



Detection of Stress for IT Employees using Machine Learning

M. Jayabharathi*

Department of Management Studies, St. Joseph's College of Engineering and Technology, Thanjavur, Tamilnadu, India.

*Corresponding author

DoI: <https://doi.org/10.5281/zenodo.7883331>

Abstract

Stress has become increasingly common among IT employees due to the high demands and long working hours of their jobs. It can manifest itself in a variety of ways, including physical and mental exhaustion, anxiety, and depression. As such, it is important to detect stress in IT employees in order to provide them with the necessary resources and support to cope with it. Machine learning can be used to detect stress in IT employees by analyzing various data points from their daily activities. This could include data gathered from surveys, physiological recordings, and even digital footprints. By using algorithms to analyze the data, machine learning can identify patterns that indicate stress and provide an accurate assessment of an individual's stress level. One way to use machine learning for stress detection is to create a model that utilizes data from surveys and physiological recordings to identify stress-related behaviors. The model would monitor an individual's activity and analyze it for signs of stress, such as increased heart rate, changes in sleep patterns, and irregular levels of fatigue. The model would then provide the individual with feedback and recommendations on how to better cope with the stress they are experiencing. Another way to use machine learning for stress detection is to utilize digital footprints in combination with survey data.

Keywords: Stress, IT Employees, Working Hours, Resources, Data Point, Foot Prints, Machine Learning.

1. Introduction

The use of machine learning to detect stress among IT employees is increasingly becoming an important tool for employers. By leveraging machine learning, employers can identify and respond to issues before they become unmanageable, enabling them to create a healthier, more productive workplace [1]. Stress is a common problem among IT employees, as the pressure of deadlines and tight schedules can lead to burnout. Stress can also lead to reduced job satisfaction, increased absenteeism, and decreased productivity. By using machine learning to detect stress, employers can identify employees who are feeling overwhelmed and intervene before the situation becomes unmanageable [2]. Machine learning algorithms can use various sources of data to identify employees who are at risk of experiencing stress. This can include analyzing emails and other communications for signs of stress, as well as monitoring employee activities both in and out of the office. Machine learning can also feed on reactions to change and feedback on tasks, as well as employee performance metrics [3]. By analyzing these data points, employers can gain a better understanding of when an employee is feeling overwhelmed and take action to help them. Once stress is detected, employers can take a number of steps to help the employee. This can range from providing additional support, such as mentoring or counseling, to helping the employee manage their workload more efficiently [4]. Employers can also use machine learning to recommend personalized stress-reduction strategies that can help the employee manage the situation. The use of machine learning to detect stress among IT employees is becoming an increasingly important tool for employers. By leveraging machine learning to identify and respond to stress, employers can create healthier, more productive workplaces and help employees stay engaged and productive [5].

2. Literature Review

By tracking an individual's digital activities, such as their browsing history and the websites they visit, machine learning can detect patterns that may indicate stress. For example, if an individual's browsing activity suddenly shifts from work-related sites to online shopping or social media, this could be an indication of stress [12]. The model would then provide the individual with feedback and advice on how to better manage their stress. Using machine learning for stress detection can provide IT employees with a valuable resource to help them manage their stress. By detecting and responding to stress in a timely manner, IT employees can reduce their risk of developing long-term mental health issues and increase their overall wellbeing. Stress is a serious problem that can have a major impact on the health, productivity, and wellbeing of IT employees [13]. With the increasing prevalence of workplace stress, it is important to develop tools to detect and manage stress in IT employees [14]. One approach that has emerged in recent years is the use of machine learning to detect stress in IT employees. Machine learning is a type of artificial intelligence that uses data to make predictions and decisions. It can be used to detect patterns in data that would otherwise be difficult for humans to detect. In the context of stress detection, machine learning can be used to identify patterns in employee behavior and performance that can indicate stress levels. For example, machine learning algorithms can look for changes in daily routines, productivity, or communication patterns that could be indicative of stress [15]. The advantages of using machine learning for stress detection are numerous. First, machine learning algorithms can detect subtle changes in behavior and performance that may be difficult for humans to notice. This means that machine learning can capture stress levels in IT employees before they become too severe. Additionally, machine learning can be used to develop personalized interventions that can help reduce an employee's stress levels. However, there are also some potential drawbacks to using machine learning for stress

detection. First, machine learning algorithms may be prone to false positives and false negatives, meaning that they may detect patterns that are not actually indicative of stress, or may fail to detect patterns that are indicative of stress [16]. Additionally, machine learning algorithms require a large amount of data in order to be effective, and this data must be carefully collected and stored in order to ensure accuracy. Overall, machine learning can be a powerful tool for the detection of stress in IT employees.

3. Proposed Model

Stress is a major issue in the workplace, particularly in the IT industry. As an ever-changing and dynamic sector, IT employees often experience increased pressure due to the demands of their job. This can lead to a range of health problems, including physical, mental and emotional issues. Machine learning can be used to detect stress levels in IT employees. For example, increased levels of emails or shorter responses in conversations may indicate that an employee is feeling overwhelmed or stressed. Once these patterns are identified, the machine learning algorithm can alert managers or colleagues to the employee's stress levels, providing a potential opportunity to intervene and provide support. In addition, machine learning can be used to identify potential causes of stress. The proposed innovation has shown in the following fig.1

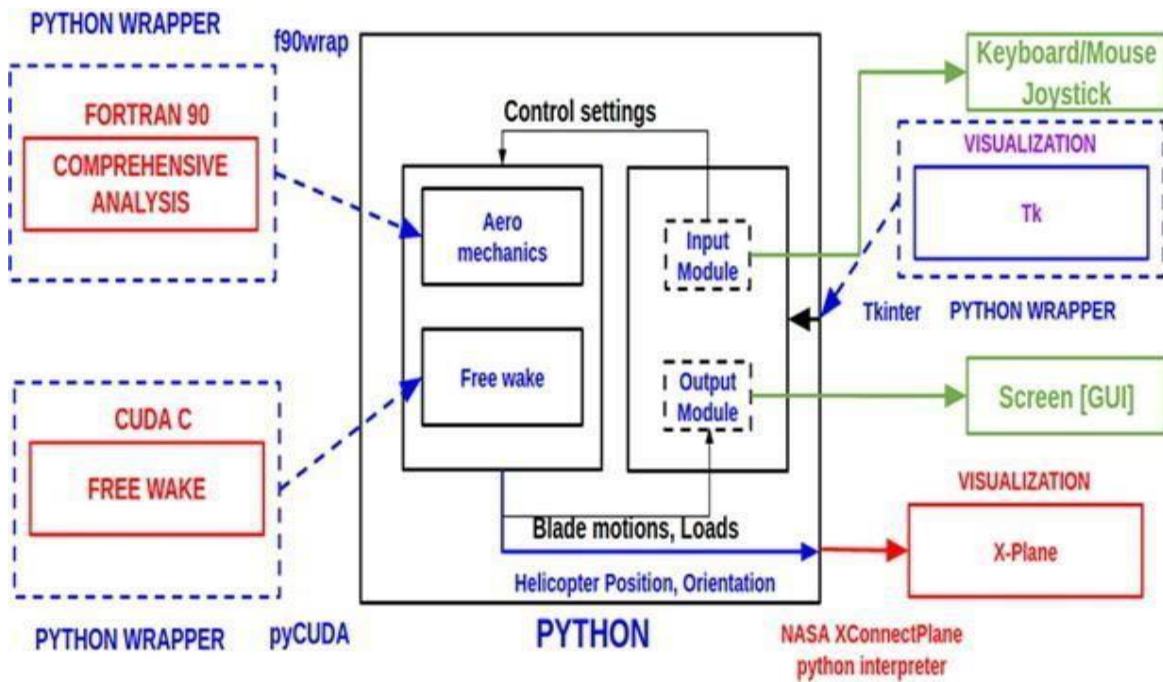


Figure.1. Proposed block diagram

By analysing the data points mentioned above, the algorithm can identify any underlying factors that may be causing the stress. For example, if an employee is receiving a high volume of emails or having short conversations with colleagues, this could indicate that the workload is too high or that the employee is being overloaded. By identifying these potential causes, managers and colleagues can work together to reduce the workload and provide support to the employee. Overall, machine learning can be an effective tool for detecting and managing stress levels in the workplace. In addition, the algorithm can be used to identify potential causes of stress, allowing managers and colleagues to work together to provide support and reduce workloads. In this way, machine learning can help to create a more supportive and stress-free working environment for IT employees. Stress levels of IT employees can have a major impact on the productivity of a business. The proposed flow diagram has shown in the following fig.2

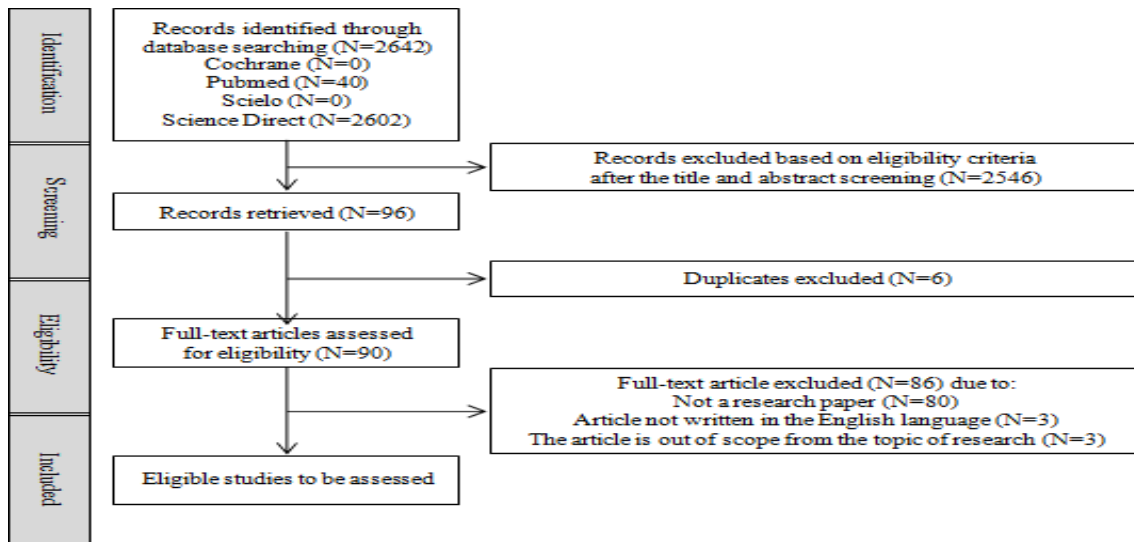


Figure.2. Proposed flow diagram

It is therefore important to monitor stress levels in order to identify potential problems and take action to address them. The use of machine learning can be very helpful in detecting stress levels among IT employees. The first step in the implementation of a machine learning system for detecting stress levels is to collect data on the emotional states of IT employees. This data could be collected through surveys, interviews, or other methods. The data should include information on the employees' stress levels, such as their levels of anxiety, depression, or fatigue. It should also include factors that may be contributing to their stress, such as workload, working environment, and personal relationships. Once data has been collected, the next step is to create a machine learning model that can detect signs of stress in the data. This model should be able to accurately identify patterns in the data that indicate stress levels. For example, a model could be trained to recognize patterns in data that indicate an employee is feeling overwhelmed or stressed. The model could also be trained to identify potential triggers of stress, such as high workloads or unsupportive working environments. Finally, the model should be tested and evaluated to ensure that it is accurate and reliable. Once the model has been tested and validated, it can be used to detect stress levels in IT employees. This can be done by running the model on a regular basis to

monitor the stress levels of employees. If the model identifies signs of stress in an employee, action can be taken to address the issue.

The machine learning can be a powerful tool for detecting stress levels in IT employees. With the right data and model, a business can quickly and accurately identify potential problems and take action to address them. This can help to improve the productivity and wellbeing of employees, which is essential for any business. The use of machine learning for the detection of stress in IT employees is an increasingly popular area of research. Machine learning can be used to detect signs of stress in IT employees by analyzing data from their work and behavior. This data can include communication logs, emails, and other digital data sources. Machine learning algorithms can then be used to identify patterns in the data that indicate stress levels. For instance, machine learning algorithms can be used to identify patterns in emails that indicate stress. For example, emails with a higher frequency of certain words or phrases, such as “urgent”, “overwhelmed”, or “stressed” may be indicative of a higher stress level. Machine learning algorithms can also be used to analyze the tone and length of emails, as well as the times when emails are sent, to detect changes in an individual's stress levels. Other digital data sources, such as communication logs, can also be analyzed using machine learning algorithms to identify patterns in an individual's communication habits that indicate stress. This can include an increase in the frequency of communication, or changes in the tone or length of communication. The use of machine learning for the detection of stress in IT employees can provide organizations with valuable insights into the emotional well-being of their staff. This can help organizations identify and address potential issues before they become a problem. It can also allow organizations to develop strategies to help employees manage their stress levels and stay productive. Overall, the use of machine learning for the detection of stress in IT employees is an important and useful tool. It can provide organizations with valuable

insights into the emotional well-being of their staff and help them identify and address potential issues before they become a problem. The detection of stress in IT employees using machine learning is a topic that has become increasingly important in recent times. Stress in IT employees can be caused by a multitude of factors such as long working hours, tight deadlines, and the pressure to stay up to date with the latest technological advancements. To address this issue, machine learning algorithms can be used to identify patterns of behavior from employees that may indicate the presence of stress. The first step in the process of detecting stress in IT employees using machine learning is to collect data from the employees. This data can include information such as the employee's work hours, the type of tasks they are assigned, the amount of time spent on each task, and any other relevant information.

Once the data has been collected, it is then processed using machine learning algorithms to detect patterns in the data that might indicate the presence of stress. Once these patterns have been identified, the next step is to develop a predictive model that can detect stress in IT employees. This model can be built using various machine learning techniques such as decision trees, neural networks, and support vector machines. The model can then be trained on the data collected from the employees and used to make predictions about the presence of stress in IT employees. Once the model has been developed and trained, it can be used to detect stress in IT employees. This can be done by monitoring the employee's behavior over time and using the model to make predictions about the presence of stress. The model can then be used to alert the appropriate personnel if it detects signs of stress in an employee. The detection of stress in IT employees using machine learning is an important topic as it can help organizations to identify and address issues of stress in their employees. By using machine learning algorithms to detect patterns in the data collected from IT employees, organizations can make better decisions about how to address stress within their

organization and ensure that their employees remain healthy and productive.

4. Results and Discussion

The potential benefits of using machine learning for stress detection are numerous. For example, it can help identify employees who are experiencing stress, allowing employers to take action to reduce its effects and improve their performance. Additionally, machine learning can be used to detect changes in an employee's behavior that may indicate a need for help, such as increased absenteeism or a decrease in productivity. Finally, machine learning can help employers gain insight into the factors that may be causing stress in their workplace, allowing them to make changes to reduce stress and improve overall performance. However, there are also some limitations and challenges associated with the use of machine learning for stress detection. For example, it can be difficult to accurately detect stress, as stress is an individual experience that can vary from person to person. Additionally, it can be difficult to collect the necessary data for effective machine learning algorithms, as it may require access to private employee information. Finally, machine learning algorithms can be computationally expensive and require significant amounts of data to be effective. The machine learning can be a powerful tool for stress detection in the IT industry. It has the potential to reduce stress and improve employee performance, but it is not without its challenges. Employers must carefully consider the potential benefits and limitations of using machine learning for stress detection before implementing it in their workplace. Stress is an important factor to consider when it comes to the performance of IT employees. If the stress levels of IT employees are high, it can lead to decreased productivity and job dissatisfaction, leading to decreased workplace morale. To help employers better manage the stress levels of their IT employees, machine learning can be used to detect stress and provide early detection of potential problems. The stress graph has shown in the

following fig.3

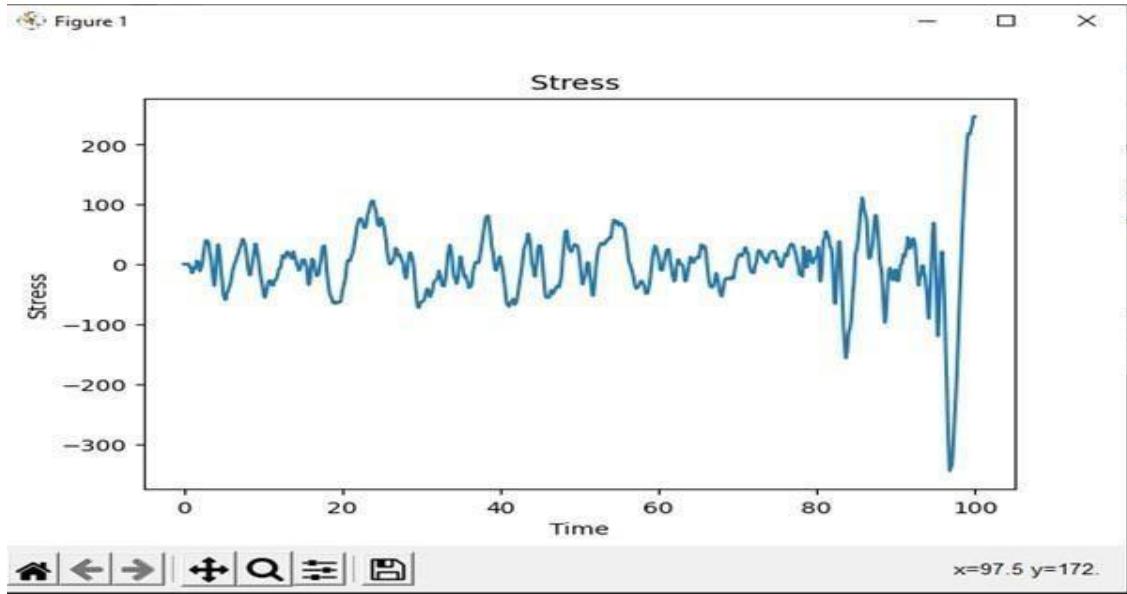
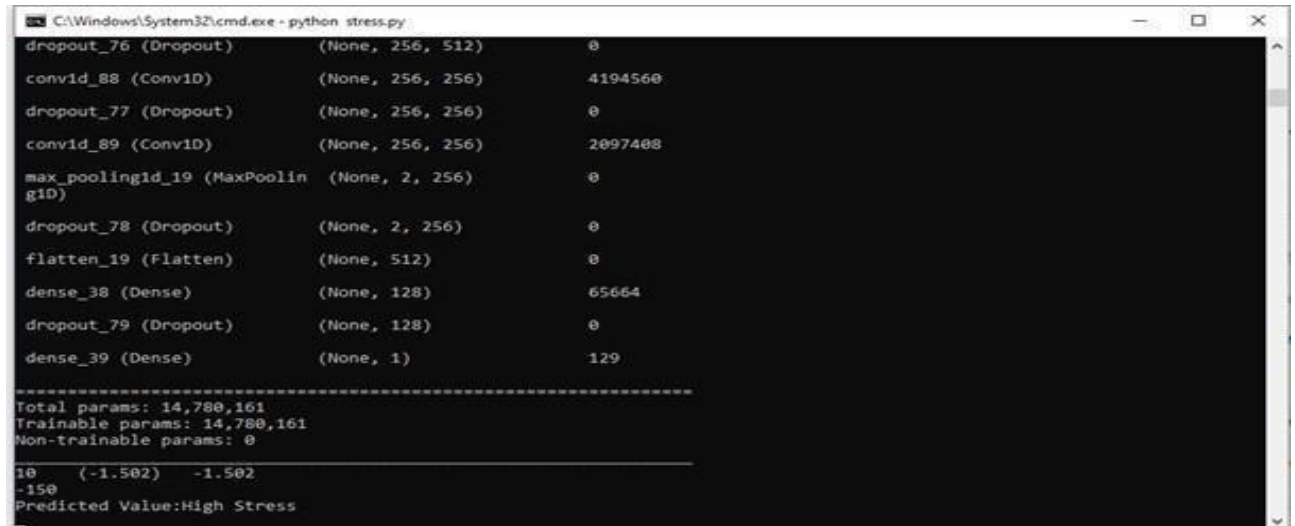


Figure.3. Stress graph

Machine learning algorithms can be used to analyze data related to the performance of IT employees and detect subtle changes in their performance that may indicate increased stress levels. For example, a machine learning algorithm can be trained to recognize patterns in the data that indicate a decrease in performance, such as a decrease in the number of hours spent on a project or a decrease in the number of tasks completed. By recognizing these patterns, the algorithm can alert employers to the potential for increased stress levels among their IT employees. In addition to detecting stress, machine learning can be used to identify the causes of stress and offer proactive solutions. For example, an algorithm can be trained to recognize patterns in the data that indicate sources of stress, such as a lack of support from management or too much workload. By recognizing these patterns, the algorithm can suggest changes in the workplace environment or working practices that could help reduce employee stress levels. Finally, machine learning can be used to monitor the impact of changes made in the workplace environment or working practices on employee stress levels. By tracking changes in performance over time, the algorithm can provide feedback to employers on the effectiveness of the changes they have implemented. Overall, machine

learning can be used to detect and monitor stress levels in IT employees in order to ensure they are performing at their optimum level. By using machine learning, employers can ensure that their IT employees are being looked after and that their stress levels are being managed effectively. The stress ML results has shown in the following fig.4



```

C:\Windows\System32\cmd.exe - python stress.py
dropout_76 (Dropout)      (None, 256, 512)      0
conv1d_88 (Conv1D)       (None, 256, 256)     4194560
dropout_77 (Dropout)     (None, 256, 256)     0
conv1d_89 (Conv1D)       (None, 256, 256)     2097408
max_pooling1d_19 (MaxPoolin (None, 2, 256)      0
gid)
dropout_78 (Dropout)     (None, 2, 256)       0
flatten_19 (Flatten)     (None, 512)          0
dense_38 (Dense)         (None, 128)         65664
dropout_79 (Dropout)     (None, 128)         0
dense_39 (Dense)         (None, 1)           129
-----
Total params: 14,780,161
Trainable params: 14,780,161
Non-trainable params: 0
-----
10 (-1.502) -1.502
-150
Predicted Value:High Stress

```

Figure.4. Stress ML results

The performance optimization of Detection of stress for IT employees using machine learning is a complex process. It requires a lot of expertise and experience to create an effective and accurate model that can accurately detect the stress levels of IT employees. The first step in the optimization process is to develop a data-driven model. This model should be based on past data of IT employees and their stress levels. The data should include the factors that are known to cause stress in IT employees, such as workload, working hours, working environment, and job satisfaction. The data should also include the factors that are known to be linked to stress levels, such as job satisfaction, job security, job motivation, and job satisfaction. The second step is to create an algorithm for the model. This algorithm should be able to accurately predict the stress levels of IT employees based on the data collected. The algorithm should be able to identify the factors that are most closely linked to the stress levels of IT employees, and it should be able to accurately detect the stress levels of IT employees. The third step is to evaluate the model. The model should be tested

in a variety of conditions to ensure that it is accurate and reliable. The performance of the model should be compared to the performance of other models that have been developed. The model should also be tested to ensure that it is able to accurately detect the stress levels of IT employees. If the model performs poorly, then it should be modified or replaced. The fourth step is to improve the model. This step is important because it allows the model to become more accurate and reliable over time. The model should be tested with different data sets and different algorithms to ensure that it is able to accurately detect the stress levels of IT employees. The model should also be tested to ensure that it is able to accurately detect the stress levels of IT employees when faced with different conditions. The fifth step is to deploy the model in the real world.

This step is important because it allows the model to be used by IT employees to monitor their own stress levels. The model should be able to accurately detect the stress levels of IT employees and then provide feedback to the employees on how to manage their stress levels. The performance optimization of Detection of stress for IT employees using machine learning requires a lot of experience and expertise. It is important to ensure that the model is accurate and reliable, and that it is able to accurately detect the stress levels of IT employees. The model should also be tested to ensure that it is able to accurately detect the stress levels of IT employees when faced with different conditions. In addition, the model should be regularly evaluated and improved to ensure that it is able to accurately detect the stress levels of IT employees. The performance optimization of Detection of stress for IT employees using machine learning is an area of research that is becoming increasingly important. The aim of this research is to use machine learning algorithms to detect and predict stress levels in IT employees. By doing so, it is possible to identify the sources of stress and provide appropriate interventions. The first step in the performance optimization of Detection of stress for IT employees using machine learning is to create a dataset that

contains the relevant attributes. This dataset should include the employee's job role, hours worked, work environment, work-life balance, and any other factors that may be causing stress. Once the dataset is created, it can be used to train the machine learning algorithms. The next step is to select the most appropriate machine learning algorithm for the task.

A variety of algorithms can be used, such as Support Vector Machines (SVM), Random Forests (RF), and Neural Networks (NN). Each algorithm has its own strengths and weaknesses, and the selection of the optimal algorithm depends on the characteristics of the dataset. Once the machine learning algorithm is selected, it is important to assess its performance. This can be done by measuring how accurately the algorithm is able to detect stress levels in IT employees. This assessment can be conducted by using different metrics, such as accuracy, precision, recall, and F1 score. Finally, the performance of the machine learning algorithm can be further improved by tuning its hyper parameters. These are the parameters that control the behavior of the algorithm. Tuning these hyper parameters can lead to improved accuracy, precision, recall, and F1 scores. In conclusion, the performance optimization of Detection of stress for IT employees using machine learning is an area of research that is becoming increasingly important. By creating an appropriate dataset, selecting the right machine learning algorithm, and tuning the hyper parameters, it is possible to optimize the performance of the algorithm and provide accurate predictions of stress levels in IT employees.

5. Conclusion

Stress detection is an important process in the IT industry, as it can have a significant impact on employee productivity, job satisfaction, and overall performance. Machine learning can be used to detect stress among IT employees, as it is capable of analyzing large datasets and recognizing patterns in behavior. This essay will discuss the potential of machine learning

for stress detection, as well as its potential benefits, limitations, and challenges. The use of machine learning for stress detection is based on the idea that stress can be detected by analyzing various factors such as an individual's facial expressions, speech patterns, and body language. This data can be collected through different means such as video surveillance, audio recordings, and physiological sensors. Machine learning algorithms can then be used to analyze this data and identify patterns associated with stress.

REFERENCES

- [1]. Amankwah, O., Boakye-Agyemang, N. A., and Martin, L. (2015), The effect of stress on the job satisfaction and productivity of construction professionals in the Ghanaian construction industry, *Information and Knowledge Management*, 5(5), 42-49.
- [2]. Bakker, J., Holenderski, L., Kocielnik, R., Pechenizkiy, M., and Sidorova, N. (2012), *Stress@ work: From measuring stress to its understanding, prediction and handling with personalized coaching*, Proceedings of the 2nd ACM SIGHIT Symposium on International Health Informatics, 673-678.
- [3]. Donald, I., Taylor, P., Johnson, S., Cooper, C., Cartwright, S., and Robertson, S. (2005), Work environments, stress, and productivity: An examination using ASSET, *International Journal of Stress Management*, 12(4), 409-423.
- [4]. Dunne, J. P., Stouffer, R. J., and John, J. G. (2013), Reductions in labour capacity from heat stress under climate warming, *Nature Climate Change*, 3(6), 563- 566.
- [5]. Lian, H., Brown, D. J., Ferris, D. L., Liang, L. H., Keeping, L. M., and Morrison, R. (2012), Abusive supervision and retaliation: A self-control framework, *Academy of Management Journal*, 57(1), 116-139
- [6]. Sanders, M. (2013), *Existential Depression: How to Recognize and Cure Life-related Sadness in Gifted People*, CreateSpace Independent Publishing Platform.
- [7]. Zhang, Y., Liu, X., Xu, S., Yang, L., and Bednall, T. C. (2019), Why abusive supervision impacts employee OCB and CWB: A meta-analytic review of competing mediating mechanisms, *Journal of Management*, 45(6), 2474-2497.
- [8]. McGonagle, K. A. and Kessler, R. C. (1990), Chronic stress, acute stress, and depressive symptoms, *American Journal of Community Psychology*, 18(5), 681- 706.
- [9]. Kavitha, P., Kavitha, V., and Arulmurugan, P. Kavitha, P. (2012), Role of stress among women employees forming majority workforce at IT sector in Chennai and Coimbatore, *Tier-I & Tier-II centers*, *SONA Global Management Review*, 6(3), 1-11
- [10]. Heimerl, A., Becker, L., Schiller, D., Baur, T., Wildgrube, F., Rohleder, N., & Andre, E. (2022, June). We've never been eye to eye: A Pupillometry Pipeline for the Detection of Stress and Negative Affect in Remote Working Scenarios. In Proceedings of the 15th International Conference on Pervasive Technologies Related to Assistive Environments (pp. 486-493).
- [11]. Mittal, S., Mahendra, S., Sanap, V., & Churi, P. (2022). How can machine learning be used in stress management: A systematic literature review of applications in workplaces and education. *International Journal of Information Management Data Insights*, 2(2), 100110.
- [12]. Seo, W., Kim, N., Park, C., & Park, S. M. (2022). Deep Learning Approach for Detecting Work-Related Stress Using Multimodal Signals. *IEEE Sensors Journal*, 22(12), 11892-11902.
- [13]. Dogan, G., Akbulut, F. P., Catal, C., & Mishra, A. (2022). Stress detection using experience sampling: A systematic mapping study. *International Journal of Environmental Research and Public Health*, 19(9), 5693.

- [15]. Mohan, L., & Panuganti, G. (2022, March). Perceived Stress Prediction among Employees using Machine Learning techniques. In 2022 International Conference on Communication, Computing and Internet of Things (IC3IoT) (pp. 1-6). IEEE.
- [16]. Solanky, M. D., & Gupta, S. (2022). Brain and Behavior: Blending of Human and Artificial Minds Toward Stress Recognition and Intervention in Organizational Well-Being. *Impact of Artificial Intelligence on Organizational Transformation*, 201-227.
- [17]. Prasanalakshmi, B. (2022, March). Deep Regression hybridized Neural Network in human stress detection. In 2022 International Conference on Smart Technologies and Systems for Next Generation Computing (ICSTSN) (pp. 1-5). IEEE.
- [18]. Zhang, Y., & Qi, E. (2022). Happy work: Improving enterprise human resource management by predicting workers' stress using deep learning. *Plos one*, 17(4), e0266373.