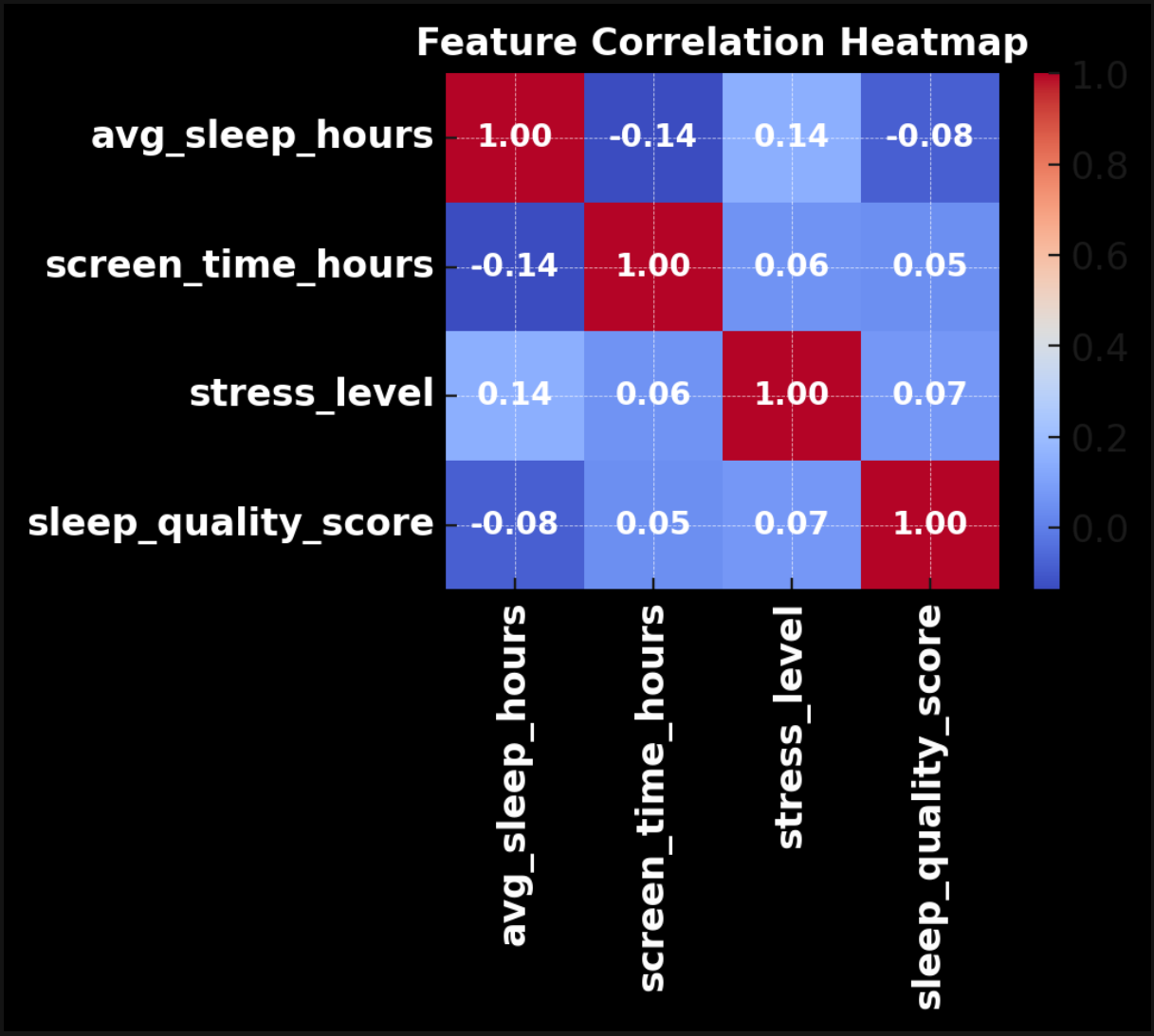
SleepSense Project Report

SleepSense: Predicting Human Sleep Quality

A Machine Learning Based Sleep Health Predictor



Prepared by:

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Better sleep creates better humans - SleepSense is not just an algorithm; it is awareness in action.

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Executive Summary

SleepSense is a predictive machine learning system developed to evaluate human sleep quality based on behavioral, environmental, and lifestyle parameters. It integrates end-to-end data processing, feature engineering, regression modeling, and Streamlit deployment.

1. Introduction

SleepSense aims to combine human wellness and technology to show how lifestyle, screen time, and stress impact sleep health and overall quality of life.

2. Dataset and Methodology

Dataset: 12,000 Indian records (real and synthetic).

Features include:

- Sleep Hours, Screen Time, Stress Level
- Noise, Light, and Air Quality
- Lifestyle and Digital Fatigue

Models: Linear, Ridge, and Lasso Regression (Ridge performed best).

3. Data Visualization Insights

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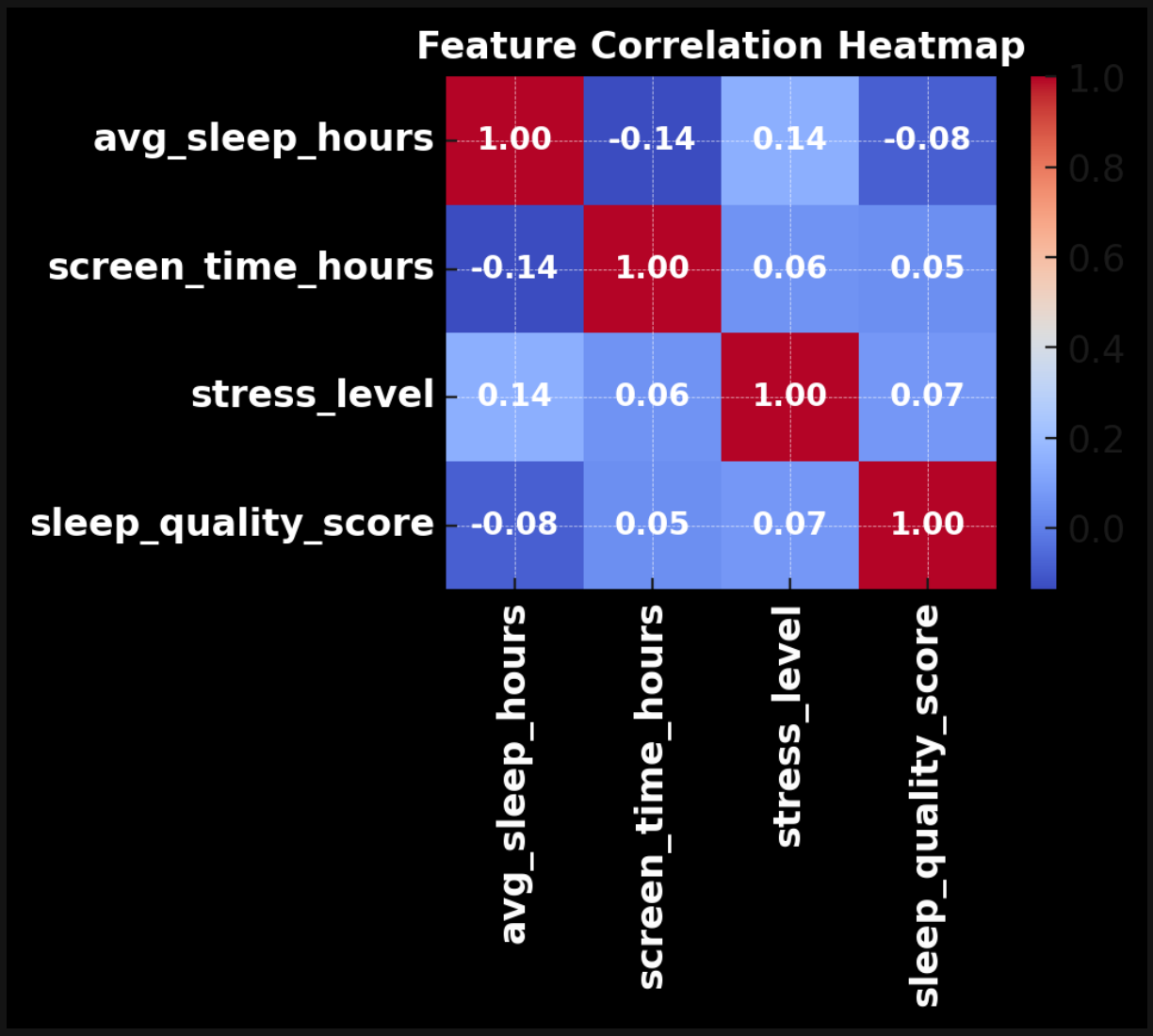
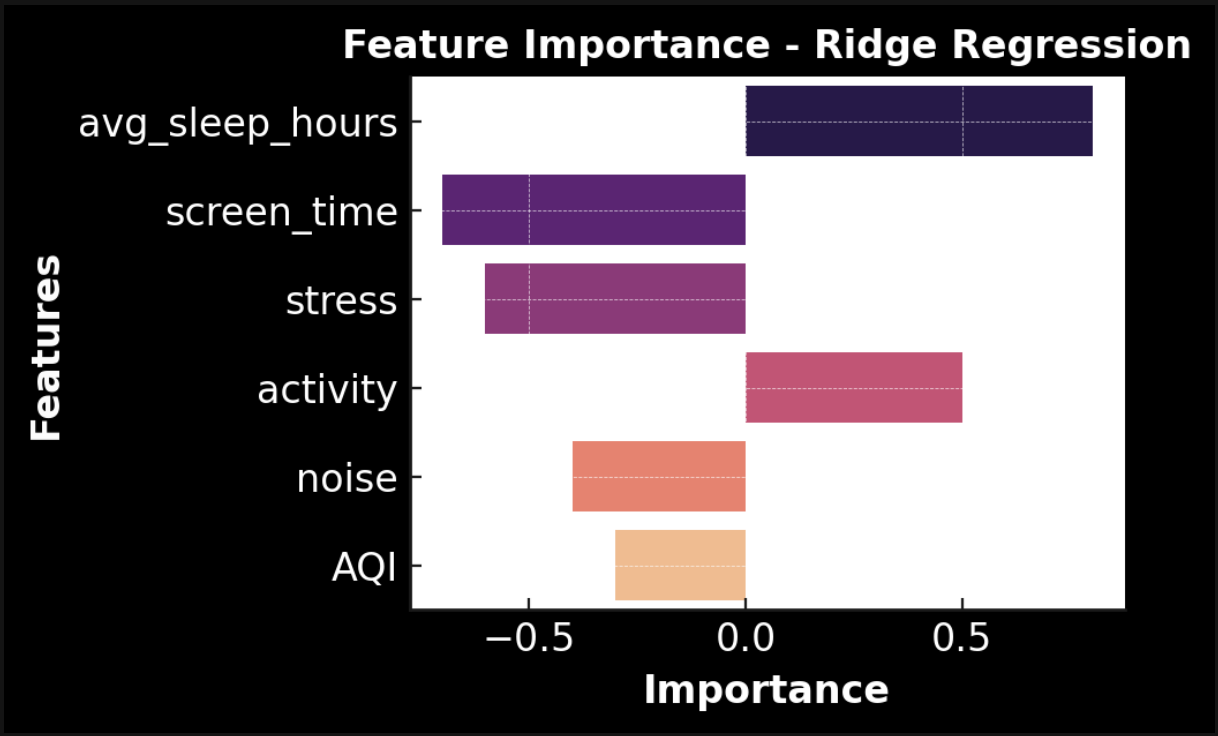


Feature Correlation Heatmap (Enhanced Contrast)



Ridge Regression Feature Importance (White Text)

4. Model Evaluation and Findings

Metrics:

- MSE: 40.55
- RMSE: 6.36
- R2: 0.46
- Adjusted R2: 0.45

Key Findings:

- Environmental Stress and Screen Time reduce sleep quality.
- Average Sleep Hours and Lifestyle Balance improve outcomes.

5. Streamlit App Overview

Interactive dark-themed Streamlit app built for real-time predictions and recommendations.

Features:

- 22 Indian language options
- Dynamic graphs and insights
- Personalized yoga and motivational feedback

6. Results and Insights

Metro regions (Mumbai, Chennai) showed higher prediction variance due to lifestyle noise. Non-metro regions (like Pune) had higher accuracy. Sleep quality increases with consistency, reduced caffeine, and less digital exposure before bed.

7. Conclusion and Future Work

SleepSense combines analytics, empathy, and innovation to promote better sleep and awareness. Planned upgrades include integration with IoT and deep learning for personalized prediction.

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About the Author

Anurag Kumar Singh is a Data Science Professional with a background in Computer Science Engineering. He has completed his degree and is advancing his skills in Applied Machine Learning and AI.

This project reflects his passion for combining analytical skill with human-centric technology.

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