SLEEP DISORDER PREDICTION USING MACHINE LEARNING

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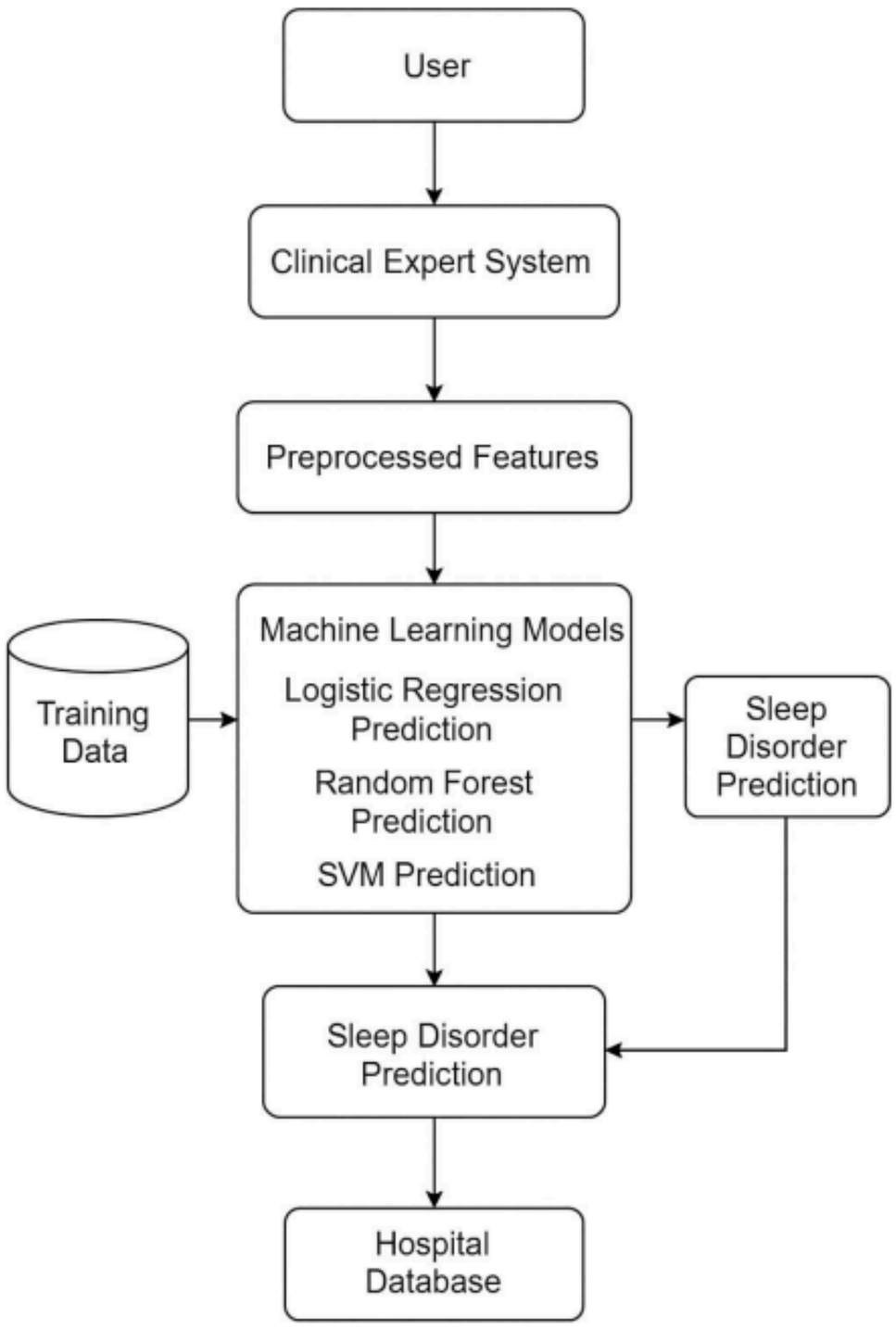
INTRODUCTION

Sleep disorders negatively affect quality of life, mental health, and productivity. Manual diagnosis through clinical studies is time-consuming and error-prone. This project predicts sleep disorders using ML models
trained on lifestyle and health data, offering a faster, scalable, and interpretable approach.

ARCHITECTURE DIAGRAM



OBJECTIVE

- To predict sleep disorders by analyzing health and lifestyle attributes using machine learning.
- To create predictive models for identifying sleep disorders using variables like age, BMI, heart rate, stress level, and occupation.
- To build an accurate and interpretable tool for clinical decision-making.

Sources and related content

METHODOLOGY

- Employs machine learning and deep learning techniques.
- Uses deep learning models (CNN, LSTM, MLP) to extract features from sleep-related data.
- Classifies features using Random Forest and XGBoost.
- Includes feature selection and importance measures.
- Models used: Logistic Regression, SVM, Random Forest, Hybrid Model.
- Technology: Python, pandas, NumPy, scikit-learn, seaborn, matplotlib, joblib.

RESULTS

- The study evaluated several machine learning models for sleep disorder prediction.
- Models included Logistic Regression, Random Forest, Support Vector Machine (SVM), and a Hybrid Model.
- Performance was measured using accuracy, precision, recall, and F1-score.

Accuracy:
- Logistic Regression: 89.39%
- Random Forest: 93.18% (Highest)
- SVM: 91.67%
- Hybrid Model: 88.64%

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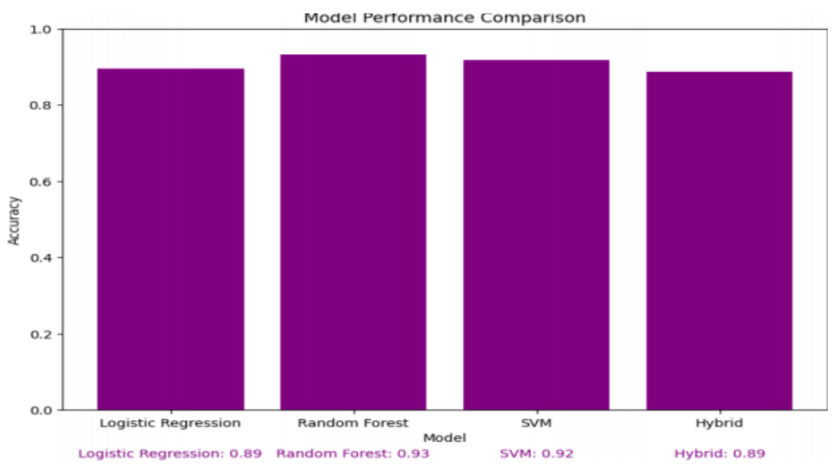
ANALYSIS

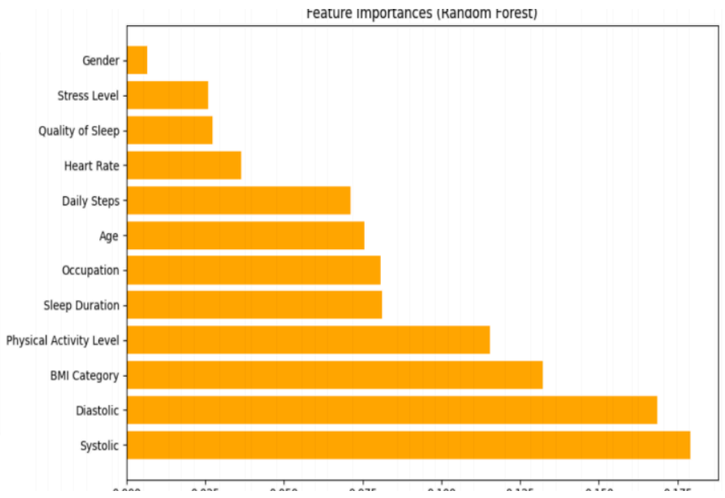
- The study utilized machine learning models to predict sleep disorders based on health and lifestyle data.
- Key performance metrics used to evaluate the models included accuracy, precision, recall, and F1-score.

Model Performance:
- The Random Forest model achieved the highest accuracy at 93.18%.
- Other models (Logistic Regression, SVM, Hybrid Model) also demonstrated strong predictive capabilities.

Feature Importance:
- Analysis of feature importance revealed the significant factors influencing sleep disorder predictions.

Hybrid Model Analysis:
- The Hybrid Model combined predictions from individual models to leverage their strengths.
- While its overall accuracy was slightly lower than Random Forest, it offers robustness and potential for real-world application.





Hybrid Model

Class	Precision	Recall	F1-Score	Support
0	0.88	0.76	0.81	29
1	0.82	0.94	0.88	52
2	0.98	0.90	0.94	51
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Accuracy	0.89			132

CONCLUSION

- Machine learning offers a valid approach for early diagnosis and risk evaluation of sleep disorders.
- Several models, including Logistic Regression, Random Forest, SVM, and a Hybrid model, were used to predict sleep disorders.
- The Random Forest model achieved the highest accuracy (93.18%).
- All models demonstrated strong performance in detecting sleep disorders.
- The models can be deployed in healthcare settings to aid clinicians in decision-making.
- The study highlights the potential of machine learning to improve healthcare through proactive management of sleep disorders.

RELATED LITERATURE

- Agarwal & Mehta (2021) provide an overview of sleep disorders and their detection using machine learning techniques.
- Chen & Wang (2020) offer a review of deep learning approaches for sleep stage detection.
- Das & Gupta (2021) discuss the use of wearable devices for sleep monitoring from a machine learning perspective.