STUDENT STRESS DETECTION SYSTEM USING MACHINE LEARNING

SYNOPSIS (MAJOR PROJECT)

SUBMITTED BY:

KHUSHI PANDEY
Roll No: 23001530029

GUIDED BY:
Mr. AMAN MISHRA

GOEL INSTITUTE OF TECHNOLOGY & MANAGEMENT

ACKNOWLEDGEMENT

I would like to express my sincere gratitude to my respected project guide, Mr. Aman Mishra, for his continuous support, encouragement, and valuable guidance throughout the development of this mini-project. His expertise and constructive feedback have helped shape this work professionally.

I am also grateful to the Department of Computer Science and Engineering (AI & ML), Goel Institute of Technology & Management, for providing the essential resources, academic environment, and technical support required for this project.

Finally, I extend heartfelt thanks to my family and friends for their motivation, patience, and constant support during every stage of this project.

— Khushi Pandey (23001530029)

ABSTRACT

Stress among students has significantly increased due to academic pressure, competitive exams, irregular sleep cycles, lifestyle imbalance, and prolonged screen exposure. These factors affect mental well-being, concentration, academic performance, and overall health.

The Student Stress Detection System uses Machine Learning classification models to predict the stress level of a student based on measurable lifestyle and academic attributes. The dataset includes features such as sleep duration, study hours, screen time, attendance, diet rating, mood, physical activity, and health symptoms.

The model uses multiple ML algorithms, including Logistic Regression, Random Forest, SVM, Decision Tree, and KNN. Model performance is evaluated using accuracy, precision, recall, F1-score, and confusion matrix.

This mini-project introduces students to end-to-end ML pipeline development, including dataset design, preprocessing, visualization, training, evaluation, and result interpretation.

CHAPTER 1: INTRODUCTION

Student stress has become a critical issue in educational institutions worldwide. Stress adversely impacts student performance, emotional stability, and physical health. Identifying stress early enables intervention, counseling, and support.

This project leverages Machine Learning techniques to analyze daily behavioral and academic patterns and predict the stress category: Low, Moderate, or High. The aim is to support educational institutions in promoting mental wellness and helping students achieve a balanced academic life.

Objectives:

- Develop a dataset of lifestyle and academic parameters.
- Preprocess, clean, and encode data for ML.
- Build ML models to identify stress levels.
- Evaluate the models and select the best-performing classifier.
- Provide a simple prediction interface for student stress detection.

Scope:

- Applicable to colleges, schools, and mental wellness departments.
- Can be extended into a web or mobile-based app.
- Useful for academic counselors for early stress detection.

CHAPTER 2: LITERATURE SURVEY

Several research studies highlight that lifestyle patterns, physiological responses, and emotional stability influence academic stress. Traditional stress detection relied on surveys like the Perceived Stress Scale (PSS), but modern approaches leverage computational intelligence.

Machine Learning-based systems have been used for psychological state detection, mood prediction, and health diagnosis.

Recent works show ML models such as Random Forest and SVM achieve reliable performance in classifying stress levels. Deep learning and wearable sensors have also been investigated, but they increase cost and complexity.

Our project focuses on a simple, dataset-driven, cost-effective ML method requiring no medical devices.

CHAPTER 3: DATASET DETAILS & METHODOLOGY

The dataset includes the following attributes(includes 13 features + 1 output)

1. sleep_hours – Average hours of sleep per day.
2. study_hours – Daily time spent studying.
3. screen_time – Daily mobile/PC usage duration.
4. physical_activity – Exercise duration.
5. attendance – Percentage of classes attended.
6. diet_quality – Rated as Good, Average, Poor.
7. mood – Happy, Neutral, Sad.
8. health_symptoms – Presence of headache, fatigue, irritation, etc.
9. commute_time – Daily travel duration between home and college.
10. exam_pressure – Level of exam-related pressure (Low/Medium/High).
11. assignment_load – Number of weekly assignments or academic tasks.
12. sleep_quality – Quality of sleep experienced (Good/Average/Poor).
13. social_support – Level of emotional support from friends or family.
14. stress_level – Target output with three classes: Low, Moderate, High.

Technology Stack:

- Python Programming
- Pandas & NumPy for data handling
- Matplotlib & Seaborn for visualization
- Scikit-Learn for model development
- Jupyter Notebook / VS Code environment

Each feature undergoes preprocessing such as missing value handling, encoding, normalization, and scaling

PHASE 1: DATA COLLECTION

Data are gathered using a questionnaire that captures lifestyle and mental health indicators.

PHASE 2: DATA PREPROCESSING

- Removal of missing or inconsistent values
- Label Encoding for categorical attributes
- Normalization using MinMaxScaler/StandardScaler
- Train-test split (80/20)

PHASE 3: MODEL BUILDING

ML algorithms implemented:

- Logistic Regression (baseline)
- Random Forest Classifier
- Support Vector Machine
- Decision Tree Classifier

PHASE 4: MODEL EVALUATION

- Accuracy Score
- Precision
- Recall
- F1-Score
- Confusion Matrix

PHASE 5: FINAL SYSTEM

User inputs values → Model predicts stress category.

CHAPTER 4: FACILITIES REQUIRED

I am planning to implement the Model with UI/UX, using some web stacks like Flask, HTML, CSS, JS, for a simple version.

Software Requirements:

- Python 3.x
- Jupyter Notebook / VS Code
- Pandas, Numpy, Sklearn
- Matplotlib, Seaborn

Hardware Requirements:

- Desktop or Laptop
- Minimum 2GB RAM
- Dual-core processor or higher

CHAPTER 5: CONCLUSION

The Student Stress Detection System demonstrates how Machine Learning can help identify stress levels among students using everyday academic and lifestyle data. By analyzing factors like sleep, study habits, mood, and workload, the model provides a quick and reliable indication of whether a student is experiencing low, moderate, or high stress. This system can be easily extended with a simple web-based interface, allowing students to check their stress levels in real time and colleges to better understand overall student well-being.

The motivation behind this project is rooted in the fact that many students silently struggle with stress but hesitate to share it with others. A tool like this can help institutions recognize early signs of distress and encourage students to seek support. While the model only predicts stress levels, it serves as a meaningful first step toward creating a healthier and more supportive academic environment.