Stress Identification In It Employees Utilizing SVM, CNN

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ABSTRACT

The proposed project aims to solve the fundamental problem of stress detection in IT professionals using imaging techniques. A recording of stressed and non-stressed people. Most importantly, the preprocessing stage includes transformation and gray transformation, while the extraction process includes both measurement methods such as index and standard deviation, and techniques such as local binary pattern (LBP). Then, various classification techniques were used, including neural network (CNN), support vector machine (SVM), and tree pruning models. The aim of this paper is to use machine learning and task visualization to identify overwork of IT personnel. Our technology is an improvement over traditional stress testing methods and does not involve a scale or personal counseling. This study is a modification of the anxiety research process that does not involve supervision or personal counseling. Gather information about employees' stress levels through research to provide effective solutions. This article explores stress management and how to create a healthy, productive work environment to get the most out of your employees. The model is trained and analyzed with a combination of SVM and decision-making models and accuracy measurements that are competitive with the CNN model. Accurately identifying stress situations provides an effective way to manage stress in the workplace.

Keywords: stress detection, Machine learning, CNN, SVM, IT sector

1.INTRODUCTION

In the dynamic information technology (IT) field, where innovation is emerging at a dizzying pace and the need for efficiency and productivity continues, the impact on personal health will be even greater. Despite playing a key role in supporting progress and connectivity worldwide, the IT sector often sees its workforce under pressure for a variety of reasons[1], including tight deadlines and challenging tasks, the need for continuous improvement and adaptation to new technologies. Chronic stress not only affects the physical and mental health of IT professionals, but also poses a serious risk to organizational performance, employee retention and the culture of entire workplaces. Realizing the urgent need to solve this difficult problem, the concept of IT stress management was born as a beacon of hope and a beacon of recovery for the water flows' journey out of the digital age. New products and services[2]. Also, according to research, employee stress is increasing over the years. Although many companies offer health benefits to their employees, problems remain. We start by understanding the stress levels of office workers. Art and machine learning will be used to analyze stress patterns and identify the most important factors affecting a person's stress.

According to the World Health Organization, depression is a mental illness that affects one in four voters. Psychological and social problems, lack of openness in the workplace, lack of trust among co-workers, and death are just a few examples. Counselling can be very helpful for people with anxiety. If we do not take action to manage stress, relationships and work will suffer. Preventive measures can help reduce the damage of stress. Today, it aims to provide new technologies and products that offer new perspectives to businesses. Throughout the survey, a level of staff diligence was observed that raised the standard.

Using stress management software can improve personal health and well-being. Therefore, technology needs to be developed that can analyze physical[3] data and automatically estimate human stress. Stress can lead to obesity, heart disease, diabetes, asthma and other health problems. In another part of the country, a student commits suicide every hour. IT has a variety of strategies, interventions and support systems designed to address the specific stressors present in the environment. Its framework is based on the integration of modern technologies, including artificial intelligence (AI), data analytics, and digital platforms, that not only investigate and monitor stress indicators, but also provide personalized interventions and resources to reduce their negative effects. The system also recommends a supportive workplace culture that includes open communication, flexible work arrangements, skill development, and opportunities for success at work. Some include stress assessment tools, employee programs, mental health programs, and wellness services tailored to the specific needs and challenges faced by IT professionals. The system works to ensure that people have the necessary support networks of knowledge, skills, and experience to prevent and combat stress in a healthy and sustainable way, through preventive measures such as stress awareness, high-performance training, and kindness. Policies and practices, including measures such as flexible working hours, remote work options, and management, also play a key role in improving the workplace. Respecting business ethics helps to ensure a healthy working life and reduce employee stress[4]. A traditional method of measuring workplace stress involves asking employees to fill out a survey. It takes a lot of time and effort on the part of the sender to get the information to the recipient. Employers who use stress management systems can better prepare their employees to deal with stressful situations before they arise. When office workers are focused on their work, awareness of stress can sometimes mean the difference between “stressful” and “relaxed” situations. Take photos of your employees and ask them questions that are similar in style and layout. Physical effort is reduced, thus saving time and money[5].

1.1.Project Objective:

Together, these goals are designed to create a supportive and functional workplace culture that empowers employees to thrive in the face of stress and hard work and contribute to the organization’s goals. Early Detection: Prevent signs of stress in IT professionals from escalating into larger problems by identifying them early[6]. Timely Support: Provide timely intervention and support processes to reduce stress and prevent negative outcomes such as burnout and poor performance. Personalized Services: Provide appropriate support and resources based on individuals’ unique needs, preferences, and circumstances.

Productivity:

Optimize the performance and productivity of your IT staff by promoting employee wellness and productivity.

1.3. LITERATURE SURVEY

1) Detection of stress and anxiety by facial cues Author: G. Giannakakis et al. A successful experiment was designed to induce different emotional states (neutral[7], relaxed and stressed/anxious) from various external and internal stressors. To analyze emotions clearly and accurately, this article focuses on negative and partial facial cues. Visual activity, verbal activity, gesture recognition and heart rate are also checked. This article analyzes a person's face to create a real-time, seamless video that detects and determines their emotional state. Each video has its own perspective and the stress level is determined several hours after the video is shot. A technology that allows us to train the system and analyze the differences between predictions. The results of the research thesis show that the developed system is suitable to be used as a universal model for all age groups. S. Reddy et al. Use machine learning to train models after prioritizing data. Measured and compared with models shown above to determine their efficiency. In our tests, support proved to be the most accurate of all models. Factors such as gender, family history and access to health benefits at work are all contributing factors to stress, according to Tree Decision. Many companies are now better understanding how to reduce workplace stress among their employees by using new solutions.

2.EXISTING SYSTEM:

Current IT stress detection methods include a variety of methods and techniques designed to identify and reduce stress in IT staff. One popular method is to use surveys and questionnaires to measure employee self-reported stress and other factors such as work, deadlines, and relationships. Some organizations are also using wearable devices and biometric sensors to monitor physical signs of stress, such as heart rate variability and skin conductance. In addition, advances in natural language processing (NLP) and sentiment analysis are enabling the analysis of digital communications, such as emails and chats[8], to identify words associated with stress and anxiety. Additionally, new technologies such as machine learning and data analytics are increasingly being used to analyze large data sets, discover patterns, and predict stressful events in historical data and content context. While these existing methods provide a good understanding of IT staff stress, there is a need for a more efficient and effective method that covers many areas, including individual differences, and provides timely interventions to improve employee health and well-being.

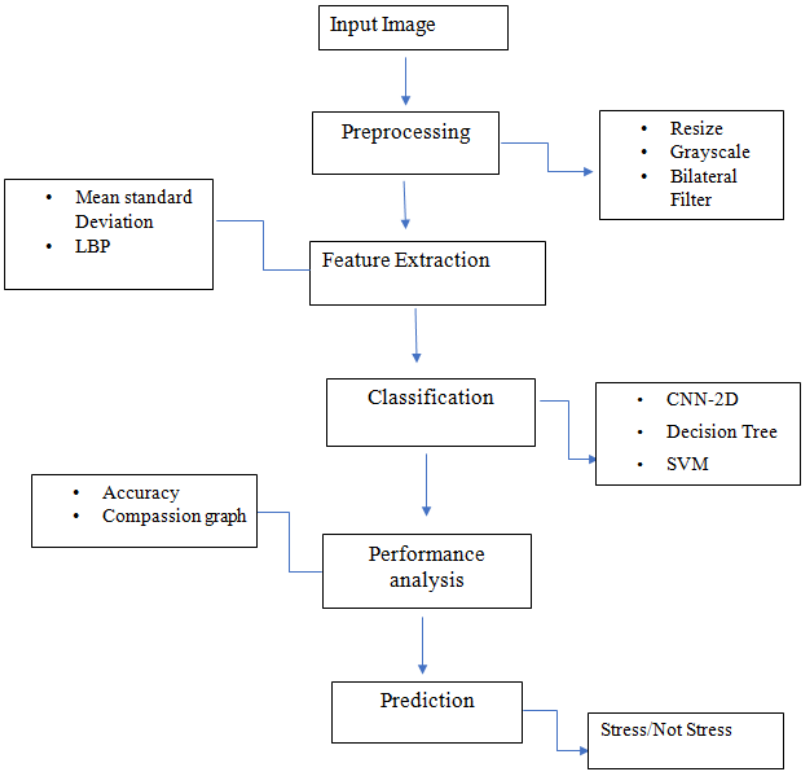
2.1. DISADVANTAGES:

1. Reliance on Self-Reporting
2. Limited Scope
3. Lack of Real-Time Monitoring
4. Incomplete Data Analysis

3.PROPOSED SYSTEM:

The IT concept detects anxiety before collecting data from a dataset containing images of anxious and non-anxious individuals. The images were processed including resizing and feature extraction using methods such as mean and standard deviation calculations and local binary model (LBP). Complex patterns and nuances in the art of photography[9]. The CNN model is trained using the collected data, focusing on achieving accuracy in classifying stress situations. An alternative method for stress detection is also provided using support vector machine (SVM) and decision tree models for comparison and reference purposes. and other performance metrics. The prevalence and patterns of stress in the IT department ultimately create a healthier, more productive environment for IT professionals.

3.1.ARCHITECTURE DIAGRAM:



3.1.1 ADVANTAGES:

1. Early Detection
2. High Accuracy
3. Scalability
4. Personalized Intervention

3. MODULES

- Image selection
- Preprocessing
- Feature Extraction
- Image splitting
- Classification
- Prediction
- Result generation

3.1. MODULES DESCRIPTION:

3.1.1: IMAGE SELECTION:

- The datasetis implemented as input. The dataset is taken from dataset repository. The input dataset is in the format '.png, '.jpg[10].
- In this step, we have to read or load the input image by using the imread () function.
- The dataset was taken from kaggle.

3.2.: IMAGE PREPROCESSING:

- In our process, we have to resize the image and convert the image into gray scale.
- To **resize an image**, you call the resize () method on it, passing in a two-integer tuple argument representing the width and height of the resized image.
- The function doesn't modify the used image; it instead returns another Image with the new dimensions.
- Convert an Image to **Grayscale** in Python Using the Conversion Formula and the matplotlib Library.
- We can also convert an image to grayscale using the standard RGB to grayscale conversion formula that is imgGray = 0.2989 * R + 0.5870 * G + 0.1140 * B.
- **Bilateral Filtering :** Bilateral filtering is a non-linear edge-preserving smoothing filter used in image processing and computer vision tasks. Unlike traditional linear filters, such as Gaussian or mean filters, bilateral filtering considers both spatial proximity and intensity similarity when smoothing an

image[11]. This technique is particularly effective in preserving edges and fine details while reducing noise.

3.2.2: FEATURE EXTRACTION:

- It's the measure of dispersion the most often used, along with the standard deviation, which is simply the square root of the variance.
- **Mean Standard Deviation**:Mean: The mean (average) of a set of numbers is calculated by summing all the values in the set and dividing by the total number of values. It represents the central tendency of the data.
- Standard Deviation: The standard deviation measures the amount of variation or dispersion in a set of values. It indicates how much the values deviate from the mean. A low standard deviation suggests that the values are close to the mean, while a high standard deviation indicates that the values are spread out over a wider range.
- **Local Binary Pattern (LBP):**Local: LBP operates on small local neighborhoods within an image rather than the entire image.
- Binary: LBP converts the grayscale values of pixels within the neighborhood into binary patterns based on a thresholding operation.
- Pattern: These binary patterns are then used to represent the texture or structure of the image at that particular location.

3.2.3 : IMAGE SPLITTING:

- During the machine learning process, data are needed so that learning can take place.
- In addition to the data required for training, test data are needed to evaluate the performance of the algorithm in order to see how well it works[12].
- In our process, we considered 70% of the input dataset to be the training data and the remaining 30% to be the testing data.
- Data splitting is the act of partitioning available data into two portions, usually for cross-validator purposes.
- One Portion of the data is used to develop a predictive model and the other to evaluate the model's performance.
- Separating data into training and testing sets is an important part of evaluating data mining models.
- Typically, when you separate a data set into a training set and testing set, most of the data is used for training, and a smaller portion of the data is used for testing.

3.2.4: CLASSIFICATION:

- In our process, we can implement deep learning such as and CNN, Decision Tree, SVM.
- **Convolutional Neural Network (CNN) - 2D:**Convolutional: CNNs use convolutional layers to extract features from input data. These layers apply filters (kernels) across the input image to detect patterns and features. Neural Network[13]: CNNs are a type of neural network that consists of multiple layers, including convolutional, pooling, and fully connected layers. These layers learn hierarchical representations of data.2D: In the context of image processing, CNNs operate on 2D data, such as images, where each pixel has two dimensions (width and height).
- **Decision Tree (DT):**Decision Tree: A decision tree is a supervised learning algorithm that recursively partitions the input space into regions based on feature values. Each internal node represents a decision based on a feature, and each leaf node represents a class label or outcome.
- **Support Vector Machine (SVM):**Support Vector Machine: SVM is a supervised learning algorithm used for classification and regression tasks[14]. It finds the hyperplane that best separates data points into different classes while maximizing the margin between classes[15].

3.2.5: RESULT GENERATION:

The Final Result will get generated based on the overall classification and prediction. The performance of this proposed approach is evaluated using some measures like

Accuracy of classifier refers to the ability of classifier. It predicts the class label correctly and the accuracy of the predictor refers to how well a given predictor can guess the value of predicted attribute for a new data[16].

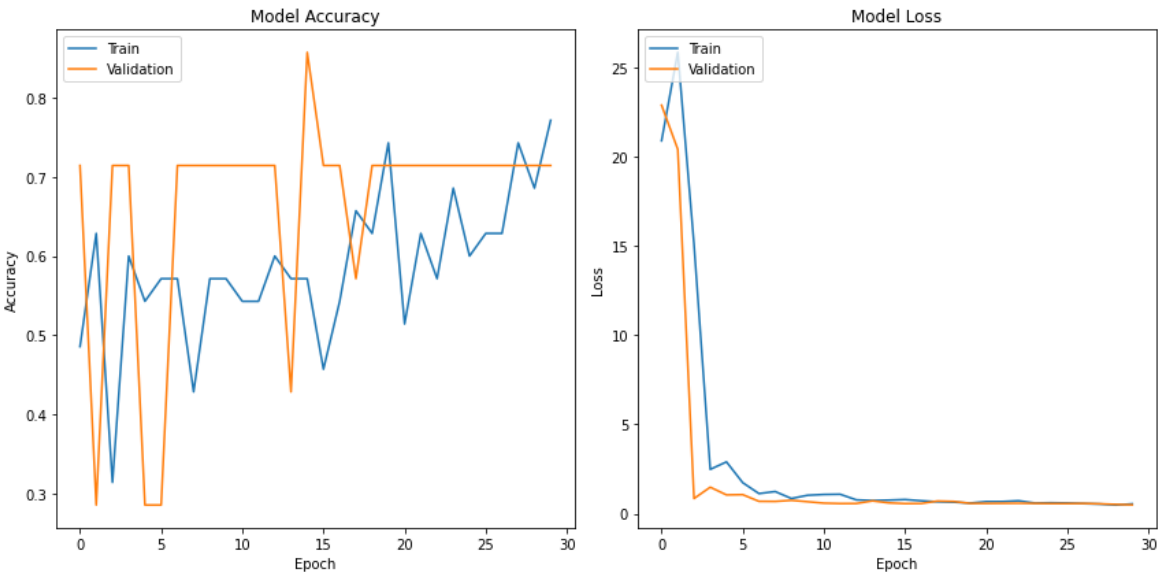
AC= (TP+TN)/ (TP+TN+FP+FN)

4. Results:

Fig : Input Image

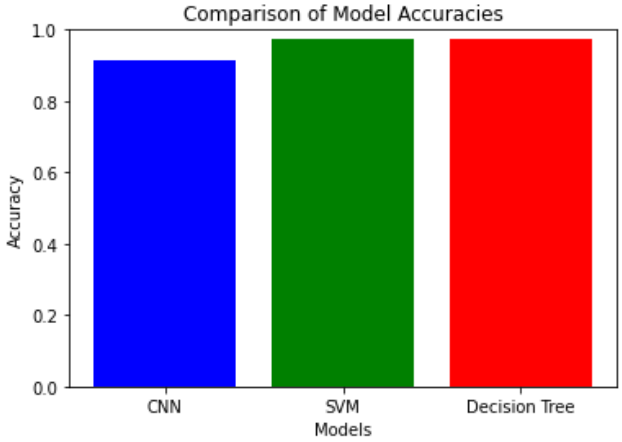
```
--------------Cconvolutional neural network (CNN-2D)  ---------------

Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d (Conv2D)             (None, 67, 67, 32)        896

 max_pooling2d (MaxPooling2D  (None, 33, 33, 32)       0
 )

 conv2d_1 (Conv2D)           (None, 31, 31, 64)        18496

 max_pooling2d_1 (MaxPooling  (None, 15, 15, 64)       0
 2D)

 conv2d_2 (Conv2D)           (None, 13, 13, 128)       73856

 max_pooling2d_2 (MaxPooling  (None, 6, 6, 128)        0
 2D)

 conv2d_3 (Conv2D)           (None, 4, 4, 256)         295168

 max_pooling2d_3 (MaxPooling  (None, 2, 2, 256)        0
 2D)

 flatten (Flatten)           (None, 1024)              0

 dense (Dense)               (None, 128)               131200

 dropout (Dropout)           (None, 128)               0

 dense_1 (Dense)             (None, 3)                 387
```

```
Total params: 520,003
Trainable params: 520,003
Non-trainable params: 0
```



```
Test Loss: 0.2374
Test Accuracy: 0.9143
1/1 [==============================] - 0s 32ms/step - loss: 0.7385 - accuracy: 0.4286
Validation Loss: 0.7385
Validation Accuracy: 0.5143

-----------------Suppport Vector Machine ------------------------

SVM Accuracy: 97.61904761904762

-----------------Decision Tree-------------------------

Decision Tree Accuracy: 97.61904761904762
```

```
1/1 [==============================] - 0s 107ms/step
Prediction: Stress
```



5. CONCLUSION

In summary, IT stress detection has tremendous potential to improve employee health and productivity in today's workplace. Integrating technologies such as machine learning, devices, and real-time monitoring, these systems can detect and mitigate stressors before they escalate. IT stress analysis enables organizations

to create healthier, more efficient operations by providing timely intervention, personalized support, and insight. Additionally, the data-driven approach of these systems supports continuous improvement of crisis management strategies by enabling continuous monitoring, evaluation, and optimization. However, privacy concerns must be addressed by ensuring the integrity of the data used and prioritizing the human design of these systems to ensure employee trust and recognition. Overall, the use of IT stress measures represents a good and forward-thinking way to improve employee well-being, foster a culture of support, and enable successful engagement in the digital age.

6. FUTURE ENHANCEMENT

In the future development of IT stress assessment, various methods of improvement and optimization can be explored to make its results more effective and applicable. First, the inclusion of real-time monitoring capabilities allows continuous monitoring of employee stress, allowing for timely intervention and support. This may include the integration of wearable devices or smartphones that provide suggestions and recommendations based on real-time data analysis. In addition, advances in machine learning technology can be used to develop sophisticated systems that can detect subtle changes in behavior or physical activity that indicate distressing stress. Furthermore, self-improvement and modification of stress mechanisms can be related to the influence and support resources directed at personal preferences, needs, and coping strategies. Integrating feedback systems that allow users to provide feedback on the performance of intervention measures can support system optimization and improvement. Finally, addressing privacy concerns and ensuring the integrity of the material is critical to increasing employee trust and acceptance. With the implementation of these future developments, IT stress detection can become a useful, personalized, and effective tool for improving employee health and productivity in the digital workplace.

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