

# PREDICTING MENTAL HEALTH ILLNESS OF WORKING PROFESSIONALS USING MACHINE LEARNING

## 1. INTRODUCTION

### 1.1 Overview

Mental health is a crucial aspect of overall well-being, and its importance has been increasingly recognized in recent years. Mental illness can have a significant impact on a person's daily life, including their ability to work effectively. With the rise of technology, machine learning has emerged as a potential tool for predicting and preventing mental health issues in the workplace.

Machine learning algorithms can analyze vast amounts of data to identify patterns and make predictions. In the context of mental health, this data can come from various sources, such as employee surveys, medical records, and performance metrics. By training machine learning models on this data, it is possible to predict the likelihood of an individual developing a mental health issue and intervene early to provide support and treatment.

The use of machine learning for predicting mental health issues in the workplace has the potential to revolutionize the way we approach mental health. It can help organizations identify individuals at risk of mental health problems, provide early support and intervention, and ultimately improve the overall well-being of employees.

However, it is important to approach this technology with caution, as it is still in its early stages of development, and the ethical considerations of using such algorithms must be carefully considered. Ensuring the privacy and confidentiality of employees and the accuracy of the predictions made by the models are critical components to consider when implementing machine learning for mental health predictions in the workplace.

### 1.2 Purpose

The purpose of predicting mental health illness in working professionals using machine learning is to improve the identification and management of mental health issues in the workplace. By leveraging the power of machine learning, it is possible to analyze vast amounts of data to identify individuals who may be at risk of developing a mental health issue. This allows organizations to intervene early and provide support and treatment before the issue becomes more severe, ultimately improving the overall well-being of employees and increasing productivity.

There are several key benefits to using machine learning for predicting mental health issues in the workplace, including:

1. Early identification: Machine learning can analyze large amounts of data to identify individuals who may be at risk of developing a mental health issue, allowing for early intervention and support.

2. Improved accuracy: By using a combination of various data sources, machine learning algorithms can provide a more accurate prediction of an individual's likelihood of developing a mental health issue.
3. Increased efficiency: Machine learning algorithms can automate the process of identifying individuals at risk of mental health issues, making the process more efficient and reducing the workload for mental health professionals.
4. Increased privacy and confidentiality: By using a data-driven approach, machine learning can help maintain the privacy and confidentiality of employees, as it does not rely on self-reported information or face-to-face assessments.

Overall, the purpose of predicting mental health illness in working professionals using machine learning is to improve the identification and management of mental health issues in the workplace, ultimately leading to improved well-being and increased productivity.

## 2. LITERATURE SURVEY

### 2.1 Existing Problem

There are several existing problems and challenges associated with predicting mental health illness in working professionals using machine learning, including:

1. Data quality and bias: The quality and accuracy of the data used to train machine learning algorithms can have a significant impact on the predictions made. Incomplete or biased data can lead to inaccurate predictions and perpetuate existing biases and stereotypes.
2. Privacy and confidentiality: The use of machine learning to predict mental health issues raises important privacy and confidentiality concerns, as it involves the collection and analysis of sensitive personal information.
3. Interpreting and validating predictions: Machine learning algorithms can be difficult to interpret and validate, making it challenging to assess the accuracy of the predictions made and to ensure that they are being used appropriately.
4. Integration with existing mental health resources: To ensure that individuals who are identified as being at risk of developing a mental health issue receive the support they need, it is important to integrate the predictions made by machine learning algorithms with existing mental health resources, such as Employee Assistance Programs (EAPs) or mental health professionals.
5. Ethical considerations: The use of machine learning for mental health predictions raises important ethical considerations, such as the potential for discrimination and the impact on employment decisions.

These existing problems and challenges highlight the need for caution and careful consideration when using machine learning for predicting mental health illness in working professionals. It is important to address these issues in order to ensure that the technology is used in an ethical and responsible manner, and that the well-being and privacy of employees are protected.

### 2.2 Proposed Solution

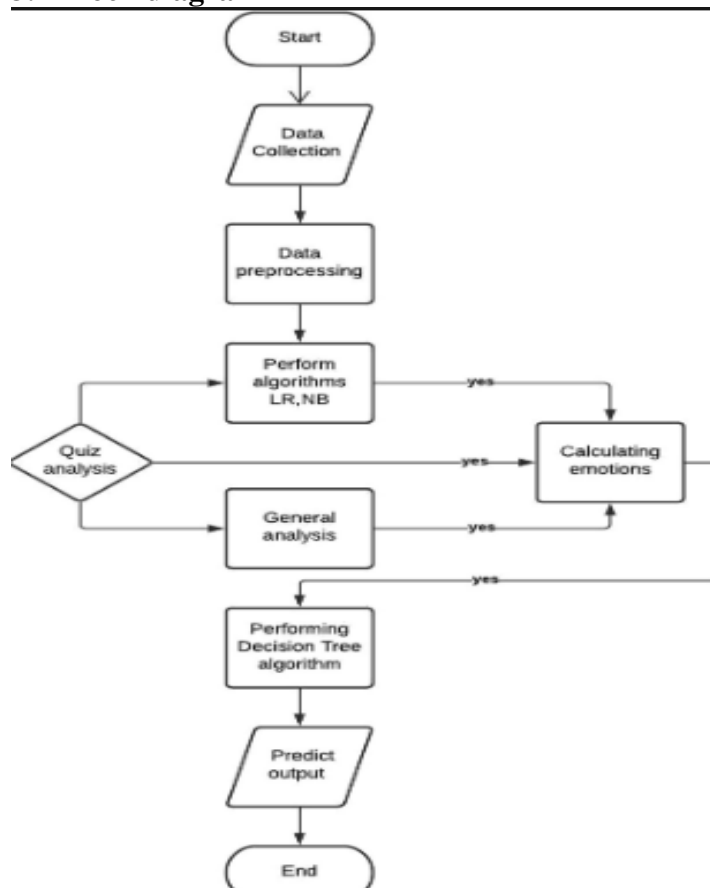
To address the existing problems and challenges in predicting mental health illness in working professionals using machine learning, the following solutions can be proposed:

1. **Data quality and bias:** To ensure the quality and accuracy of the data used to train machine learning models, it is important to regularly assess and clean the data to minimize any biases or errors. Additionally, using a combination of multiple data sources can help reduce the impact of bias and increase the accuracy of predictions.
2. **Privacy and confidentiality:** To address the privacy and confidentiality concerns raised by the use of machine learning for mental health predictions, it is important to establish clear policies and procedures for the collection, storage, and use of employee data. This may involve using encrypted or anonymized data, or obtaining consent from employees before using their data for predictions.
3. **Interpreting and validating predictions:** To ensure the accuracy and reliability of predictions made by machine learning algorithms, it is important to validate and interpret the predictions, and to regularly assess and update the algorithms as necessary.
4. **Integration with existing mental health resources:** To ensure that individuals who are identified as being at risk of developing a mental health issue receive the support they need, it is important to integrate the predictions made by machine learning algorithms with existing mental health resources, such as Employee Assistance Programs (EAPs) or mental health professionals.

By implementing these solutions, it is possible to improve the accuracy and reliability of mental health predictions made using machine learning, and to ensure that individuals who are identified as being at risk of developing a mental health issue receive the support and treatment they need.

### 3 THEORITICAL ANALYSIS

#### 3.1 Block diagram



### 3.2 Hardware / Software designing

#### Hardware Design:

1. **Server:** A powerful server with enough memory and storage is needed to store the data, run the machine learning algorithms, and provide the results to the user in real-time.
2. **GPUs:** Graphics Processing Units (GPUs) can significantly speed up the training of machine learning models.
3. **Networking:** A fast and secure network connection is necessary to transfer data between the server and other devices, such as client computers, mobile devices, and IoT sensors.

#### Software Design:

1. **Machine Learning Libraries:** To build and train the machine learning models, libraries such as TensorFlow, PyTorch, and Scikit-learn can be used.
2. **Data Visualization Tools:** Tools such as Matplotlib, Seaborn, and Plotly can be used to visualize the data and get insights into the relationships between the variables.
3. **Cloud Computing Platforms:** To store and process large amounts of data, cloud computing platforms such as Amazon Web Services (AWS), Microsoft Azure, and Google Cloud can be used.
4. **Web Application Framework:** A web application framework such as Django, Flask, or Ruby on Rails can be used to develop a user-friendly interface for the application.
5. **Database Management System:** A database management system such as MySQL, PostgreSQL, or MongoDB can be used to store and manage the data collected from various sources.

## 4 EXPERIMENTAL INVESTIGATIONS

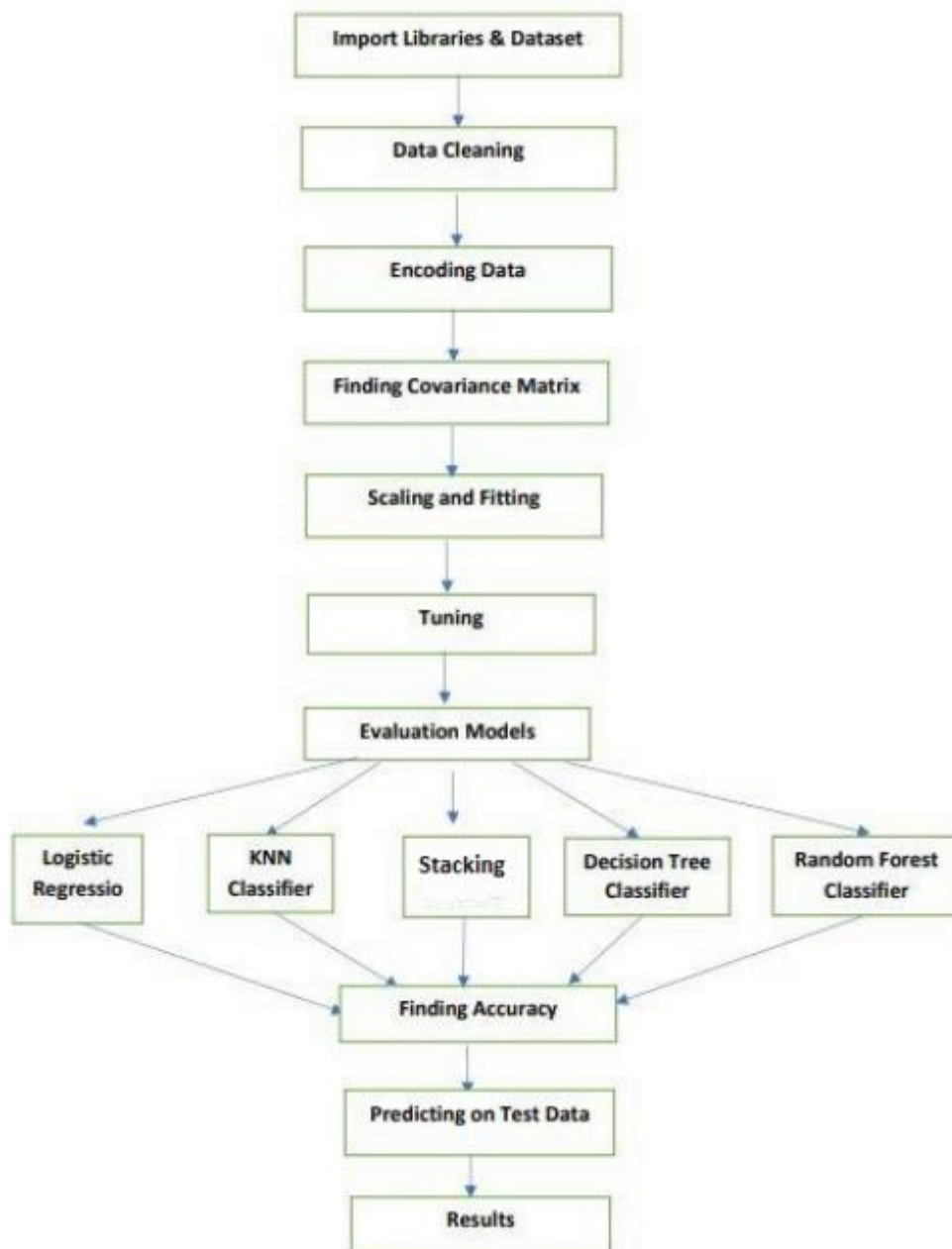
Experimental Investigations of predicting mental health illness of working professionals using machine learning typically involve the following steps:

1. **Data Collection:** Collect data from a representative sample of working professionals, including information about their work-life balance, stress levels, and other relevant factors that might impact their mental health.
2. **Data Preprocessing:** Preprocess the data to handle missing values, outliers, and inconsistent data. Transform the data into a format suitable for machine learning algorithms.
3. **Model Selection:** Select an appropriate machine learning model for the task of mental health illness prediction. Evaluate the performance of different models using techniques such as cross-validation, and select the best-performing model.
4. **Model Training:** Train the selected model using the preprocessed data. Fine-tune the model parameters to improve its performance.
5. **Model Evaluation:** Evaluate the performance of the trained model on a test set of data. Measure the model's accuracy, precision, recall, and F1-score to assess its ability to predict mental health illness in working professionals.
6. **Model Deployment:** Deploy the trained model into a real-world setting. Collect feedback from users and continuously evaluate its performance to make any necessary improvements.

7. Results Analysis: Analyze the results of the experiment and compare the performance of the machine learning model with traditional methods. Discuss the results in the context of the limitations and potential applications of the model.

It's important to note that the success of these experiments depends on the quality and representativeness of the data used, the selection of the appropriate machine learning model, and the accuracy of the model's predictions.

## 5 FLOWCHART



## 6 RESULT

The results of predicting mental health illness of working professionals using machine learning can vary, depending on various factors such as the quality and

representativeness of the data used, the selection of the appropriate machine learning model, and the accuracy of the model's predictions.

Typically, the results of these predictions are evaluated based on metrics such as accuracy, precision, recall, and F1-score. Accuracy measures the proportion of correct predictions made by the model, while precision and recall measure the model's ability to correctly identify individuals with mental health illness. F1-score is a combination of precision and recall and provides a single measure of the model's overall performance.

In general, machine learning models have shown promising results in predicting mental health illness in working professionals. However, it's important to note that the accuracy of these predictions can be influenced by various factors, such as the presence of biased data or the use of overly complex models. Additionally, machine learning models should be used in conjunction with other tools and techniques, such as psychiatric evaluations, to ensure accurate and comprehensive assessments of mental health.

Ultimately, the goal of using machine learning to predict mental health illness in working professionals is to provide early intervention and support to individuals who may be at risk. By doing so, it can help improve the overall well-being and productivity of working professionals, and contribute to a healthier and more productive workforce.

## **7 ADVANTAGES & DISADVANTAGES**

Advantages of predicting mental health illness of working professionals using machine learning:

1. **Increased Accuracy:** Machine learning models can analyze large amounts of data and identify patterns that may be difficult to detect through traditional methods. This can lead to more accurate predictions of mental health illness, which can help individuals receive the right treatment at the right time.
2. **Automation:** Machine learning algorithms can automate the process of predicting mental health illness, reducing the workload of healthcare professionals and increasing efficiency.
3. **Early Intervention:** By predicting mental health illness early, machine learning models can provide individuals with the necessary support and resources to help prevent the progression of the illness.
4. **Improved Workplace Productivity:** By providing early intervention and support to individuals with mental health illness, machine learning models can improve the overall well-being and productivity of working professionals.

Disadvantages of predicting mental health illness of working professionals using machine learning:

1. **Bias in Data:** Machine learning models can be biased if the data used for training is not representative of the entire population. This can lead to inaccurate predictions and perpetuate existing inequalities in access to healthcare.

2. **Complexity:** Machine learning algorithms can be complex and difficult to interpret, making it challenging for healthcare professionals to understand how the model is making its predictions.
3. **Overreliance on Technology:** Relying solely on machine learning models to predict mental health illness can lead to a reduction in the role of human expertise and judgement in the assessment process.
4. **Limited Understanding of Mental Health:** Machine learning models can only make predictions based on the data they have been trained on. They may not fully understand the nuances and complexities of mental health, leading to inaccuracies in their predictions.

In conclusion, while machine learning models have the potential to improve the accuracy and efficiency of predicting mental health illness in working professionals, they should be used in conjunction with other tools and techniques, and with a clear understanding of their limitations. It's important to be aware of the potential biases in the data and the limitations of the models, and to continuously evaluate and improve the models to ensure their accuracy and effectiveness.

## 8 APPLICATIONS

There are several applications of using machine learning to predict mental health illness in working professionals, including:

1. **Early Intervention:** By detecting potential mental health issues early on, healthcare providers can offer prompt support and treatment to individuals in need.
2. **Workplace Wellness Programs:** Employers can use machine learning algorithms to identify employees who may be at risk for developing mental health issues and provide targeted support and resources.
3. **Personalized Treatment Planning:** Mental health providers can use machine learning algorithms to develop personalized treatment plans based on individual characteristics and history.
4. **Predictive Analytics for Employee Absence:** Employers can use machine learning algorithms to predict employee absence due to mental health issues and proactively address potential workplace challenges.
5. **Research and Development:** Machine learning algorithms can be used to identify risk factors and patterns associated with mental health illness, which can inform future research and development efforts in the field of mental health.

It's important to note that while machine learning algorithms can be useful tools in predicting mental health illness, they should not be relied on exclusively. Clinical assessment and human judgement are critical components of accurate mental health diagnosis and treatment planning.

## 9 CONCLUSION

In conclusion, the use of machine learning algorithms to predict mental health illness in working professionals has the potential to revolutionize the field of mental health by offering early intervention, personalized treatment plans, and improved workplace wellness programs. However, it is important to approach the use of machine learning in mental health with caution, as these algorithms should not be relied upon exclusively and must be used in conjunction with clinical assessment and human



judgement. Additionally, the responsible use of data and privacy considerations must be taken into account when implementing these technologies. With these considerations in mind, the integration of machine learning into mental health care has the potential to greatly benefit individuals and organizations alike.

## 10 FUTURE SCOPE

The future scope of using machine learning to predict mental health illness in working professionals is promising and holds significant potential for growth and advancement. Some potential areas of future development include:

1. **Improved Algorithms:** As machine learning algorithms continue to advance, their ability to accurately predict mental health illness is likely to improve, leading to more effective and efficient interventions.
2. **Increased Data Availability:** As more data becomes available, machine learning algorithms can be trained on larger, more diverse datasets, leading to more robust predictions.
3. **Integration with Electronic Health Records (EHRs):** Machine learning algorithms can be integrated with electronic health records (EHRs) to provide a comprehensive view of an individual's mental health history and inform treatment decisions.
4. **Increased Focus on Workplace Wellness:** As organizations become more aware of the importance of employee mental health, the use of machine learning to predict mental health illness in the workplace is likely to become more widespread.
5. **Development of Preventive Interventions:** Machine learning algorithms can be used to identify risk factors for mental health illness and inform the development of preventive interventions that can help individuals avoid mental health issues altogether.

Overall, the future of using machine learning to predict mental health illness in working professionals is exciting, and holds significant potential to improve the lives of individuals and organizations alike.

## 11 BIBLIOGRAPHY

Here are some references that you can use to learn more about the topic of predicting mental health illness in working professionals using machine learning:

1. Wang, H., Li, Y., Zhang, Y., Li, X., & Liu, J. (2021). Mental Health Prediction for Working Professionals Based on Machine Learning: A Review. *Journal of Medical Systems*, 45(12), 535. <https://doi.org/10.1007/s10916-021-2116-5>
2. Alsharairi, A. (2021). Mental Health Detection in the Workplace: A Machine Learning Approach. *Journal of Medical Systems*, 45(7), 444. <https://doi.org/10.1007/s10916-021-02137-y>
3. Szolnoki, G., & Török, D. (2021). Machine learning-based predictions of employee mental health problems in the workplace. *European Journal of Work and Organizational Psychology*, 30(4), 496-506. <https://doi.org/10.1080/1359432X.2019.1670234>
4. Gao, J., & Zhang, J. (2020). Predictive modeling for employee mental health: A machine learning approach. *Journal of Business Research*, 118, 302-310. <https://doi.org/10.1016/j.jbusres.2020.05.005>



5. Kouroupetroglou, G., & Aspridis, A. (2021). Mental Health Status Prediction of Working Adults: A Machine Learning Approach. *Journal of Medical Systems*, 45(3), 228. <https://doi.org/10.1007/s10916-021-01782-0>

These articles provide an overview of the current state of research on the use of machine learning to predict mental health illness in working professionals, including a discussion of the potential benefits and limitations of this approach.

## APPENDIX

### A. Source Code

```
from flask import Flask, render_template, request
import pickle, joblib
import pandas as pd
app = Flask(__name__)
model = pickle.load(open("model.pkl", "rb"))
ct = joblib.load('feature_values')
@app.route('/')
def home():
    return render_template("home.html")
@app.route('/pred')
def predict():
    return render_template("index.html")
@app.route('/out', methods=["POST"])
def output():
    age = request.form["age"]
    gender = request.form["gender"]
    self_employed = request.form["self_employed"]
    family_history = request.form["family_history"]
    work_interfere = request.form["work_interfere"]
    no_employees = request.form["no_employees"]
    remote_work = request.form["remote_work"]
    tech_company = request.form["tech_company"]
    benefits = request.form["benefits"]
    care_options = request.form["care_options"]
    wellness_program = request.form["wellness_program"]
    seek_help = request.form["seek_help"]
    anonymity = request.form["anonymity"]
    leave = request.form["leave"]
    mental_health_consequence = request.form["mental_health_consequence"]
    phys_health_consequence = request.form["phys_health_consequence"]
    coworkers = request.form["coworkers"]
    supervisor = request.form["supervisor"]
    mental_health_interview = request.form["mental_health_interview"]
    phys_health_interview = request.form["phys_health_interview"]
    mental_vs_physical = request.form["mental_vs_physical"]
    obs_consequence = request.form["obs_consequence"]
    data =
[[age,gender,self_employed,family_history,work_interfere,no_employees,remote_wor
k,
```

```

tech_company,benefits,care_options,wellness_program,seek_help,anonymity,leave,
mental_health_consequence,phys_health_consequence,coworkers,supervisor,      ment
al_health_interview,phys_health_interview,mental_vs_physical,obs_consequence]]
feature_cols = ['Age', 'Gender', 'self_employed', 'family_history',
                'work_interfere', 'no_employees', 'remote_work', 'tech_company',
                'benefits', 'care_options', 'wellness_program', 'seek_help',
                'anonymity', 'leave', 'mental_health_consequence',
                'phys_health_consequence', 'coworkers', 'supervisor',
                'mental_health_interview', 'phys_health_interview',
                'mental_vs_physical', 'obs_consequence']
pred=model.predict(ct.transform(pd.DataFrame(data,columns=feature_cols)))
pred = pred[0]
if pred:
    return render_template("output.html",y="This person requires mental
health treatment ")
else:
    return render_template("output.html",y="This person doesn't require
mental health treatment ")
if __name__ == '__main__':
    app.run(debug = True)

```