MACHINE LEARNING

Mental Health and Machine Learning in Companies

How Machine Learning is helpful for predicting the Mental Health of Employees and How it is implemented?

Rajvi Shah
Nov 23 · 7 min read ★

Reference: Jonathan Dalton

Mental Health Introduction

Mental health includes our emotional, psychological, and social well-being. It affects how we think, feel, and act. It also helps determine how we handle stress, relate to others, and make choices in life. It is crucial and challenging at every stage of life, from childhood and adolescence through adulthood and specifically, in the case of working professionals. The modernized (hectic) lifestyle and workload take a toll on people over time making them more prone to mental disorders like mood disorder and anxiety

disorder. Thus, the risk of mental health problems increases in working professionals. To deal with this problem industries provide mental health care incentives to their employees, but it is not enough to deal with the problem.

Machine Learning and Mental Health

Machine Learning (ML), as one of the most recent generations of AI technologies, has demonstrated superior performance in many real-world applications ranging from computer vision to healthcare. Neuroscientists and clinicians around the world are using machine learning to develop treatment plans for patients and to identify some of the key markers for mental health disorders before they may set in. One of the benefits is that machine learning helps clinicians predict who may be at risk of a particular disorder.

Mental Health in the case of Working Professionals

In the context of working professionals, many employees suffer from mental trauma, depression, and anxiety which sometimes lead to extreme steps such as suicide. There have been various Mental Disorders by which the employees get affected and lack of awareness leads to serious problems in later stages. There are many surveys, reviews, and research papers written with a solid basis about how machine learning can be implemented for predicting the mental health of employees in different sectors.

Context of the Article

Paper Link: https://ieeexplore.ieee.org/document/9368923

Here, in this article, I will give a review of a paper that implemented numerous Machine Learning algorithms utilizing the data from mental health survey 2019 that contains the data of working professionals for both tech and non-tech company employees. In the technique, data is processed to find the features influencing the mental health of employees or features that can help to predict the mental health of the employee the feature can be either personal or professional.

In the modernized world, working professionals are under lots of pressure for reasons like peer pressure, short deadlines, competition. All these things contribute to building up mental stress, which slowly leads to mental health disorders. In the US 18% of the working population which is 40 million people suffers from mental health disorders.

Types of Disorders in Employees

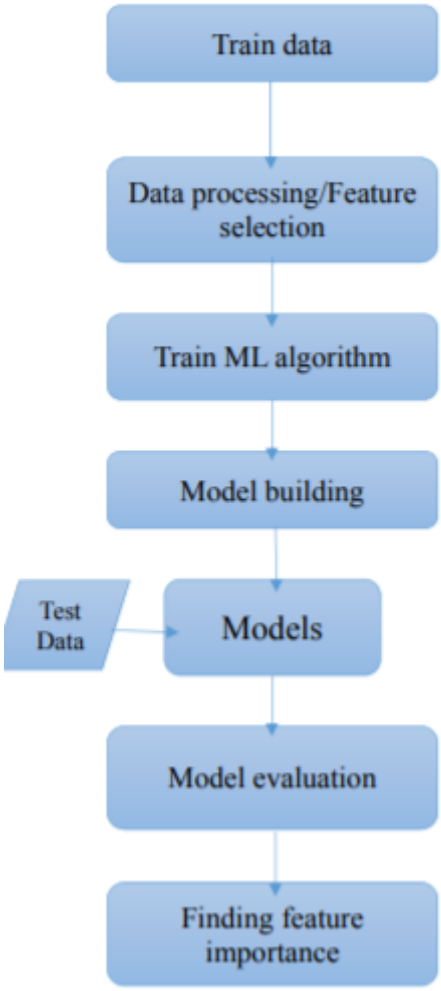
Classification of mental health disorders is done into two types first Mood disorder and second Anxiety disorder. A mood disorder is serious changes in mood in the form of

emotional inconsistency or abrupt changes/ amplification of certain specific emotions, which can be feeling extremely sad or feeling irritable. When they start interfering or disrupting normal life activities we call it mood disorder, in the case of working professionals the disruption is in form of work performance like having a hard time completing deadlines. Anxiety is a normal emotion but an anxiety disorder is an entirely different case. In which we feel an excessive amount of fear and anxiety for no reason whatsoever, excess anxiety can make people skip meetings, avoid social interactions, and much more.

Machine Learning Techniques Used

Supervised Learning Algorithms were used for the application such as Support Vector Machines (SVMs), Logistic Regression, k Nearest Neighbors (kNN), Decision Trees, Random Forest, and Naive Bayes.

Data Flowchart



Reference: https://ieeexplore.ieee.org/document/9368923

Results

The accuracies of respective Machine Learning algorithms are as follows:

S.no	Algorithms	Accuracy (%)	Precision	Recall	F1
1.	KNN	74%	76	82	79
2.	SVM	76%	75	88	81
3,	Logistic Regression	84%	82	94	87
4.	Decision tree	84%	83	92	87
5.	Random Forest	77%	81	80	81
6.	Naïve bayes	79%	78	90	83

Reference: https://ieeexplore.ieee.org/document/9368923

After analyzing, we found that the decision tree classifier has the best performance. As it has the best accuracy and precision with accuracy 84% and precision 83 followed by logistic regression with 84% accuracy and 82 precision followed by Naïve Bayes with 79% accuracy and 78 precision, random forest with 77% accuracy and 81 precision, SVM with 76% accuracy and 75 precision and KNN has the worst performance with 74% accuracy and 76 precision.

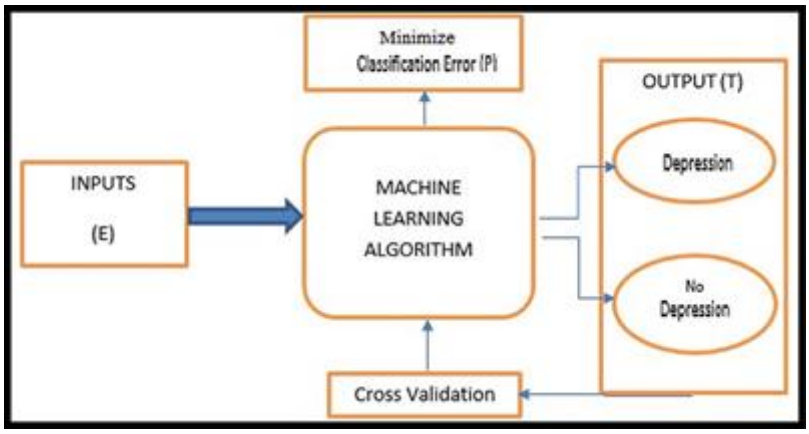
Thus, features affecting the mental health disorder with selected attributes which are,

1. Whether the company is a Tech company or not.
2. Age of the employee.
3. Gender of the employee.
4. Family history of mental health disorders if any.
5. Personal history of a mental health disorder.

> 6. Mental health benefits or care provided by the employer.
>
> 7. Discussing mental health status with the employer.

Also, the Feature importance of the selected features showed that a history of mental health disorder contributes most during disorder prediction followed by family history. It was also found that the rest of the features contributes bare minimum to the prediction with gender as their top rest of the features which includes mental health benefits or care provided by the employer, age, and discussing mental health status with the employer barely makes any contribution to the prediction of mental health disorder.

Other related studies



Reference: https://www.frontiersin.org/articles/10.3389/fdata.2020.00015/full

- In the paper, for predicting Anxiety disorder author proposed rules based on factors like persons working place(home or office) and some other personal factors, and the prediction is done using logistic model trees. Which is a hybrid model based on logistic regression and decision trees, and provides better accuracy.
- In the paper, the author used a smartphone-based sensor system to monitor or find the changes in the states of bipolar disorder patients. Also, develop an early warning system with recall and precision of about 97%.
- In the paper, the author proposed a wearable headband for multimodal stress monitoring and detection.
- In the study, the author predicted generalized anxiety disorder among women and proposed that women are more prone to GAD (generalized anxiety disorder)

almost two times than men are; the author was able to predict GAD with 90% accuracy with random forest.

- In the study, the author used wearable sensors for Bipolar based prediction using Heart rate variability.
- In the paper, the author used ML algorithms to detect stress in working employees and found features that contribute to mental stress. Random forest was found to have the highest precision and accuracy with 75.13%.
- In the study, the author used HRV to detect stress with multiple ML algorithms to predict the stress.
- In the paper, the author used heartbeat data to identify stress and used ML algorithms for classification, data is collected at a 5- minute interval such that after 5 minutes of heartbeat data collection a relaxation interval of 5 minutes to the user.

Summary in the context with the results of Machine Learning for Mental Health of Employees

Recent years have witnessed an increase in excitement and exploratory research on potential applications of ML for mental health. This article tried to offer an overview of this area of research and highlighted current trends and challenges. Aiming to shape the future direction of work, we have discussed current approaches and potential steps toward achieving ML systems that are effective and implementable for mental health care.

Specifically, it is examined how constraints and requirements for access to large-scale, high-quality data can pose challenges to study design and urge researchers to extend efforts to gain a more in-depth understanding of the specific needs or challenges that are faced by MHPS and people with lived mental health experiences. Deeper and more creative explorations of the design space can meaningfully inform future research questions and problem scenarios for ML to ensure the domain can truly benefit from novel data tools. This may extend beyond more obvious ML applications for mental health. Bound-up with data access is the need to better assist people in assessing potential benefits of data sharing and how potential risks are mitigated or outweighed by potential benefits (e.g., the effectiveness of interventions), such that they can make more informed choices about data uses and to aid their trust in, and acceptance of, data applications.

In addition, while it was often argued in the literature that novel ML models have advantages over existing research and clinical methods, it is suggested to look at these as complementary approaches to knowledge generation. Furthermore, there is a lot more scope for future research to also extend explorations of how ML interventions can become valuable tools to address the needs not only of mental health care recipients but to support the practices of mental health care experts. In applying ML approaches to the capture and assessment of rich human needs and experiences, researchers should also be mindful to not translate and abstract away too much from the individual person and their unique context in data analysis, interpretation, and representation.

References

- https://www.mentalhealth.gov/basics/what-is-mental-health
- https://ieeexplore.ieee.org/document/9368923
- https://towardsdatascience.com/machine-learning-and-mental-health-7981a6001bd5
- https://dl.acm.org/doi/fullHtml/10.1145/3398069


Download on the
App Store


GET IT ON
Google Play