

A Data-Driven Approach to Identifying and Preventing Burnout in High-Stress Environments Using ML

Synopsis on

Mini Project-III

(UCBIL0571)

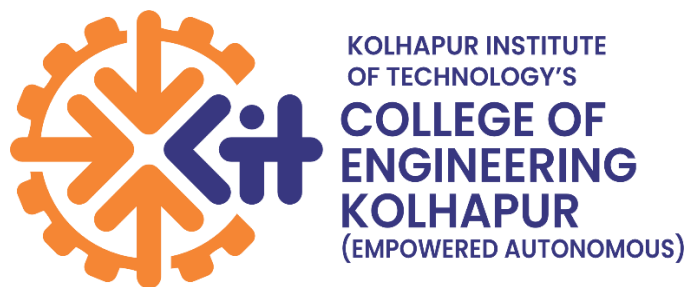
by

Roll no.	Name	PRN
A32	Ajit Birajdar	2324000805
A34	Om Nalawade	2324000862
A41	Chinmai kulkarni	2324001291
A43	Anagha Shelake	2324000941

Under the Guidance of

Mrs. Pramila Gadyanavar

Asst. Professor



Department of Computer Science and Business Systems

KIT's College of Engineering (Empowered Autonomous) Kolhapur

August, 2025

Abstract

This mini-project addresses the significant issue of stress-induced burnout, a condition that severely compromises individual mental well-being, academic performance for students, and workplace productivity for employees. The core objective is to develop a novel machine learning-based system capable of providing early detection of burnout risk and facilitating proactive intervention. Our methodology primarily involves collecting and analysing multi-dimensional, self-reported daily data, including metrics on perceived stress, sleep quality, mood, activity levels, and academic/workload hours. Utilizing advanced classification algorithms, the system will learn to identify patterns indicative of burnout risk levels. The anticipated outcome is a functional prototype that not only accurately predicts risk levels but also generates personalized, actionable insights and timely suggestions, empowering users to recognize early warning signs and implement preventative strategies before burnout becomes severe.

INTRODUCTION

In today's demanding academic and professional environments, stress has become an unavoidable reality, frequently culminating in the debilitating condition of burnout. This state, characterized by profound emotional exhaustion, cynicism, and a reduced sense of accomplishment, not only deteriorates an individual's mental and physical health but also severely compromises their academic performance, workplace productivity, and overall quality of life. Traditional approaches to managing stress and preventing burnout often prove insufficient, typically responding only after severe symptoms manifest and lacking the personalized insights necessary for effective, timely intervention.

Addressing this critical gap, this project proposes the development of a Stress Burnout Detection and Prevention System using Machine Learning. By harnessing the analytical capabilities of artificial intelligence, our system aims to transcend conventional reactive strategies. It will continuously analyze self-reported daily data on lifestyle, emotional states, and workload, leveraging sophisticated machine learning algorithms to identify subtle, early indicators of burnout risk. The ultimate goal is to equip users with proactive, data-driven insights and actionable recommendations, enabling them to recognize warning signs and implement preventative measures to foster greater resilience against chronic stress before burnout takes hold.

MOTIVATION

The relentless pace of modern academic and professional life has made stress and its severe manifestation, burnout, a pervasive concern, deeply affecting students and employees. This condition, marked by exhaustion and reduced effectiveness, not only degrades individual mental and physical well-being but also significantly compromises academic performance and workplace productivity, leading to increased absenteeism and turnover. Current stress management and prevention strategies are largely reactive and offer generalized advice, failing to provide the personalized, timely insights essential for effective early intervention.

This project is thus motivated by the critical need for a proactive and data-driven solution. By harnessing the predictive capabilities of Machine Learning, we aim to develop an intelligent system that can analyse continuous self-reported data to identify subtle, early warning signs of burnout. This will empower individuals with personalized insights and actionable preventative strategies, fostering greater resilience against chronic stress and ultimately enhancing overall quality of life and productivity in academic and professional ecosystems.

OBJECTIVES

The primary objectives for this mini-project are to:

- **Develop a Machine Learning Model for Stress/Burnout Risk Prediction:** Design and train a robust classification model capable of accurately assessing an individual's risk of stress-induced burnout based on input features (e.g., self-reported data on mood, sleep, workload).
- **Implement a Data Collection and Preprocessing Pipeline:** Establish a system for efficiently collecting relevant user data and transforming it into a suitable format for machine learning model training and inference.
- **Create a User Interface for Data Input and Visualization:** Build a simple, intuitive interface that allows users to input their daily data and view their stress/burnout risk predictions and historical trends.
- **Provide Basic Interpretations and Actionable Feedback:** Generate easily understandable feedback based on the model's predictions, offering general insights or simple suggestions for stress management.
- **Evaluate Model Performance:** Assess the accuracy and effectiveness of the developed machine learning model using appropriate metrics and a test dataset.

PROBLEM STATEMENT

In the demanding contemporary landscape of academic and professional life, individuals are increasingly susceptible to stress-induced burnout, a pervasive condition characterized by profound emotional exhaustion, cynicism, and reduced personal accomplishment. This syndrome not only severely compromises individual mental well-being and physical health but also significantly diminishes academic performance, workplace productivity, and overall quality of life. Current approaches to managing and preventing burnout are predominantly reactive, often failing to detect the condition until it becomes severe, and typically offer generalized advice that lacks the personalized and timely insights crucial for effective early intervention. Thus, there is a critical need for a proactive and intelligent solution capable of identifying burnout risk early and facilitating preventative strategies.

REFERENCES

- **Using Machine Learning in Burnout Prediction: A Survey**
Grządzielewska, M., et al. (2021)
- **Application of Deep Learning Techniques to Detect Workplace Burnout** SSRN (2025)
- **Stress Detection in IT Employee Using Machine Learning**
Gonti Harika (2023), IJRPR
- **3 Essential Data-Driven Strategies for Managers to Prevent Employee Burnout** Alleo.ai (2024)
- **How to Reduce Developer Burnout With A Data-Driven Approach**
Hatica.io (2024)
- **Burnout Risk Profiles in Psychology Students: An Exploratory Study with Machine Learning** (<https://www.mdpi.com/3262646>)