Slide 1:

Hello everyone, I'm Ananya Barua and I'm delighted to have the opportunity to present our research paper titled **A Multi-Model Approach for Classifying Sleep Disorders Utilizing Machine Learning and Deep Learning Techniques**.

Slide 2:

In this presentation, I will provide an overview of our research objective, discussing the methodologies employed, Result Analysis, and limitations of our research.

Slide 3: *(Introduction)*

So, what is sleep disorder?

>> Sleep disorders are conditions that mess with a person's normal sleep patterns and affect the quality of sleep.

Two common types of sleep disorders are: Insomnia and sleep apnea

Insomnia is a condition where an individual finds it difficult to fall asleep or stay asleep and **Sleep Apnea** is a sleep disorder where a person's breathing is repeatedly interrupted during sleep. Symptoms of sleep apnea may include loud snoring, choking or gasping during sleep, and daytime sleepiness. If left untreated, sleep apnea can have serious health consequences.

Early diagnosis of these sleep disorders is important for managing these conditions and helps to start the treatment sooner.

Slide 4: (Background/Motivation)

Our motivation lies in early detection of sleep disorders to facilitate timely treatment for patients.

, as traditional approaches often fall short in accuracy and accessibility. We believe that by leveraging advanced machine learning and deep learning models, we can significantly enhance the precision and efficiency of diagnosis, ultimately leading to better treatment outcomes for patients. Through rigorous performance evaluation, we determine model superiority, facilitating informed decision-making for healthcare professionals. Our comparative analysis sheds light on the strengths and weaknesses of different models, guiding the selection of diagnostic tools for improved patient care.

Slide 6: *(Research Objectives)*

Our research objectives involve adopting a multi-model approach to effectively classify sleep disorders. The primary aim is to implement various models including,

- Machine Learning
- Deep Leaning

To conduct a thorough analysis to determine the best model for accurately classifying sleep disorders.

Slide 7: *(Methodology)*

We are trying to predict three distinct classes using both machine learning and deep learning models. The classes are, “Insomnia”, “Sleep Apnea” and “None” where None refers to a person with no sleeping disorders. The dataset we’ve collected is preprocessed where the null values in the target class have been replaced with “No Disorder”. Through feature engineering, it breaks down important characteristics into detailed features and simplifies the dataset by removing unnecessary attributes. Then data is strategically split into 75% for training sets and 25% for testing sets and fed into the models.

Here for machine learning, we have used Random Forest and Gaussian Naïve Bayed Models. For deep learning we have used 1D CNN and created and hybrid model by combining 1D CNN and 1D CNN+Bidirectional LSTM. The hybrid architecture blends the strength of bidirectional LSTM’s temporal modeling with the spatial feature extraction powers of 1D CNN which helps to classify sleep disorders more accurately and effectively. The models used here showed great efficiency in handling diverse datasets and complex patterns. Finally, each model showed great performance in classifying sleep disorders into three categories with great accuracy.

Slide 8: *Result and Analysis*

Here the Accuracy Analysis Table demonstrates the level of accuracy achieved by each model. Two machine learning models, namely Random Forest and Gaussian Na¨ıve Bayes, have high accuracies of 88% and 72% respectively. Among deep learning approaches, the 1D CNN model demonstrated an impressive accuracy of almost 90.67% whereas our hybrid model 1D CNN + Bidirectional LSTM outperformed its counterparts with an accuracy of 92%. This shows that in identifying sleep disorders in three different classes, the deep learning models show great performance.

Slide 9: *(Limitations)*

1. Our dataset, the 'Sleep Health and Lifestyle Dataset,' relies on synthetic data which means real-life details might impact how well our outcome.
2. Another factor to consider is the dataset contains only 500 entries, there's a concern about how well our findings can be generalized to a larger population.
3. Machine learning and deep learning models, while powerful, often pose challenges in terms of interpretability. In healthcare, understanding the reasoning behind model predictions is important.
4. One more consideration is the absence of real-time monitoring in our dataset. This limitation affects our ability to capture and analyze patient data in real-time scenarios.

Slide 10: ***(Conclusion)***

We have successfully implemented diverse models for classifying sleep disorders into three distinct categories.
Our implemented model utilizes the best features of 1D CNN and Bidirectional LSTM model.
The study's inclusion of both machine learning and deep learning models allows a comprehensive comparison between the models.
The hybrid model 1D CNN + Bidirectional LSTM shows the highest accuracy of 92% in classifying sleep disorders.

In our Future work, we intend to delve into the utilization of electrocardiogram (ECG) data as a novel approach to detecting sleep disorders. By integrating ECG signals into our analysis, we aim to enhance the accuracy and depth of our classification models, thereby offering a more comprehensive understanding of sleep patterns and their associated disorders.

Slide 11: ***(THANK YOU)***

Thank you everyone for your time.