaning of sentences in a way that is more accurate and reliable than traditional text matching techniques. This method is particularly useful for applications such as document clustering, question answering, and information retrieval, where it is necessary to identify similarities between pieces of text based on their meaning rather than their surface-level features.

The Sentence Transformers algorithm uses several algorithms in order to create vector representations of sentences and calculate their cosine similarity. Here are some of the key algorithms used:

Pre-trained Language Models: The Sentence Transformers algorithm is built on top of pre-trained language models such as BERT, RoBERTa, and DistilBERT. These models are trained on large amounts of text data and are capable of understanding the context and meaning of words within a sentence.

Transformer Networks: Transformer networks are a type of neural network that are used to generate vector representations of sentences. These networks use attention mechanisms to allow the model to focus on different parts of the sentence and encode the context of each word.

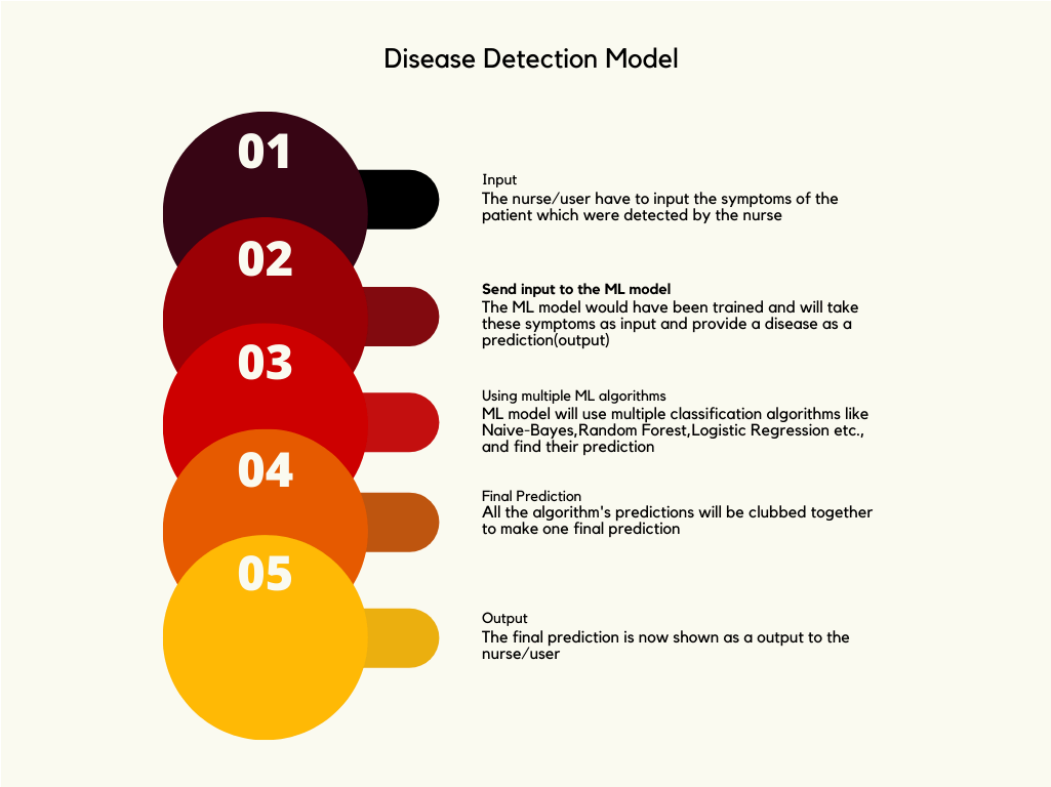
Siamese Networks: Siamese networks are a type of neural network architecture that allow for the comparison of two or more input sequences. In the context of Sentence Transformers, a Siamese network is used to compare the vector representations of two sentences and calculate their cosine similarity.

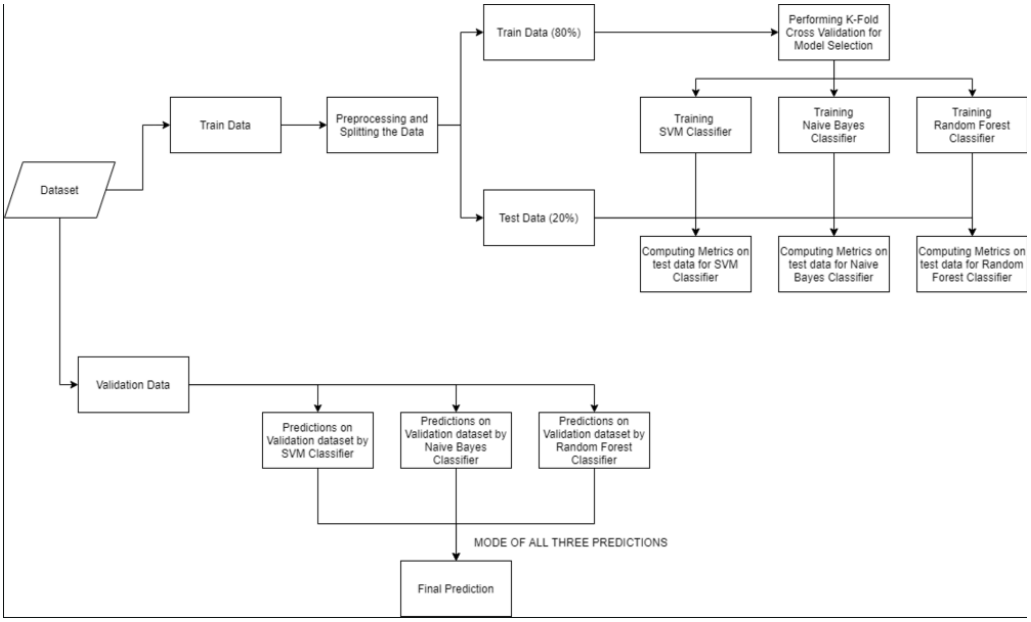
Contrastive Loss Function: The contrastive loss function is used to train the Siamese network by minimizing the distance between the vector representations of similar sentences and maximizing the distance between the vector representations of dissimilar sentences.

Overall, the Sentence Transformers algorithm combines a variety of advanced algorithms from the field of natural language processing and deep learning to create accurate vector representations of sentences and measure their similarity using cosine similarity. This allows for more accurate and reliable comparison of the semantic meaning of sentences.

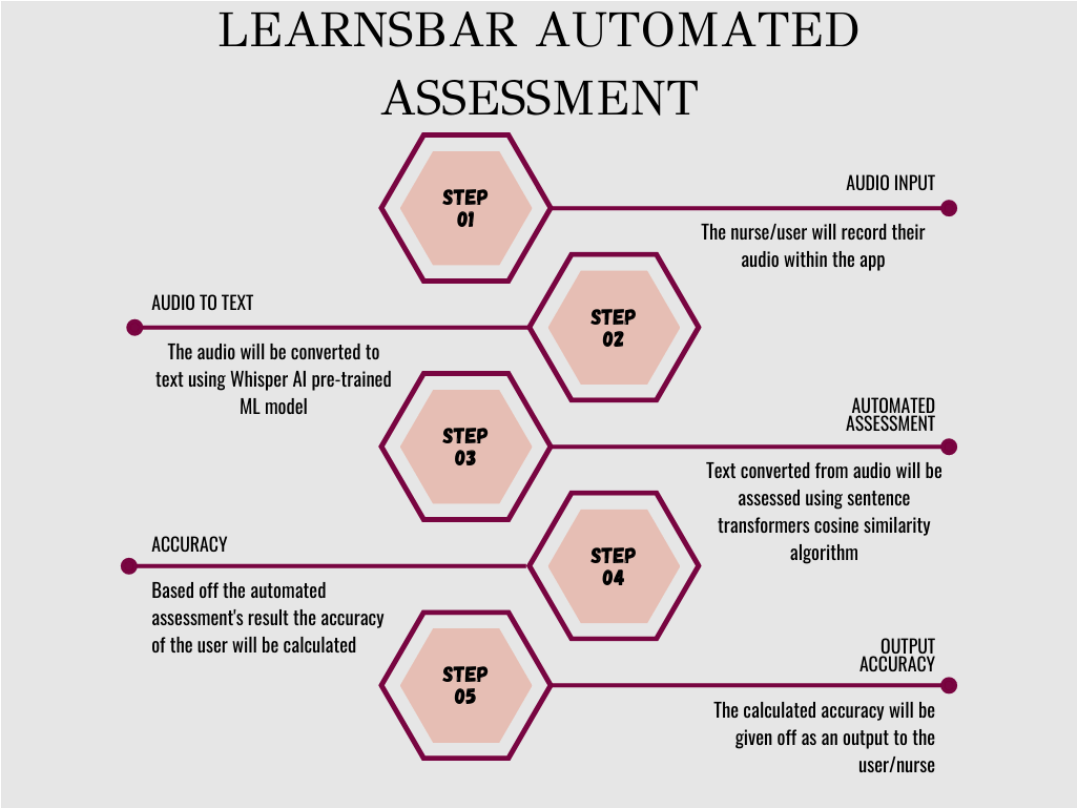
Flow of our Application:

Disease Prediction:



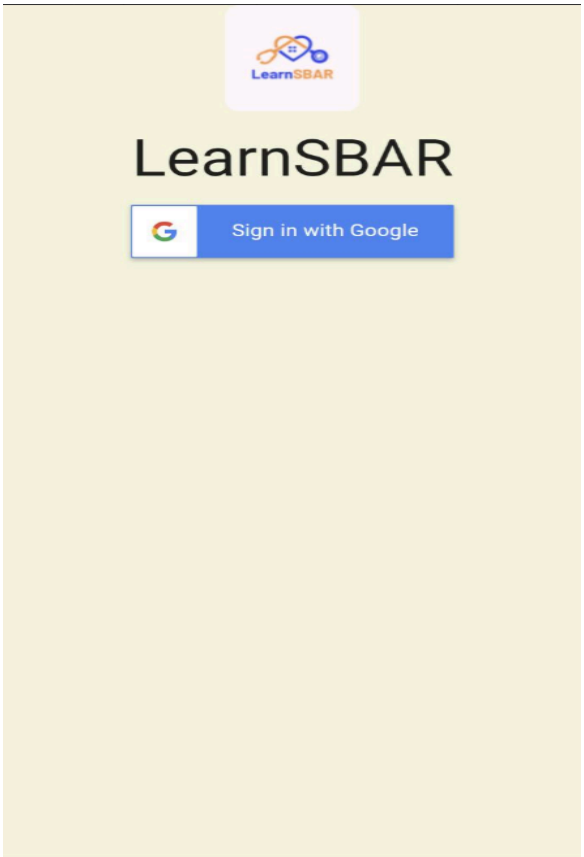


LearnSBAR Automated Assessment:



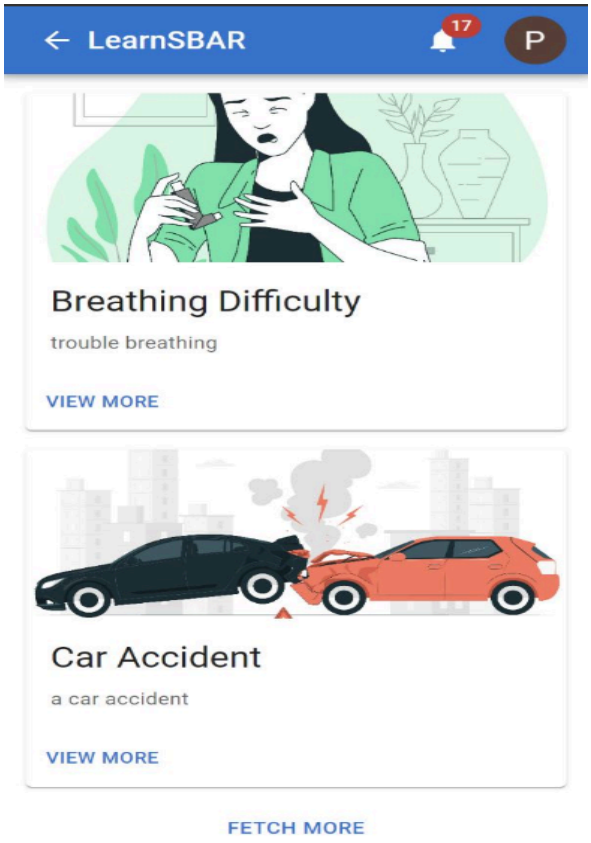
RESULTS

Sign In Page

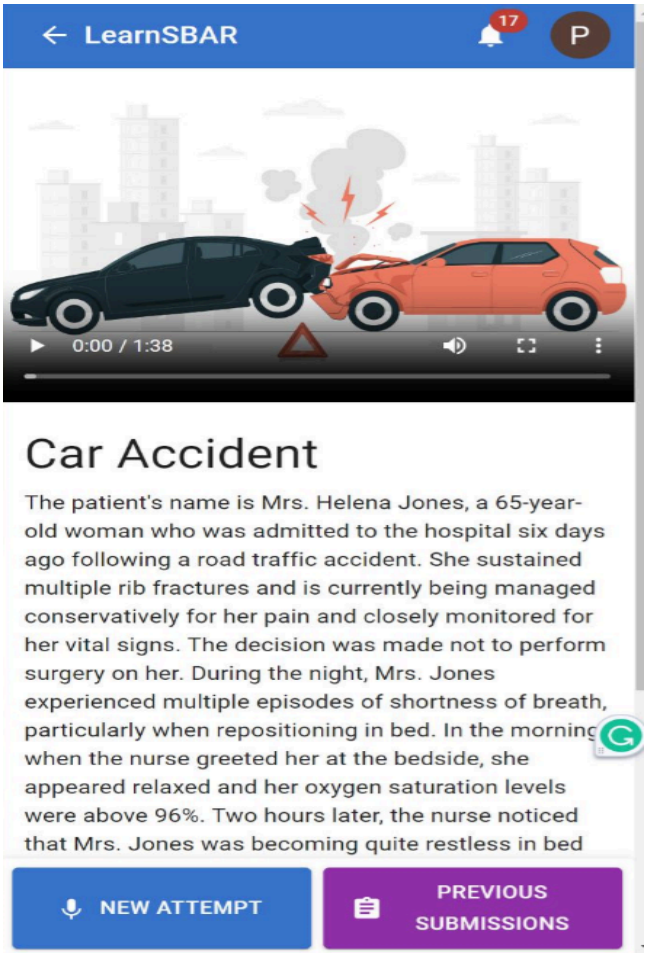


Homepage

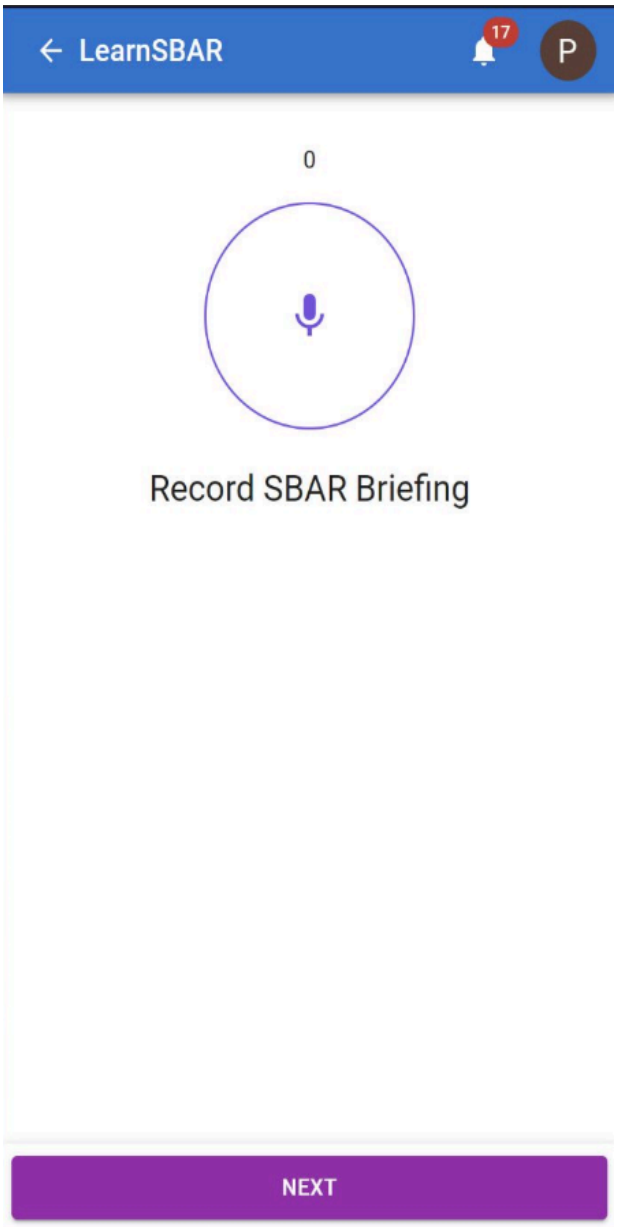
Scenarios List Page



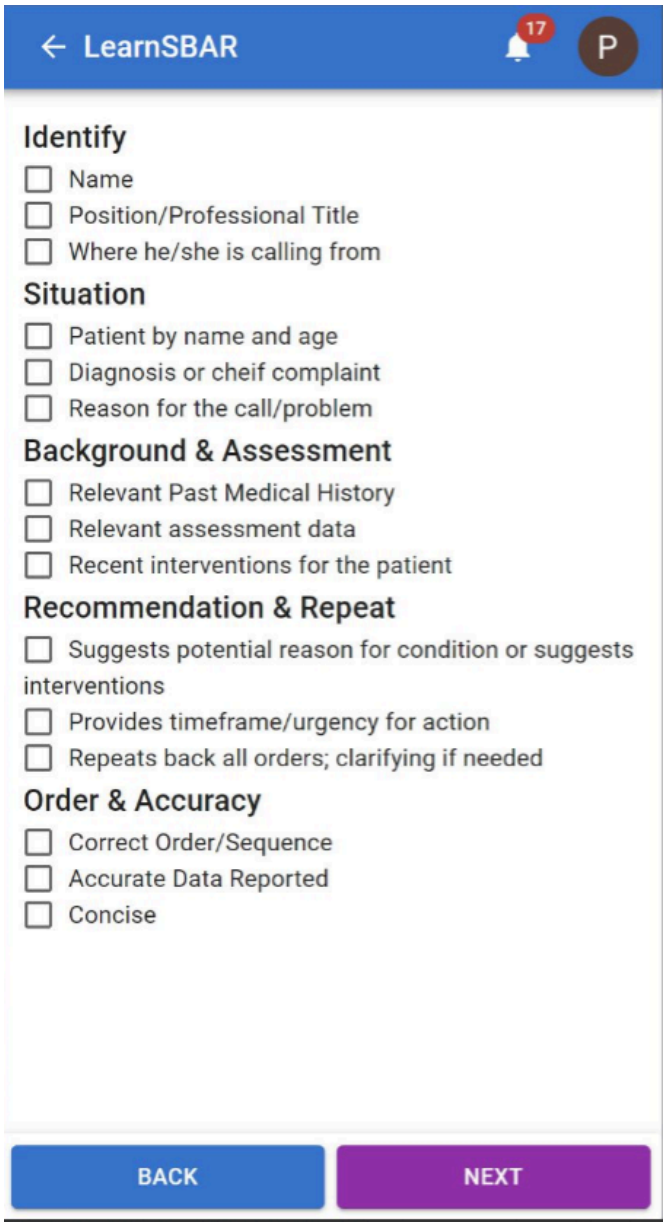
Scenario Page



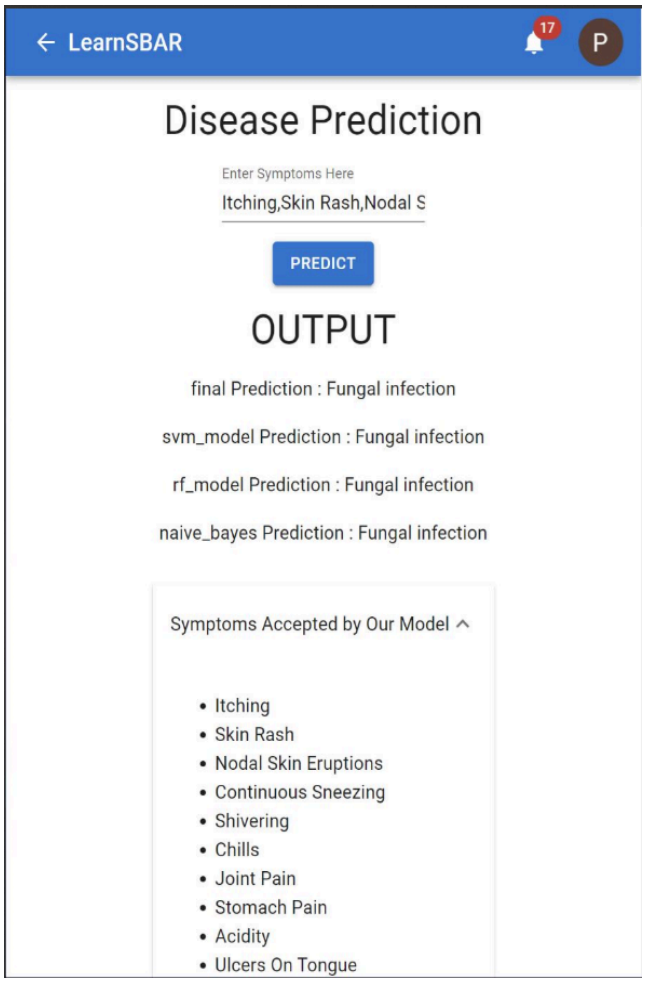
SBAR Brief Record Page



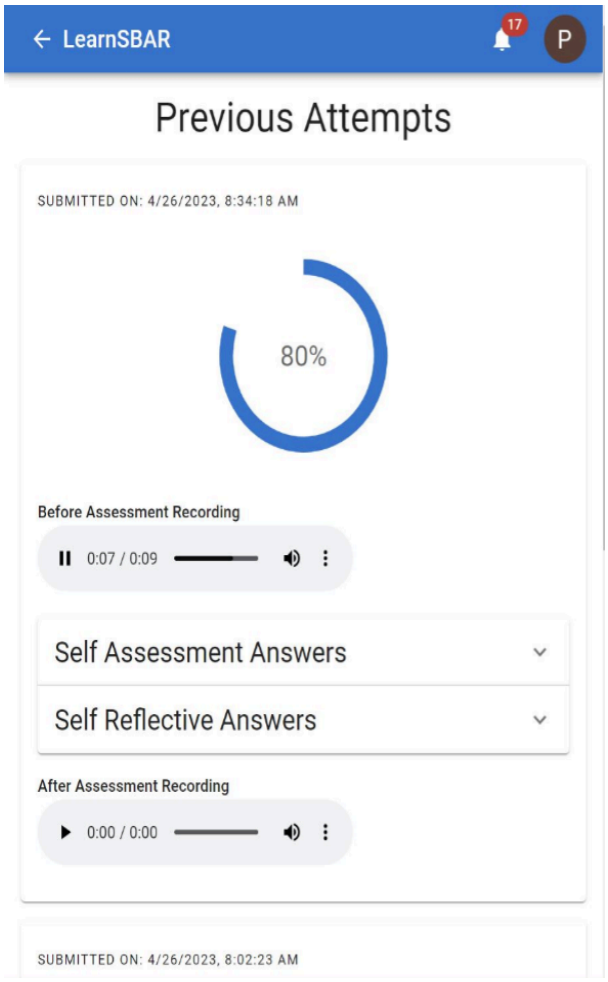
Self Assessment Page



Disease Prediction Page



Previous Attempt Page



Reasons for major changes in our Application:

1. Migration from javascript to typescript

ExpressJS is a popular and widely used web application framework for Node.js. It provides a number of features and tools for building web applications and APIs, including:

Middleware: ExpressJS provides a middleware architecture that allows developers to easily add functionality to their applications, such as authentication, logging, and error handling.

Routing: ExpressJS provides a simple and flexible routing system that allows developers to map HTTP requests to specific handlers or controllers.

Templating: ExpressJS supports a variety of templating engines, including Pug, Handlebars, and EJS, which makes it easy to create dynamic views and render them on the server.

Error Handling: ExpressJS provides a built-in error handling mechanism that makes it easy to handle errors in a consistent and organized way.

Database Integration: ExpressJS can be easily integrated with popular databases such as MongoDB and MySQL.

Security: ExpressJS provides several built-in security features, such as CSRF protection and XSS protection, to help prevent common web application vulnerabilities.

Overall, ExpressJS is a powerful and versatile framework that can be used to build a wide range of web applications and APIs. Its ease of use, flexibility, and robust feature set make it a popular choice for developers who want to build scalable and maintainable web applications with Node.js.

2. Migrate from aws to google cloud firebase.

There are several reasons why developers might consider switching from AWS to Firebase:

Serverless Architecture: Firebase provides a fully managed, serverless architecture, which means that developers can focus on building their applications rather than managing infrastructure. This can save time and reduce costs.

Real-time Database: Firebase offers a real-time database that allows developers to build real-time applications that can update data in real-time without the need for polling. This can be useful for applications such as chat apps, gaming apps, and collaborative editing tools.

Easy to Use: Firebase is designed to be easy to use and has a simple and intuitive UI that makes it easy to get started with. This can be beneficial for smaller teams or developers who are new to cloud technologies.

Scalability: Firebase is built on Google's infrastructure, which means that it is designed to be highly scalable and can handle large amounts of traffic and data.

Rich Set of Features: Firebase provides a rich set of features, including authentication, cloud storage, hosting, and analytics. This can reduce the need to use multiple cloud services and simplify the development process.

Integrated Development Environment (IDE) Support: Firebase provides excellent IDE support for popular tools such as Visual Studio Code and Android Studio, making it easy to integrate Firebase into your development workflow.

Overall, while AWS and Firebase both offer powerful cloud services, Firebase may be a better choice for smaller teams or developers who are looking for a more streamlined and easy-to-use cloud solution that can handle real-time data and has a strong set of features.

CONCLUSION

The LearnSBAR is developed using web-development tools like HTML, CSS, ReactJS and many more which fully meets the objective of the system for which it was developed. The WebApp has reached a steady state where all bugs have been squashed. The WebApp is operated at a high level of efficiency and all the teachers and users associated with the system understand its advantages. The WebApp solves the problems it was intended to solve for the required specification.

REFERENCES

Frontpage. *Official SocketIO Website.* [Online] https://socket.io/.

Pallets. Flask Documentation. *Official Flask Website.* [Online] https://flask.palletsprojects.com/en/2.1.x/.

Python 3 Documentation. *Official Python Website.* [Online] https://docs.python.org/3/.

Resources for Developers, by Developers. *Official Mozilla Website.* [Online]https://developer.mozilla.org/en-US/.

SocketIO Documentation. *Python SocketIO.* [Online] https://python-socketio.readthedocs.io/en/latest/.

ML models. Hugging face. [Online]Hugging Face – The AI community building the future.

GeekForGeeks. [Online] GeeksforGeeks | A computer science portal for geeks

scikit-learn ML library. [Online] scikit-learn: machine learning in Python — scikit-learn 1.2.2 documentation

FUTURE SCOPE

Our project can be expanded in multiple ways like:

- ❖ Add more scenarios related to the SBAR.
- ❖ Integrate more things to learn using similar practice.
- ❖ Improve UI.
- ❖ Provide live support for bug fixes and app improvements.
- ❖ Integrating with different hospitals to increase the awareness about the importance of communication.
- ❖ Feedback from the users .
- ❖ Provide mentor support for the users.
- ❖ Make the assessment based on more factors like confidence, time based speech and much more.