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# Depression Risk Prediction among Tech Employees Using Machine Learning

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**ABSTRACT**

Depression is a growing concern in the tech industry due to high workload, tight deadlines, and constant exposure to digital environments. This study explores the application of machine learning algorithms to predict the risk of depression among tech employees based on workplace, behavioural, and psychological factors. Data was collected through surveys incorporating standardized mental health assessment scales and workplace-related parameters. Various supervised learning models such as Random Forest, Support Vector Machine, and Logistic Regression were trained and evaluated. The Random Forest model achieved the highest accuracy in identifying individuals at risk. Feature importance analysis revealed key predictors including work-life balance, sleep, patterns, and job satisfaction. The models predictions can help HR and mental health professionals implement timely interventions. This research demonstrates the potential of machine learning in supporting mental health awareness and early risk detection in corporate tech environments.

## I. INTRODUCTION

The depression has become a significant mental health challenge, particularly among employees in the technology sector who often face long working hours, high-performance expectations, and limited work-life balance. The traditional mental health assessments are often subjective and delayed. Machine learning offers a data-driven approach to identify depression risk early by analysing behavioural, social, and occupational data. This predictive mental health interventions in workplace settings.

Recent advancements in ML models like Random Forest, SVM, and deep learning have shown high accuracy in mental health prediction. This study aims to build an effective ML-based framework for early detection of depression among tech professionals.

## II. EXISTING SYSTEM

We have few systems which uses basic algorithms. The attempt to detect the problem through tweets but yielding less efficiency. Existing system uses Naïve Bayes algorithms, Support vector Machine, Gaussian Classifiers etc, but the disadvantage being they need lot of Data for training which apparently takes more execution time and also yields less efficient outputs.

The Data privacy and ethical concerns are also critical challenges in current implementation.

Deposite their limitations, these systems have demonstrated moderate success in early detection and awareness.

## III. PROPOSED SYSTEM

The proposed system in an employee stress detection system that utilizes machine learning algorithms to accuracy detect stress levels in employees. The system collects data related to employee demographics, job role, job satisfaction, leaves taken, workload level, and other relevant factors to analyse and classify employee stress level. The system provides real-time feedback to employees, allowing for timely interventions to mitigate stress levels. Untreated stress leads to self-harm or in extreme cases suicide. It adversely affects the physical health of a patient, such as increased aches and pain, insomnia or oversleeping and weight problems. Fortunately, studies have shown that stress can be treated. Early detection and treatment of stress can give us good results. The proposed model is closely related in the detection of depression. This system determines if the person suffers from stress.

## IV. LITERATURE SURVEY

Depression is increasingly prevalent among tech employees due to high job demands, long working hours, job insecurity, and remote work-induced isolation. Identifying risk factors and developing predictive models can enable early intervention and support mental well-being in the tech industry:

- This study utilizes machine learning algorithms, including sparse logistic regression, support vector machines, and random forests, to predict depression risk among young Korean employees.
- This research explores the use of deep language models for detecting depression and anxiety from conversational speech.
- This analysis employs various machine learning classifiers, including logistic regression, decision trees, and gradient boosting, to predict mental health diagnoses among tech employees.

## V. SYSTEM ARCHITECTURE

High-Level Overview of the Architecture

The AI Desktop Assistant follows a modular, layered architecture to separate functions and enable smooth data flow between components. Major layers include the **User Interface Layer** (for interaction), **Processing Layer** (for command interpretation), **Task Execution Layer** (for performing actions), and **Learning Layer** (for machine learning-based improvements).

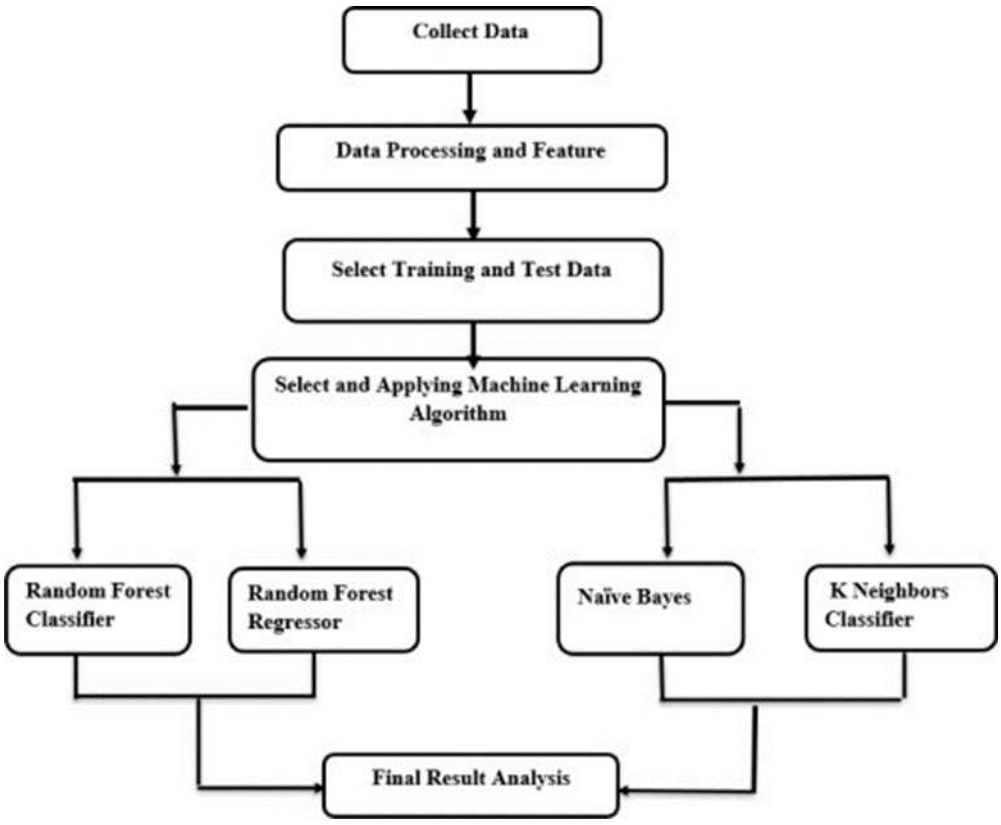
### 1.1 Collect Data

1. Surveys
2. Behavioral Logs
3. Wearables
4. HR databases

### 1.2 Data Processing and feature Engineering

- Cleaning the data
- Normalizing or standardizing variables.

### 1.3 Select and apply Algorithms



## VI. RESULTS

**Task Execution**: The execution of tasks aimed at predicting and mitigating depression risk among tech employees involves a systematic, multi-phase approach that integrates data collection, model development, intervention design, and evaluation.

**Response Time**: Response time refers to the duration between the identification of depression risk indicators.

## VII. CONCLUSION

**Summary of the Project**

Depression is increasingly recognized as a critical mental health issue in the tech industry driven by a combination of occupational lifestyle and psychological factors.

**Reflections on the Learning Outcomes**

Understanding of mental health in High-Stress Industries I gained a deeper appreciation of how fast-paced, innovation-driven environments like the tech sector can silently contribute to mental health issues.

**Practical Applications and Future Scope**

The integration of mental health awareness into workplace practices has led to several practical applications aimed at reducing depression risk among tech employees. Technological advancements have facilitated the development of digital mental health tools such as AI-driven mobile applications that provide cognitive behavioural therapy (CBT), mood tracking, and emotional support. These platforms often incorporate data from wearable devices to monitor physiological indicators like sleep patterns, heart rate, and activity levels, enabling early detection of stress and burn out.

Furthermore, organizations are increasingly employing predictive analytics using machine learning models that analyse HR records, workplace behaviour, and self-reported surveys. These tools help in identifying employees at risk and allow for timely intervention. As a result, companies are better equipped to formulate evidence-based wellness strategies tailored to their workforce.

Workplace policy reform is another significant application. Many tech companies are now adopting mental health-friendly policies such as flexible working hours, provision of mental health days, and resources for counselling and psychological support. Additionally, employee training programs on mental health literacy for managers and peer support systems foster a more supportive and stigma-free work environment.

## VIII. REFERENCES

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