

MENTAL HEALTH SICKNESS PREDICTION USING MACHINE LEARNING

A Main project Report submitted in the partial fulfillment of the Requirements for the award of the degree

BACHELOR OF TECHNOLOGY IN COMPUTER SCIENCE AND ENGINEERING

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING NARASARAOPETA ENGINEERING COLLEGE (AUTONOMOUS)

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NARASARAOPETA ENGINEERING COLLEGE (AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING



CERTIFICATE

This is to certify that the project that is entitled with the name “**MENTAL HEALTH SICKNESS PREDICTION USING MACHINE LEARNING**” is a bonafide work done by the team **SK. HEENA KOUSAR (19471A05B7), M. MANEESHA (19471A05A6), M. PRASANNA (19471A05A0)** in partial fulfillment of the requirements for the award of the degree of **BACHELOR OF TECHNOLOGY** in the Department of **COMPUTER SCIENCE AND ENGINEERING** during 2022-2023.

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INSTITUTE VISION AND MISSION

INSTITUTION VISION

To emerge as a Centre of excellence in technical education with a blend of effective student centric teaching learning practices as well as research for the transformation of lives and community.

INSTITUTION MISSION

M1: Provide the best class infra-structure to explore the field of engineering and research.

M2: Build a passionate and a determined team of faculty with student centric teaching, imbining experiential, innovative skills.

M3: Imbibe lifelong learning skills, entrepreneurial skills and ethical values in students for addressing societal problems.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

VISION OF THE DEPARTMENT

To become a centre of excellence in nurturing the quality Computer Science & Engineering professionals embedded with software knowledge, aptitude for research and ethical values to cater to the needs of industry and society.

MISSION OF THE DEPARTMENT

The department of Computer Science and Engineering is committed to

M1: Mould the students to become Software Professionals, Researchers and Entrepreneurs by providing advanced laboratories.

M2: Impart high quality professional training to get expertize in modern software tools and technologies to cater to the real time requirements of the Industry.

M3: Inculcate team work and lifelong learning among students with a sense of societal and ethical responsibilities.

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PSO1: Apply mathematical and scientific skills in numerous areas of Computer Science and Engineering to design and develop software-based systems.

PSO2: Acquaint module knowledge on emerging trends of the modern era in Computer Science and Engineering.

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The graduates of the programme are able to:

PEO1: Apply the knowledge of Mathematics, Science and Engineering fundamentals to identify and solve Computer Science and Engineering problems.

PEO2: Use various software tools and technologies to solve problems related to academia, industry and society.

PEO3: Work with ethical and moral values in the multi-disciplinary teams and can communicate effectively among team members with continuous learning. **PEO4:** Pursue higher studies and develop their career in software industry.

Program Outcomes

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.



NARASARAOPETA

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Project Course Outcomes (CO'S):

CO425.1: Analyse the System of Examinations and identify the problem.

CO425.2: Identify and classify the requirements.

CO425.3: Review the Related Literature.

CO425.4: Design and Modularize the project.

CO425.5: Construct, Integrate, Test and Implement the Project.

CO425.6: Prepare the project Documentation and present the Report using appropriate method.

Course Outcomes – Program Outcomes mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C425.1		✓											✓		
C425.2	✓		✓		✓								✓		
C425.3				✓		✓	✓	✓					✓		
C425.4			✓			✓	✓	✓					✓	✓	
C425.5					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
C425.6									✓	✓	✓		✓	✓	

Course Outcomes – Program Outcome correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C425.1	2	3											2		
C425.2			2		3								2		
C425.3				2		2	3	3					2		
C425.4			2			1	1	2					3	2	
C425.5						3	3	2	3	2	2	1	3	2	1
C425.6									3	2	1		2	3	

Note: The values in the above table represent the level of correlation between CO's and PO's:

1. Low level
2. Medium level
3. High level

Project mapping with various courses of Curriculum with Attained PO's:

Name of the course from which principles are applied in this project	Description of the device	Attained PO
C3.2.4, C3.2..5	Gathering the requirements and defining the problem, plan to develop a smart bottle for health care using sensors.	PO1, PO3
CC4.2.5	Each and every requirement is critically analyzed, the process model is identified and divided into five modules	PO2, PO3
CC4.2.5	Logical design is done by using the unified modelling language which involves individual team work	PO3, PO5, PO9
CC4.2.5	Each and every module is tested, integrated, and evaluated in our project	PO1, PO5
CC4.2.5	Documentation is done by all our four members in the form of a group	PO10
CC4.2.5	Each and every phase of the work in group is presented periodically	PO10, PO11
CC4.2.5	Implementation is done and the project will be handled by the hospital management and in future updates in our project can be done based on air bubbles occurring in liquid in saline.	PO4, PO7
CC4.2.8 CC4.2.	The physical design includes hardware components like sensors, gsm module, software and Arduino	PO5, PO6

ABSTRACT

Mental illness is becoming a serious global health problem worldwide, with a growing number of patients suffering from depression, anxiety and other disorders. New solutions are needed to tackle this issue. The main goal of this research project is to develop prediction models to classify users with poor mental health from social network data.

The emotional, psychological and social welfare of a person is revealed by their mental health. It influences how an individual will think, feel or handle a situation. Positive mental health helps an individual to work productively and achieve their full potential. At each point in life, mental health is vital, from childhood to adulthood. Numerous factors contribute to mental health issues which lead to mental illness like stress, social anxiety, depression, obsessive compulsive disorder, drug addiction, workplace issues and personality disorders.

The onset of mental illness should be determined without flaws for maintaining an appropriate life balance. We have collected data from online available datasets. The data has been label encoded for better prediction. The data is being subject to various machine learning techniques to obtain labels. These classified labels will then be used to build a model to predict the mental health of an individual. Our target population is in the working class i.e people above the age of 18. Once the model is built, it will be integrated to a website so that it can predict the outcome as per the details provided by the user.

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1. INTRODUCTION

1.1 Introduction

A person's mental well-being is his or her mental condition, as well as an overview of his or her general environment. Brain chemistry abnormalities are the cause of mental illness. An individual's mental health serves as a barometer for properly addressing his or her diseases. To predict any health-related irregularities, it is critical to keep track of diverse groups' mental health profiles. The community is made up of working professionals, college students, and high school students. There is a widespread belief that stress and sadness affect people of all ages and backgrounds. To avoid serious illness, it is necessary to identify the mental health of different categories at different times. In the next years, healthcare providers will be required to consider a patient's mental health profile to deliver better medication and aid in a speedier recovery. Some of the major mental health disorders, such as chronic diseases, bipolar disorder, and schizophrenia they don't suddenly arise out of nowhere; they often develop over time and produce symptoms that can be recognized in the early stages. Such disorders could be avoided or controlled more successfully. If abnormal mental states are discovered early in the disease's course when extra treatment and care can be provided. So judging people's mental states based on their looks or conduct is a complex psychological science that has yet to be mechanized. Although screening test solutions exist, due to time and financial constraints, this solution is not feasible for large populations. Furthermore, diagnosis-based procedures have the unintended consequence of discouraging unwell people from taking part. As a result, psychological problems frequently go unnoticed or untreated. Anxiety and depression are serious public health issues that affect people all over the world. They affect people of all ages, from children to the elderly, including both men and women. Anxiety and depression disorders have a wide range of effects on health and well-being.

Machine learning has developed as a reliable tool for analyzing these data. Machine Learning is the application of advanced probabilistic and statistical techniques to create computers that can learn from data on their own. This allows data patterns to be more easily and correctly discovered, as well as more accurate predictions from data sources. Natural language processing, speech recognition, computer vision, and Artificial intelligence have all benefited from machine learning, which allows developers and researchers to extract crucial data from datasets, deliver personalized experiences, and develop intelligent systems. In domains like bioinformatics, ML has aided substantial progress by allowing for quick and scalable analysis of complicated data. Mental health data is also being investigated using similar analytic tools, with the potential to improve patient outcomes as well as improve understanding of psychological diseases and their management.

1.2 EXISTING SYSTEM

- The existing system requires more man power and involving high amount of time
- This practice may lead to errors, consume a lot of time and excessive medical costs which affects the quality of service provided to patients.

DRAWBACKS

- Doesn't generate accurate and efficient results.
- Computation time is very high.
- Lacking of accuracy may result in lack of efficient further treatment.

1.3 PROPOSED SYSTEM

- The proposed system is based on machine learning, is very efficient for the doctors.
- This system predicts whether the person is effected to the disease and we can reduce medical errors, enhance patient safety, improve patient outcomes.

ADVANTAGES

- Generates accurate and efficient results.
- Computation time is greatly reduced.
- Reduces manual work.
- Efficient further treatment.

1.4 System Requirements

HARDWARE REQUIREMENTS:

- System Type : Intel Core i5 or above
- Hard-Disk : 1TB
- RAM : 8GB

SOFTWARE REQUIREMENTS

- Operating System : Windows 10
- Coding Language : Python
- Python Distribution : Anaconda, Spyder, Flask

2. LITERATURE SURVEY

2.1 Machine Learning

Machine learning is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. Machine learning focuses on the development of computer programs that can access data and use it learn for themselves.

The process of learning begins with observations or data, such as examples, direct experience, or instruction, in order to look for patterns in data and make better decisions in the future based on the examples that we provide. The primary aim is to allow the computers learn automatically without human intervention or assistance and adjust actions accordingly.

A popular saying goes that we are living in an “information age”. Terabytes of data are produced every day. Data mining is the process that transforms information into a set of data. The healthcare system produces massive quantities of data every day. Much of it isn't used successfully though. Animesh Hazra has suggested that any of the latest work on heart disease prediction using data mining techniques analyzes the various combinations of mining algorithms used and conclude which techniques are successful and efficient.

In this, the research has concentrated on the benefits of machine learning in improving mental health identification and diagnosis of Alzheimer's disease, depression, and other mental illnesses schizophrenia. Overall, machine learning has the potential to increase clinical and research efficiency while also providing fresh insight into mental health and wellbeing. Depression prediction is critical for patients to receive the most appropriate treatment as soon as feasible . Artificial intelligence is becoming a bigger aspect of medicine, and it will help with mental health research and practice.

To realize the full promise of AI, a varied community of specialists involved in mental health research and care, including scientists, clinicians, patients, and regulators, must communicate and interact [2]. They have analyzed by using discourse analysis in this study to better understand the practices of representation in human-centered machine learning (HCML). From this, case prediction of mental health status on social media data, they have found a dataset of 55 interdisciplinary studies. Their findings show that opposing the discourses of interaction throughout the dataset to construct and grant agency for the humans. Their findings demonstrate how the five discourses produce a paradoxical object and subject views of the human, potentially dehumanizing it accidentally.

2.2 Some Machine Learning Types:

1. **Supervised machine learning algorithms** can apply what has been learned in the past to new data using labeled examples to predict future events. Starting from the analysis of a known training dataset, the learning algorithm produces an inferred function to make predictions about the output values. The system is able to provide targets for any new input after sufficient training. The learning algorithm can also compare its output with the correct, intended output and find errors in order to modify the model accordingly.

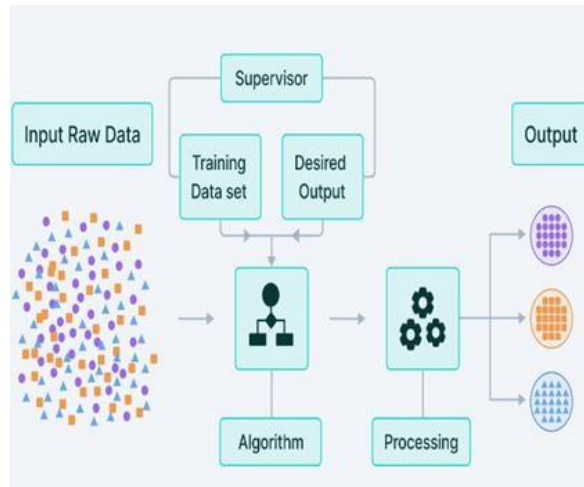


Fig :2.1 Supervised Machine Learning

2. **Unsupervised machine learning algorithms** are used when the information used to train is neither classified nor labeled. Unsupervised learning studies how systems can infer a function to describe a hidden structure from unlabeled data. The system doesn't figure out the right output, but it explores the data and can draw inferences from data sets to describe hidden structures from unlabeled data.

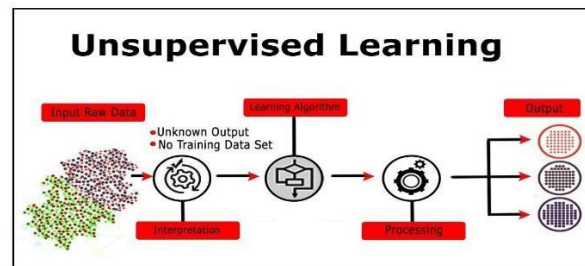


Fig:2.2 Unsupervised machine learning

3. **Reinforcement machine learning algorithms** is a learning method that interacts with its environment by producing actions and discovers errors or rewards. Trial and error search and delayed reward are the most relevant characteristics of reinforcement learning. This method allows machines and software agents to automatically determine the ideal behaviour within a specific context in order to maximize its performance. Simple reward feedback is required for the agent to learn which action is best. This is known as the reinforcement signal.

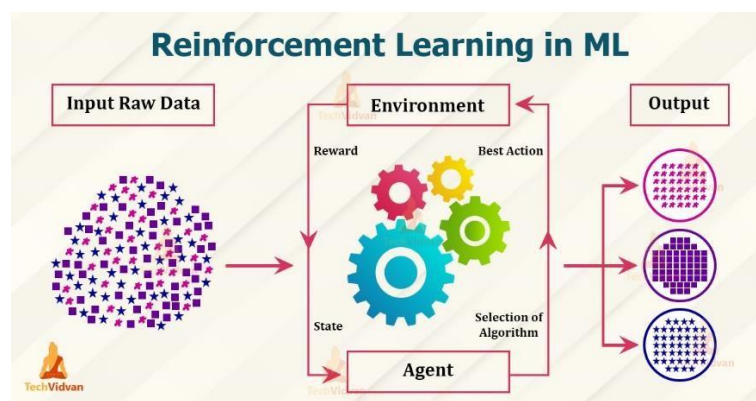


Fig:2.3 Reinforcement Machine learning

2.3 Applications of Machine Learning:

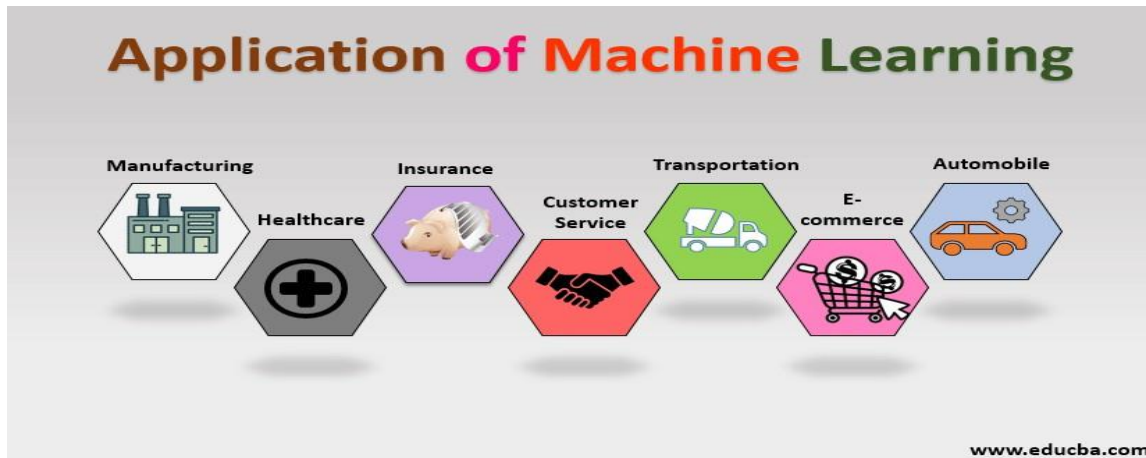


Fig:2.4 Applications of Machine Learning

1. Web Search Engine
2. Photo tagging applications
3. Spam Detection
4. Augmentation
5. Automation
6. Finance industry
7. Government Organization
8. Healthcare Industry
9. Marketing
10. Product Recommendations
11. Sentiment Analysis
12. Predict Potential Heart Failure
13. Language Translation
14. Speech Recognition
15. Predict Traffic Patterns
16. Self Driving Cars
17. Catching E-mail Spams
18. Catching Malware
19. Virtual Personal Assistant
20. Stock Market and Day Trading

2.4 Characteristics of Machine Learning

1. The ability to perform automated data visualization:

A massive amount of data is being generated by businesses and common people on a regular basis. By visualizing notable relationships in data, businesses can not only make better decisions but build confidence as well. Machine learning offers a number of tools that provide rich snippets of data which can be applied to both unstructured and structured data. With the help of user-friendly automated data visualization platforms in machine learning, businesses can obtain a wealth of new insights in an effort to increase productivity in their processes.

2. Automation at its best:

One of the biggest characteristics of machine learning is its ability to automate repetitive tasks and thus, increasing productivity. A huge number of organizations are already using machine learning-powered paperwork and email automation. In the financial sector, for example, a huge number of repetitive, data-heavy and predictable tasks are needed to be performed. Because of this, this sector uses different types of machine learning solutions to a great extent. They make accounting tasks faster, more insightful, and more accurate. Some aspects that have been already addressed by machine learning include addressing financial queries with the help of chatbots, making predictions, managing expenses, simplifying invoicing, and automating bank reconciliations.

3. Customer engagement like never before:

For any business, one of the most crucial ways to drive engagement, promote brand loyalty and establish long-lasting customer relationships is by triggering meaningful conversations with its target customer base. Machine learning plays a critical role in enabling businesses and brands to spark more valuable conversations in terms of customer engagement. The technology analyzes particular phrases, words, sentences, idioms, and content formats which resonate with certain audience members. You can think of Pinterest which is successfully using machine learning to personalize suggestions to its users. It uses the technology to source content in which users will be interested, based on objects which they have pinned already.

4. The ability to take efficiency to the next level when merged with IoT:

Machine learning has experienced a great rise in popularity. IoT is being designated as a strategically significant area by many companies. And many others have launched pilot projects to gauge the potential of IoT in the context of business operations. But attaining financial benefits through IoT isn't easy. In order to achieve success, companies, which are offering IoT consulting services and platforms, need to clearly determine the areas that will change with the implementation of IoT strategies. Many of these businesses have failed to address it. In this scenario, machine learning is probably the best technology that can be used to attain higher levels of efficiency. By merging machine learning with IoT, businesses can boost the efficiency of their entire production processes.

5. Accurate data analysis:

Traditionally, data analysis has always been encompassing trial and error method, an approach which becomes impossible when we are working with large and heterogeneous datasets. Machine learning comes as the best solution to all these issues by offering effective alternatives to analyzing massive volumes of data. By developing efficient and fast algorithms, as well as, data-driven models for processing of data in real-time, machine learning is able to generate accurate analysis and results.

6. Business intelligence at its best:

Machine learning characteristics, when merged with big data analytical work, can generate extreme levels of business intelligence with the help of which several different industries are making strategic initiatives. From retail to financial services to healthcare, and many more — machine learning has already become one of the most effective technologies to boost business operations.

2.5 Advantages of Machine Learning

- Machine Learning is the type of technology that keeps on evolving. There is a lot of scope in ML to become the top technology in the future. The reason is, it has a lot of research areas in it. This helps us to improve both hardware and software.
- ML has a wide variety of applications. This means that we can apply ML on any of the major fields. ML has its role everywhere from medical, business, banking to science and tech. This helps to create more opportunities. It plays a major role in customer interactions.

2.6 Machine Learning Algorithms

To create a machine learning model, one must write several algorithms, blend them together and create a net of neurons. Machine learning has a high computational cost. To aid machine learning models, there are machine learning platforms like KNIME Analytics, Data Robot etc.

2.7 Architectural Methods for Machine Learning Algorithms

To build this architecture following algorithms are used:

1. **Convolutional neural networks (CNNs):** The essential component of the CNN is its convolutional layer—hence the name. The convolutional layer is a filter between the input and output. It creates a feature map of the inputs which summarizes the detected features. The convolutional layer can break an image down into important features, then predict its label based on those features. After creating the feature map, the following layers are pooling layers. Pooling layers simplify the computation by reducing the dimensionality of the data. To do this, it combines the outputs of one layer before proceeding to the next layer. Pooling can happen locally or globally. The difference is whether the pooling happens in one convolutional neuron or across all the convolutional neurons.
2. **Recurrent/recursive neural networks (RNNs):** Recurrent neural networks are a basic architecture with many variations. An RNN is used largely to solve sequence-to-sequence problems where the input is a sequence and the output is another sequence. These problems typically include: Language translation (English to Chinese) Generation (predicting the next item in a sequence).
3. **Sorting/Clustering Architectures:** Sorting and clustering algorithms are used to look at the distribution of a population, and possibly discover something unknown in the data. Thus, they're great models to use in unsupervised modelling scenarios and on unstructured data. The models can be used to: Recognize patterns and place a population in classes, like groups of people who like country, rock, or hip-hop. Detection anomalies by identifying outliers in a data set, like individuals who like none of those genres.
4. **Generative models:** Generative models are a breed of ML model meant to generate data identical to the samples. They are used to say how likely a given example is. They can create faces that look like celebrities. They are used in cyber-security to say how likely an image might be a deep fake, or how likely an IP address might be an attacker. GANs can spot fakes.

2.8 Libraries of Machine Learning

All the libraries which are generally used for machine learning are open source and few of them are as follows:

- TensorFlow
- Torch
- Microsoft CNTK
- ML.NET
- Theano
- Scikit Learn
- Statsmodels

1. TensorFlow

- TensorFlow is the machine learning and deep learning library developed by Google and it came into the market around the 2016 march.
- TensorFlow grew out of an in-house library of google brain known as DistBelief.
- Currently, TensorFlow is the leading and most used library in the market.
- Different types of deep nets can be developed and also the various packages available in this library are used to attain and address most of the tasks and problems in the field of deep learning.
- This library is completely written in python and so it's easy to use for the python programmers.
- Due to a flexible computational graphical structure of TensorFlow, this library is not only limited to deep learning operations it can be used for many different operations and applications.
- TensorFlow provides a layer or we can say more of a wrapper, known as Keras which is used to access the different packages and methods easily of TensorFlow.
- Google provides a very well documentation for this library where every small intricacies and usage are mentioned anyone can refer that and use the library.
- TensorFlow is a very fast-evolving library, this library can be used for educational purposes as well as huge large scale commercial application can also be built.
- Google has developed this library for Mobil platforms as well which is known as TensorFlowlite.
- TensorFlow is the only library which provides support for Python, Java, C++, javascript and swift programming language, for Javascript TensorFlow.js
- TensorFlow has also support for GPU and big data.

2. Numpy

- Numpy or numerical Python is arguably one of the most important Python packages for Machine Learning. Scientific computations use a ton of matrix operations.
- These operations can be pretty computationally heavy. Implementing them naively can easily lead to inefficient memory usage.
- Numpy arrays are a special class of arrays that do these operations within milliseconds.
- In tasks like Natural Language Processing where you have a large set of vocabulary and hundreds of thousands of sentences, a single matrix can have millions of numbers. As a beginner, you have to master using this library.

3. Torch

- This open-source deep-learning library was developed by Facebook and Twitter.
- This library is written in Lua programming language.
- However PyTorch is the library which is widely used, and it's written in a python programming language.

4. Theano

- This is the open-source deep-learning library written in Python and CUDA.
- This library is very similar to the TensorFlow library but the implementation and usage are not that simple as that of TensorFlow.
- This library is generally used for educational and research purposes.
- Theano is not that easy to use and many deep learning libraries extend the features of this library to help ease the life of the developer for coding the deep learning models.
- Theano is fastest amongst most of the libraries mentioned because it makes use of vectors and matrices for all the functions and the vectorized code runs faster since parallel processing for the multiple values makes the things faster.

5. Microsoft CNTK

- This is a cognitive toolkit developed by Microsoft to venture in the field of Artificial intelligence.
- This library is written in python and it supports the other packages and libraries which python programming language supports, and it comes with Microsoft visual studio.
- CNTK is used to describe neural networks as a series of computational directed graphs.

6. ML.NET

- ML.NET is the open-source library which is also developed by Microsoft for the dot net developers.
- This library is written in C# and F# and it uses the Microsoft dot net platform.
- With the library, it becomes easy to create desktop as well as large scale web applications which can bring the vast possibility of the machine learning algorithm to the end-user.

7. Scikit Learn

- Scikit Learn is perhaps the most popular library for Machine Learning.
- It provides almost every popular model – Linear Regression, Lasso-Ridge, Logistics Regression, Decision Trees, SVMs and a lot more.
- Not only that, but it also provides an extensive suite of tools to pre-process data, vectorizing text using BOW, TF-IDF or hashing vectorization and many more.
- It has huge support from the community. The only drawback is that it does not support distributed computing for large scale production environment applications well.

8. Statsmodels

- Statsmodels is another library to implement statistical learning algorithms.
- It is more popular for its module that helps implement time series models.
- You can easily decompose a time-series into its trend component, seasonal component, and a residual component.

Layers in Convolutional Neural Networks

Below are the Layers of convolutional neural networks:

1. Image Input Layer:

The input layer gives inputs(mostly images), and normalization is carried out. Input size has to be mentioned here.

2. Convolutional Layer:

Convolution is performed in this layer. The image is divided into perceptrons(algorithm); local fields are created, leading to the compression of perceptrons to feature maps as a matrix with size $m \times n$.

3. Non-Linearity Layer:

Here feature maps are taken as input, and activation maps are given as output with the help of the activation function. The activation function is generally implemented as sigmoid or hyperbolic tangent functions.

4. Rectification Layer:

The crucial component of CNN, this layer does the training faster without reducing accuracy. It performs element-wise absolute value operation on activation maps.

5. Rectified Linear Units(ReLU):

ReLU combines non-linear and rectification layers on CNN. This does the threshold operation where negative values are converted to zero. However, ReLU doesn't change the size of the input.

6. Pooling Layer:

The pooling layer is also called the down sampling layer, as this is responsible for reducing the size of activation maps. A filter and stride of the same length are applied to the input volume. This layer ignores less significant data; hence image recognition is done in a smaller representation. This layer reduces

overfitting. Since the amount of parameters is reduced using the pooling layer, the cost is also reduced. The input is divided into rectangular pooling regions, and either maximum or average is calculated, which returns maximum or average consequently. Max Pooling is a popular one.

7. Dropout Layer:

This layer randomly sets the input layer to zero with a given probability. More results in different elements are dropped after this operation. This layer also helps to reduce overfitting. It makes the network to be redundant. No learning happens in this layer. This operation is carried out only during training.

8. Fully Connected Layer:

Activation maps, which are the output of previous layers, is turned into a class probability distribution in this layer. FC layer multiplies the input by a weight matrix and adds the bias vector.

9. Output Layer:

FC layer is followed by softmax and classification layers. The softmax function is applied to the input. The classification layer computes the cross-entropy and loss function for classification problems.

10. Regression Layer:

Half the mean squared error is computed in this layer. This layer should follow the FC layer.

Common steps for any Tensorflow based Algorithms: The basic steps of TensorFlow algorithm are:

Step 1: Data is Imported/Generated: TensorFlow Models depends heavily on the huge amount of Data. Either you can import your own dataset or TensorFlow also comes with the collection of Type this command to check out available datasets in TensorFlow

```
import TensorFlow as tf
import TensorFlow datasets as tendata
TensorFlow
print(tfds.list_builders())
```

Step 2: Data Normalization or Transformation: If the data is not in the appropriate forum. The Batch Normalization is the command approach used to normalize data in the TensorFlow.

Step 3: Set the Parameters of the Algorithm: For eg; the number of Iterations, Learning rate, etc.

Step 4: Set and initialize the variables and Placeholders: Variables and Placeholders are two basic programming Elements of the TensorFlow. Variables hold the state of the graph and placeholders are used to feed the data in the graph at the later date.

Step 5: Create Model structure: What operations will be performed on the data is defined.

Step 6: Define the Loss Function: It calculates the difference between predicted values and actual values. It tells how well your model is trained basically used to evaluate the output.

Step 7: Train Model: Initialize computational graph and create an Instance of a graph. Feed data into the model with the help of placeholders and let the TensorFlow do the rest of the processing for better predictions.

Step 8: Evaluate the performance: Evaluate the model by checking with new data.

Step 9: Predict the Outcome: Also checks your model on new and unseen data.

To better visualize model TensorFlow provides Tensorboard. It helps us to visualize any statistics of the neural network, debug and optimize them. You can check what happens in the code and will give you a detailed understanding of the inner working. You can fix problems very easily with the help of this tool. Tensorboard provides five types of Visualizations:

- Scalars
- Images
- Audio
- Histograms
- Graphs

The summary function of the TensorFlow gives us a detailed summary according to the specified format. To allocate resources, hold intermediate results and variables and execute graphs or part of graph session function is used.

3. SYSTEM ANALYSIS

3.1 Scope of the project

The scope of this system is to maintain patient details in datasets, train the model using the large quantity of data present in datasets and predict whether presence or absence of disease on new data during testing.

3.2 Analysis

1. Age
2. Gender
3. Country
4. State
5. Self_employeed
6. Family_history
7. Treatment
8. Work_interfere
9. Tech_company
10. Remote_work
11. Benefits
12. Care_options
13. Wellness_program and so on....

3.3 Data Set

Timestamp	Age	Gender	Country	state	self_employed	family_history	treatment
#####	37	Female	United States	IL	NA	No	Yes
#####	44	M	United States	IN	NA	No	No
#####	32	Male	Canada	NA	NA	No	No
#####	31	Male	United Kingdom	NA	NA	Yes	Yes
#####	31	Male	United States	TX	NA	No	No
#####	33	Male	United States	TN	NA	Yes	No
#####	35	Female	United States	MI	NA	Yes	Yes
#####	39	M	Canada	NA	NA	No	No
#####	42	Female	United States	IL	NA	Yes	Yes
#####	23	Male	Canada	NA	NA	No	No
#####	31	Male	United States	OH	NA	No	Yes
#####	29	male	Bulgaria	NA	NA	No	No
#####	42	female	United States	CA	NA	Yes	Yes
#####	36	Male	United States	CT	NA	Yes	No
#####	27	Male	Canada	NA	NA	No	No
#####	29	female	United States	IL	NA	Yes	Yes
#####	23	Male	United Kingdom	NA	NA	No	Yes
#####	32	Male	United States	TN	NA	No	Yes
#####	46	male	United States	MD	Yes	Yes	No
#####	36	Male	France	NA	Yes	Yes	No
#####	29	Male	United States	NY	No	Yes	Yes
#####	31	male	United States	NC	Yes	No	No
#####	46	Male	United States	MA	No	No	Yes
#####	41	Male	United States	IA	No	No	Yes
#####	33	male	United States	CA	No	Yes	Yes
#####	35	male	United States	TN	No	Yes	Yes
#####	22	male	United States	TN	No	No	No

Fig: 3.1 Dataset

3.4 Data Preprocessing:

Before feeding data to an algorithm we have to apply transformations to our data which is referred as pre-processing. By performing pre-processing the raw data which is not feasible for analysis is converted into clean data. In-order to achieve better results using a model in Machine Learning, data format has to be in a proper manner. The data should be in a particular format for different algorithms. For example, if we consider Random Forest algorithm it does not support null values. So that those null values have to be managed using raw data.

Pre-processing refers to the transformations applied to our data before feeding it to the algorithm. Data Pre-processing is a technique that is used to convert the raw data into a clean data set. In other words, whenever the data is gathered from different sources it is collected in raw format which is not feasible for the analysis.

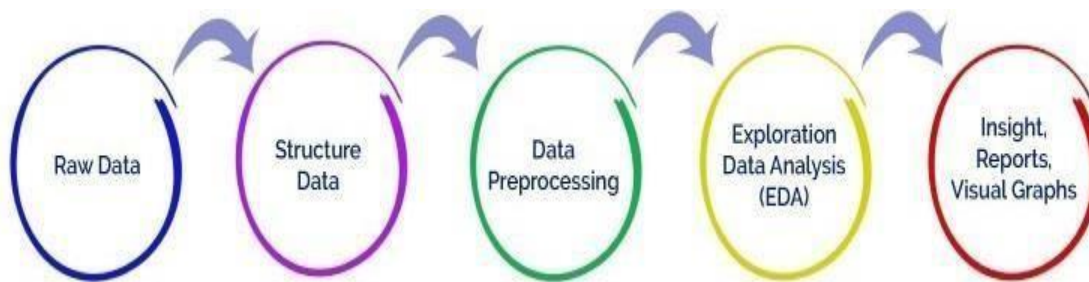


Fig: 3.2 Data Preprocessing

Need of Data Preprocessing: For achieving better results from the applied model in Machine Learning projects the format of the data has to be in a proper manner. Some specified Machine Learning model needs information in a specified format. For example, Random Forest algorithm does not support null values, therefore to execute random forest algorithm null values have to be managed from the original raw data set. Another aspect is that data set should be formatted in such a way that more than one Machine Learning and Deep Learning algorithms are executed in one data set, and best out of them is chosen.

3.5 Classification

- It is a process of categorising data into given classes. Its primary goal is to identify the class of our new data.

3.5.1 Machine learning algorithms for classification

Research on data mining has led to the formulation of several data mining algorithms. These algorithms can be directly used on a dataset for creating some models or to draw vital conclusions and inferences from that dataset. Some popular data mining algorithms are Random forest, Decision tree, Gaussian Naïve Bayes, Support vector machine etc.

3.5.1.1 Decision Tree

Analysis is a general, predictive modelling tool that has applications spanning a number of different areas. In general, decision trees are constructed via an algorithmic approach that identifies ways to split a data set based on different conditions. It is one of the most widely used and practical methods for supervised learning. Decision Trees are a non-parametric supervised learning method used for both classification and regression tasks. The goal is to create a model that predicts the value of a target

variable by learning simple decision rules inferred from the data features. The decision rules are generally in form of if-then-else statements. The deeper the tree, the more complex the rules and fitter the model.

3.5.1.2 Logistic Regression : Logistic regression is used to expect the output of specific structured variables. the result should be a categorical or discrete value. It can be 0 or 1, Yes or No, true or false, and so on, but it delivers probabilistic values that are somewhere between 0 and 1 instead of giving exact values like 0 and 1.

3.5.1.3 K-Nearest Neighbour :In the K-NN method, the existing cases and new case/data will be similar. KNN is a non-parametric algorithm that doesn't make any assumption of its underlined data or its distribution. And also it works with multiple classes.

3.5.1.4 Random Forest : It is a technique that solves classification as well as regression problems. However, it is frequently used for classification. Because it combines many decision trees to create a "forest" and feeds random features from the input dataset to them, it is called a random forest.

3.5.1.6 Stacking : Stacked Generalization, or simply "Stacking," is a machine learning ensemble algorithm. Like bagging and boosting, it entails aggregating predictions from many machine learning models on the same dataset.

3.5.1.7 Adaboost Classifier : Boosting has been a prevalent technique for tackling binary classification problems. These algorithms improve the prediction power by converting a number of weak learners to strong learners . The principle behind boosting algorithms is first we built a model on the training dataset, then a second model is built to rectify the errors present in the first model. This procedure is continued until and unless the errors are minimized, and the dataset is predicted correctly.

3.5.1.8 Gradient Boosting : Gradient boosting is a machine learning technique used in regression and classification tasks, among others. It gives a prediction model in the form of an ensemble of weak prediction models, which are typically decision trees.

4. IMPLEMENTATION

```
## Import Necessary Modules

import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sb
import sklearn

data = pd.read_csv(r"C:\Users\Heena\mp\data\survey.csv")
#data.head()

data.shape

data.info()

data.isnull().sum()

data['state'].value_counts()

data['state'].fillna('CA',inplace=True)

data['self_employed'].value_counts()

data['self_employed'].fillna('No',inplace=True)

data['work_interfere'].value_counts()

data['work_interfere'].fillna('Sometimes',inplace=True)

data['comments'].value_counts()

data['comments'].fillna('* Small family business - YMMV.',inplace=True)

data.isnull().sum()

data['Gender'].replace(['Male','Male ','male','M','m','Cis Male','Man','cis male','Mail','Male-
ish','Male (CIS)','Cis Man','msle','Malr','Mal',
                        'maile','Male','Make','male leaning androgynous','ostensibly male, unsure what that really means'],'Male',inplace=True)
data['Gender'].replace(['Female','Female ','female','F','f','woman','femail','Cis Female','cis-
female/femme','Femake','Female (cis)',
                        'Woman'],'Female',inplace=True)
data['Gender'].replace(['Female (trans)','queer/she/they','non-binary','fluid','queer','Androgyne','Trans-
female','male learning androgynous',
```

```
'Agender','A little about you','Nah','All','ostensibly male','unsure what that really means','Genderqueer','Enby','p',  
'Neuter','something kinda male?','Guy (-ish) ^_^','Trans woman'],'Trans',inplace=True)
```

```
data['Gender'].unique()  
X = data.drop('treatment', axis=1)  
y = data['treatment']
```

```
from sklearn.compose import ColumnTransformer  
from sklearn.preprocessing import LabelEncoder, OrdinalEncoder
```

```
encoder = OrdinalEncoder()
```

```
X = ['Timestamp','Age','Gender','Country','state','self_employed','family_history','work_interfere','no_employees','remote_work','tech_company',  
     'benefits','care_options','wellness_program','seek_help','anonymity','leave','mental_health_consequence','physical_health_consequence',  
     'coworkers','supervisor','mental_health_interview','physical_health_interview','mental_vs_physical','obs_consequence',  
     'comments']  
X = encoder.fit_transform(data[X])  
X
```

```
le = LabelEncoder()
```

```
y = le.fit_transform(y)  
print(y)
```

```
from sklearn.model_selection import cross_val_score  
from sklearn.model_selection import train_test_split  
X_train, X_test, y_train, y_test = train_test_split(X,y, test_size=0.3, random_state=49)
```

```
X_train.shape, X_test.shape, y_train.shape, y_test.shape
```

```
data.dtypes
```

```
import joblib  
joblib.dump(X,'feature_values')
```

```
from sklearn.linear_model import LogisticRegression  
from sklearn.tree import DecisionTreeClassifier  
from sklearn.neighbors import KNeighborsClassifier  
from sklearn.ensemble import RandomForestClassifier, AdaBoostClassifier, GradientBoostingClassifier  
#from xgboost.sklearn import XGBClassifier  
from sklearn.metrics import accuracy_score, roc_curve, confusion_matrix, classification_report, auc  
from sklearn.ensemble import StackingClassifier
```

```
model_dict={ }
```

```

# model_dict['Logistic Regression'] = LogisticRegression(solver='liblinear', random_state=49)
# model_dict['KNN Classifier'] = KNeighborsClassifier()
# model_dict['Decision Tree Classifier'] = DecisionTreeClassifier(random_state=49)
# model_dict['Random Forest Classifier'] = RandomForestClassifier(random_state=49)
# #model_dict['XGB Classifier'] = XGBClassifier(random_state=49)
# model_dict['AdaBoost Classifier'] = AdaBoostClassifier(random_state=49)
model_dict['Gradient Boosting Classifier'] = GradientBoostingClassifier(random_state=49)

def model_test (X_train, X_test, y_train, y_test, model, model_name):
    model.fit(X_train,y_train)
    y_pred = model.predict(X_test)
    accuracy = accuracy_score(y_test,y_pred)
    print('====={ }====='.format(model_name))
    print('score is : { }'.format(accuracy))
    print()

for model_name,model in model_dict.items():
    model_test(X_train, X_test, y_train, y_test, model, model_name)

abc=GradientBoostingClassifier(random_state=99)
abc.fit(X_train,y_train)
pred_abc=abc.predict(X_test)

print('Accuracy of GradientBoosting',accuracy_score(y_test,pred_abc))

import pandas as pd
import pickle
pd.read_pickle("model.pkl")

import pickle
pickle.dump(abc, open("model.pkl", "wb"))

```

home.html

```

<html>
<head>
    <nav>
        <h1>Mental Health Prediction</h1><br/>
    </nav>
    <br><br/>
</head>
<style>
    nav{

```

```

width: 100%;
height: 45px;
background-color: #d8b7b0;
text-align: center;
font-size: 25px;
}
</style>

<body>
<form action="{ { url_for('predict') } }"method="POST">
  <table>
    <tr>
      <td>
        Age
        <br><br/>
      </td>
      <td>
        <input type="number" name="age" required>
        <br><br/>
      </td>
    </tr>
    <tr>
      <td>
        Gender
        <br><br/>
      </td>
      <td>
        <input list="gender" name="gender" required>
        <datalist id="gender">
          <option value="Female">
          <option value="Male">
          <option value="Other">
        </datalist>
        <br><br/>
      </td>
    </tr>
    <tr>
      <td>
        Are you self employed ?
        <br><br/>
      </td>
      <td>
        <input list="self-employed" name="self_employed" required>
        <datalist id="self-employed">
          <option value="Yes">
          <option value="No">

```

```

        </datalist>
        <br><br/>
    </td>
</tr>
<tr>
    <td>
        Do you have a family history of mental illness?
        <br><br/>
    </td>
    <td>
        <input list="family-history" name="family_history" required>
        <datalist id="family-history">
            <option value="Yes">
            <option value="No">
        </datalist>
        <br><br/>
    </td>
</tr>
<tr>
    <td>
        If you have a mental health condition, <br/>
        do you feel that it interferes with your work ?
        <br><br/>
    </td>
    <td>
        <input list="work_interfere" name="work_interfere" required>
        <datalist id="work_interfere">
            <option value="Never">
            <option value="Rarely">
            <option value="Sometimes">
            <option value="Often"></option>
        </datalist>
        <br><br/>
    </td>
</tr>
<tr>
    <td>
        How many employees does your company have ?
        <br><br/>
    </td>
    <td>
        <input list="no_employees" name="no_employees" required>
        <datalist id="no_employees">
            <option value="1-25">
            <option value="6-25">
            <option value="26-100">

```

```

        <option value="100-500">
        <option value="500-1000">
        <option value="More than 1000">

    </datalist>
    <br><br/>
</td>
</tr>
<tr>
    <td>
        Do you work remotely (outside of an office) at least 50% of the time?
        <br><br/>
    </td>
    <td>
        <input list="remote_work" name="remote_work" required>
        <datalist id="remote_work">
            <option value="Yes">
            <option value="No">
        </datalist>
        <br><br/>
    </td>
</tr>
<tr>
    <td>
        Is your employer primarily a tech company organization ?
        <br><br/>
    </td>
    <td>
        <input list="tech_company" name="tech_company" required>
        <datalist id="tech_company">
            <option value="Yes">
            <option value="No">
        </datalist>
        <br><br/>
    </td>
</tr>
<tr>
    <td>
        Does your company provide mental health benefits ?
        <br><br/>
    </td>
    <td>
        <input list="benefits" name="benefits" required>
        <datalist id="benefits">
            <option value="Yes">
            <option value="No">

```

```

        <option value="Don't know">
    </datalist>
    <br><br/>
</td>
</tr>
<tr>
    <td>
        Do you know the options for mental health care your employer provides?
        <br><br/>
    </td>
    <td>
        <input list="care_options" name="care_options" required>
        <datalist id="care_options">
            <option value="Yes">
            <option value="No">
            <option value="Not sure">
        </datalist>
        <br><br/>
    </td>
</tr>
<tr>
    <td>
        Has your employer ever discussed<br/>
        mental health as a part of an employee wellness program ?
        <br><br/>
    </td>
    <td>
        <input list="wellness_program" name="wellness_program" required>
        <datalist id="wellness_program">
            <option value="Yes">
            <option value="No">
            <option value="Don't know">
        </datalist>
        <br><br/>
    </td>
</tr>
<tr>
    <td>
        Does your company provide resources to learn more about<br/>
        mental health issues and how to seek help ?
        <br><br/>
    </td>
    <td>
        <input list="seek_help" name="seek_help" required>
        <datalist id="seek_help">
            <option value="Yes">

```

```

        <option value="No">
        <option value="Don't know">
    </datalist>
    <br><br/>
</td>
</tr>
<tr>
    <td>
        Is your anonymity protected if you chose to take advantage<br/>
        of mental health abuse treatment resources ?
        <br><br/>
    </td>
    <td>
        <input list="anonymity" name="anonymity" required>
        <datalist id="anonymity">
            <option value="Yes">
            <option value="No">
            <option value="Don't know">
        </datalist>
        <br><br/>
    </td>
</tr>
<tr>
    <td>
        How easy is it for you to take medical leave for a mental health condition?
        <br><br/>
    </td>
    <td>
        <input list="leave" name="leave" required>
        <datalist id="leave">
            <option value="Somewhat easy">
            <option value="Very easy">
            <option value="Somewhat difficult">
            <option value="Very difficult">
            <option value="Don't Know">
        </datalist>
        <br><br/>
    </td>
</tr>
<tr>
    <td>
        Do you think that discussing a mental health issue with your employee<br/>
        would have negative consequence ?
        <br><br/>
    </td>
    <td>

```



```

    <input list="mental_health_consequence" name="mental_health_consequence"
required>
    <datalist id="mental_health_consequence">
        <option value="Yes">
        <option value="No">
        <option value="May be">
    </datalist>
    <br><br/>
</td>
</tr>
<tr>
<td>
    Do you think that discussing a physical health issue with your employee<br/>
    would have negative consequence ?
    <br><br/>
</td>
<td>
    <input list="phys_health_consequence" name="phys_health_consequence" required>
    <datalist id="phys_health_consequence">
        <option value="Yes">
        <option value="No">
        <option value="May be">
    </datalist>
    <br><br/>
</td>
</tr>
<tr>
<td>
    Would you be willing to discuss a mental health issue with your coworkers ?
    <br><br/>
</td>
<td>
    <input list="coworkers" name="coworkers" required>
    <datalist id="coworkers">
        <option value="Yes">
        <option value="No">
        <option value="Some of them">
    </datalist>
    <br><br/>
</td>
</tr>
<tr>
<td>
    Would you be willing to discuss a mental health issue with your direct supervisor ?
    <br><br/>
</td>

```

<input list="supervisor" name="supervisor" required="" type="list"/> <div> <div>supervisor</div> <div> <div>Yes</div> <div>No</div> <div>Some of them</div> </div> </div>
<p>Would you bring up a mental health issue with a potential employer in an interview ?</p>
<input list="mental_health_interview" name="mental_health_interview" required="" type="list"/> <div> <div>mental_health_interview</div> <div> <div>Yes</div> <div>No</div> <div>May be</div> </div> </div>
<p>Would you bring up a physical health issue with a potential employer in an interview ?</p>
<input list="phys_health_interview" name="phys_health_interview" required="" type="list"/> <div> <div>phys_health_interview</div> <div> <div>Yes</div> <div>No</div> <div>May be</div> </div> </div>
<p>Do you feel that your employer takes mental health as seriously as physical health ?</p>

```

        <input list="mental_vs_physical" name="mental_vs_physical" required>
        <datalist id="mental_vs_physical">
            <option value="Yes">
            <option value="No">
            <option value="Don't know">
        </datalist>
        <br><br/>
    </td>
</tr>
<tr>
<td>
    Have you heard of or observed negative consequences for coworkers<br/>
    with mental health conditions in your workplace ?
    <br><br/>
</td>
<td>
        <input list="obs_consequence" name="obs_consequence" required>
        <datalist id="obs_consequence">
            <option value="Yes">
            <option value="No">
        </datalist>
        <br><br/>
    </td>
</tr>
</table>
<p><button    type="Predict"    class="btn    btn-primary    btn-block    btn-large"
color='black'>Predict</button></p>
    {{prediction}}
</form>
</body>
</html>

```

```

app.py

from flask import Flask, request, render_template

from sklearn.preprocessing import LabelEncoder, OrdinalEncoder

import pickle

import pandas as pd

app = Flask(__name__, template_folder='templates')

model = pickle.load(open('model.pkl', 'rb'))

data = pd.read_csv("filtered.csv")

X = data[['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']]

ord_encoder = OrdinalEncoder()

X = ord_encoder.fit_transform(X)

le = LabelEncoder()

y = data["treatment"]

y = le.fit_transform(y)


@app.route('/')

def home():

    return render_template("home.html")

@app.route('/home', methods=['POST'])

def predict():

    features = [x for x in request.form.values()]

    ready = ord_encoder.fit_transform([features])

    prediction = model.predict(ready)

    if prediction[0] == 0:

        output = 'NO NEED ANY TREATMENT'

    else:

```

```

        output = 'YOU NEED TREATMENT'

    return render_template('home.html', prediction=output)

if __name__ == '__main__':
    app.run(debug=True)

model.py

import pandas as pd

from sklearn.preprocessing import OrdinalEncoder, LabelEncoder

from sklearn.model_selection import train_test_split

from xgboost import XGBClassifier

import pickle

data = pd.read_csv("filtered.csv")

X = data[['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']]

ord_encoder = OrdinalEncoder()

X = ord_encoder.fit_transform(X)

y = data['treatment']

le = LabelEncoder()

y = le.fit_transform(y)

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.33, random_state=42)

classifier = XGBClassifier()

classifier.fit(X_train, y_train)

pickle.dump(classifier, open("model.pkl", "wb"))

```

5 .RESULT ANALYSIS

Here we used different number of machine learning algorithms like Random Forest, Decision Tree, K-Nearest Neighbors, Logistic Regression, Stacking, Support Vector Machine, Adaboost, Gradient Boosting, XG Boost. All the algorithms has given accuracy above 79%. But the highest accuracy has XG Boost classifier with 86%.

METHOD	ACCURACY (%)
Logistic Regression	82
Random Forest	85
Decision Tree	85
Gradient Boosting	85
XG Boost	86
SVM	84

Fig: 5.1 Comparison of Algorithms

So in the above table we mentioned the accuracies of every algorithm that we used in our project. As we can see that Random Forest, Decision tree and Gradient Boosting is giving same accuracies i.e., 85%. After comparing each and every algorithm we can consider XG Boost classifier in order to build our model to get the best accurate results.

6. OUTPUT SCREENS

Mental Health Prediction

Age	<input type="text"/>
Gender	<input type="text"/>
Are you self employed ?	<input type="text"/>
Do you have a family history of mental illness?	<input type="text"/>
If you have a mental health condition, do you feel that it interferes with your work ?	<input type="text"/>
How many employees does your company have ?	<input type="text"/>
Do you work remotely (outside of an office) at least 50% of the time ?	<input type="text"/>
Is your employer primarily a tech company organization ?	<input type="text"/>
Does your company provide mental health benefits ?	<input type="text"/>
Do you know the options for mental health care your employer provides ?	<input type="text"/>
Has your employer ever discussed mental health as a part of an employee wellness program ?	<input type="text"/>
Does your company provide resources to learn more about mental health issues and how to seek help ?	<input type="text"/>

Does your company provide resources to learn more about mental health issues and how to seek help ?	<input type="text"/>
Is your anonymity protected if you chose to take advantage of mental health abuse treatment resources ?	<input type="text"/>
How easy is it for you to take medical leave for a mental health condition ?	<input type="text"/>
Do you think that discussing a mental health issue with your employee would have negative consequence ?	<input type="text"/>
Do you think that discussing a physical health issue with your employee would have negative consequence ?	<input type="text"/>
Would you be willing to discuss a mental health issue with your coworkers ?	<input type="text"/>
Would you be willing to discuss a mental health issue with your direct supervisor ?	<input type="text"/>
Would you bring up a mental health issue with a potential employer in an interview ?	<input type="text"/>
Would you bring up a physical health issue with a potential employer in an interview ?	<input type="text"/>
Do you feel that your employer takes mental health as seriously as physical health ?	<input type="text"/>
Have you heard of or observed negative consequences for coworkers with mental health conditions in your workplace ?	<input type="text"/>

{{prediction}}

Fig:6.1 Prediction Form

Mental Health Prediction

Age	<input type="text" value="45"/>
Gender	<input type="text" value="Female"/>
Are you self employed ?	<input type="text" value="Yes"/>
Do you have a family history of mental illness?	<input type="text" value="Yes"/>
If you have a mental health condition, do you feel that it interferes with your work ?	<input type="text" value="Rarely"/>
How many employees does your company have ?	<input type="text" value="1-25"/>
Do you work remotely (outside of an office) at least 50% of the time ?	<input type="text" value="Yes"/>
Is your employer primarily a tech company organization ?	<input type="text" value="Yes"/>
Does your company provide mental health benefits ?	<input type="text" value="No"/>
Do you know the options for mental health care your employer provides ?	<input type="text" value="Not sure"/>
Has your employer ever discussed mental health as a part of an employee wellness program ?	<input type="text" value="Don't know"/>
Does your company provide resources to learn more about mental health issues and how to seek help ?	<input type="text" value="Yes"/>
Is your anonymity protected if you chose to take advantage of mental health abuse treatment resources ?	<input type="text" value="Don't know"/>
How easy is it for you to take medical leave for a mental health condition ?	<input type="text" value="Somewhat easy"/>
Do you think that discussing a mental health issue with your employee would have negative consequence ?	<input type="text" value="No"/>
Do you think that discussing a physical health issue with your employee would have negative consequence ?	<input type="text" value="No"/>
Would you be willing to discuss a mental health issue with your coworkers ?	<input type="text" value="No"/>
Would you be willing to discuss a mental health issue with your direct supervisor ?	<input type="text" value="No"/>
Would you bring up a mental health issue with a potential employer in an interview ?	<input type="text" value="No"/>
Would you bring up a physical health issue with a potential employer in an interview ?	<input type="text" value="Yes"/>
Do you feel that your employer takes mental health as seriously as physical health ?	<input type="text" value="Yes"/>
Have you heard of or observed negative consequences for coworkers with mental health conditions in your workplace ?	<input type="text" value="Yes"/>
<input type="button" value="Predict"/>	

Fig:6.2 Filling Prediction Forms

Mental Health Prediction

NEEDS TO BE TREATED

Fig:6.3 Output Screen

Mental Health Prediction

NO NEED ANY TREATMENT

Fig: 6.4 Output Screen

7. CONCLUSION & FUTURE SCOPE

In this proposed work we have seven different techniques of machine learning which are used to classify the dataset on various problems of mental health. It is very clear from the results that all the seven machine learning techniques give more accurate results. The accuracy of all the classifiers are above 79%. Nowadays, we have many special programs in the medical field that predict disease very accurately in advance so that treatment can be done effectively and efficiently. A large data set can be used and the research can be applied on the same for more accuracy.

7. REFERENCES

<https://www.kaggle.com/datasets/osmi/mental-health-in-tech-survey>

- [1] Stevie Chancellor, Eric PS Baumer, and Munmun De Choudhury. Who is the” human” in human-centered machine learning: The case of predicting mental health from social media. Proceedings of the ACM on Human-Computer Interaction, 3(CSCW):1–32, 2019.
- [2] Sarah Graham, Colin Depp, Ellen E Lee, Camille Nebeker, Xin Tu, Ho-Cheol Kim, and Dilip V Jeste. Artificial intelligence for mental health and mental illnesses: an overview. Current psychiatry reports, 21(11):1–18, 2019.
- [3] Theodoros Iliou, Georgia Konstantopoulou, Mandani Ntekouli, Christina Lympelopoulou, Konstantinos Assimakopoulos, Dimitrios Galiatsatos, and George Anastassopoulos. Iliou machine learning preprocessing method for depresssion type prediction. Evolving Systems, 10(1):29–39, 2019.
- [4] T Nagar. Prediction of mental health problems among children using machine learning techniques.
- [5] Adrian BR Shatte, Delyse M Hutchinson, and Samantha J Teague. Machine learning in mental health: a scoping review of methods and applications. Psychological medicine, 49(9):1426–1448, 2019.
- [6] M Srividya, S Mohanavalli, and N Bhalaji. Behavioral modeling for mental health using machine learning algorithms. Journal of medical systems, 42(5):1–12, 2018.

Mental Health Sickness Prediction using Machine Learning Algorithm

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1. **ABSTRACT** : Mental Illness is becoming a serious health problem now-a-days. There is a growing number of patients suffering from different mental health disorders. So we need to find solution to tackle this issue. The main goal of this research project is to develop the machine learning models to predict the mental illness of the users(people with poor mental health). Here we used some of the machine learning models to solve this issue. For to observe clearly, we took datasets of the mental health records of the people to train our models. And also we need to do preprocessing on that dataset because the dataset may have noisy data or maybe invalid data. The data is being subject to various machine learning techniques to obtain labels.

KEYWORDS : Mental Health, Machine Learning , Self-Analysis, Mental Health Counselling

2. INTRODUCTION

Machine Learning is a subfield of Artificial Intelligence that primarily concentrates on using data and the algorithms to mimic how human learns and eventually improves its accuracy. So ml is useful to build the model using different algorithms and then testing and training performed on this huge data. Advanced probabilistic and statistical techniques are used in ml to build computers that can learn from data. It is divided into 3 types:

- Supervised Learning
- Unsupervised Learning
- Reinforcement Learning

This study has focussed on the advantages of machine learning for better mental health identification. Here we used some of the best ML algorithms like Random Forest, KNN,

Decision Tree, Logistic Regression and Stacking. All these algorithms are best fit to build a model. Overall, machine learning has the potential to improve the clinical and research efficiency and also providing fresh insight into mental health.

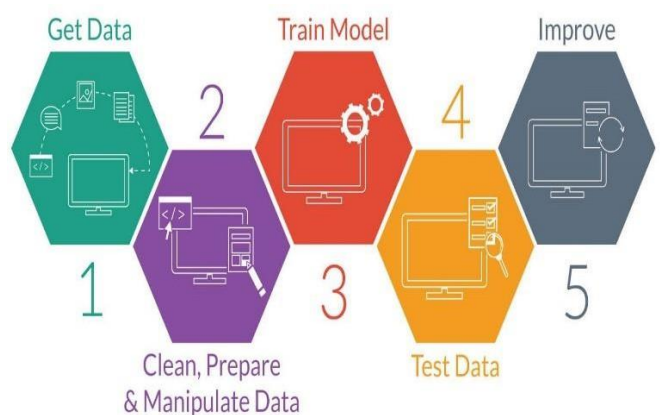


figure : process of building a model

3. LITERATURE REVIEW

This study evaluated the effectiveness of various ml algorithms that categorise the dataset into distinct mental health disorders. This system was developed to assess a person's mental health status and prediction models were built using this framework.

Now-a-days many people are afflicted with mental health conditions like depression, stress, and anxiety as well. Mainly the people who are under the employment sector is mainly facing this issue. For this we need to implement something so that it will be so easy for them to get proper knowledge about their mental health issues. The main aim of this project is to check whether a person needs a treatment or not so that with this result they can proceed to next level treatments. Here we used Random Forest, KNN, Logistic Regression, Decision Tree, AdaBoost, Gradient Boosting, and XGB Classifier. Among these models, XGB performed well.

Hence, in order to obtain correct results for this project, we can utilize this classifier. The XGB has 86% accuracy rate. 29 columns and 1259 entries make up the dataset. The tests revealed that the performance of GD Boost, Decision Tree, and Random Forest was substantially identical.

The field of medicine is beginning to focus more on artificial intelligence, which will aid in the study and application of mental health. To fully enact the pledge Scientists, physicians, patients, and regulators are just a few of the diverse professions involved in mental health research and care who must connect and communicate with AI. In this study, discourse analysis was used to analyse the data in order to better understand the representational practises used in machine learning (HCML). Using this ,

they have discovered a collection of 55 interdisciplinary research that predict the mental health state based on social media data. The methods employed on our dataset are listed below along with their accuracy levels..

So these are the algorithms which is helpful to predict the mental health of a person.

Methods	Accuracy (%)
Logistic Regression	82
Random Forest	85
Decision Tree	85
Gradient Boosting	85
XG Boost	86
SVM	84

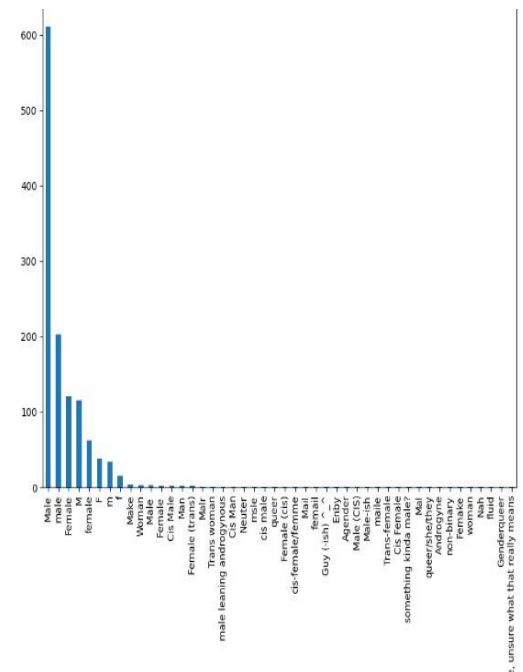
4.PROPOSED SYSTEM

4.1 DATASET DESCRIPTION :

In this dataset we have 27 columns and 1259 entries which are Timestamp, Age, Gender, Country, State,

- 1.Timestamp – It describes about time of an event that a computer records.
2. Age – It is about the age of a person
3. Self_employed – whether a person is employed or not
4. work_interfere – whether the work is interferes or not
5. family_history – if the person is having any family background regarding the mental health issue
6. remote_work – does remote work is effects the person or not

7. benefits – does the company provides the benefits or not
8. mental_health_consequence – does the person will think that he will have negative consequence if he/she shares his condition
9. phys_health_consequence – does the person will think that he will have negative consequence if he/she shares his condition
10. coworkers – does the person is willing to share his condition with their coworkers



age	Gender	Country	state	self_empt	family_his	treatment	work_inteno	emplicremote
37	Female	United Sts	IL	NA	No	Yes	Often	Jun-25 No
44	M	United Sts	IN	NA	No	No	Rarely	More than No
32	Male	Canada	NA	NA	No	No	Rarely	Jun-25 No
31	Male	United Kir	NA	NA	Yes	Yes	Often	26-100 No
31	Male	United Sts	TX	NA	No	No	Never	100-500 Yes
33	Male	United Sts	TN	NA	Yes	No	Sometime	Jun-25 No
35	Female	United Sts	MI	NA	Yes	Yes	Sometime	01-May Yes
39	M	Canada	NA	NA	No	No	Never	01-May Yes
42	Female	United Sts	IL	NA	Yes	Yes	Sometime	100-500 No
23	Male	Canada	NA	NA	No	No	Never	26-100 No
31	Male	United Sts	OH	NA	No	Yes	Sometime	Jun-25 Yes
29	male	Bulgaria	NA	NA	No	No	Never	100-500 Yes
42	female	United Sts	CA	NA	Yes	Yes	Sometime	26-100 No
36	Male	United Sts	CT	NA	Yes	No	Never	500-1000 No
27	Male	Canada	NA	NA	No	No	Never	Jun-25 No
29	female	United Sts	IL	NA	Yes	Yes	Rarely	26-100 No
23	Male	United Kir	NA	NA	No	Yes	Sometime	26-100 Yes
27	Male	United Sts	TN	NA	No	Yes	Sometime	Jun-25 No

Figure – dataset image

The figure is about the dataset and we have some invalid data. So we need to do pre-processing on that dataset. Here we will remove the invalid data from the age column because the age of a person can not be a negative value and ‘9999999’ cannot be the age of any person. The columns which are removed from dataset is ‘comments’ because that column has majority null values so we need to delete the whole column in order to get the accurate results.

4.2 DATA PREPROCESSING :

Preparing the data is crucial stage in machine learning. It is crucial that we pre-process our data before fitting it into our model since the valuable information that can be deduced from it and the quality of the data directly influence how well our model learns. Data engineering and feature engineering are both involved in the pre-processing of the data for ml. The process of transforming unprepared data into prepared data is known as data engineering. The data that has been prepared is then tuned as a result of feature engineering to provide the features that our ML model anticipates. We must first determine whether our dataset contains any null values as the first stage in the pre-processing procedure. If we find more number of null values in any column then simply we can drop that column. If we check our age and gender column, we have invalid data.

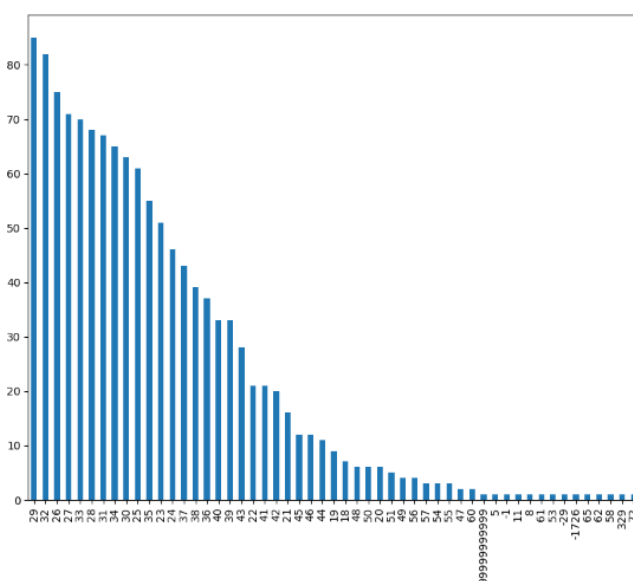


Figure – age distribution

4.3 MODEL SELECTION

Model selection can help in choosing better hyperparameters. Model selection is straightforward.

4.5.1 RANDOM FOREST

The primary idea behind the random forest is that it blends many trees that are utilised to determine the dataset's class. Also, this technique employs three concepts: randomly selecting training data when creating trees; selecting particular subsets of variables when splitting each node.

4.5.2 LOGISTIC REGRESSION

The likelihood of a dependent or a target variable is predicted using supervised machine learning. We can establish and predict the associations between the dependent variable and one or more independent variables using logistic regression.

4.5.3 DECISION TREE

A supervised learning approach called a decision tree is utilised for both classification and regression tasks. A root node serves as the first node in a decision tree and has no outgoing branches. It uses a greedy search to implement a divide and conquer approach.

4.5.4 SUPPORT VECTOR MACHINE

Regression and classification issues are both addressed by it. The SVM's objective is to construct the optimal line that can divide n-dimensional space into classes.

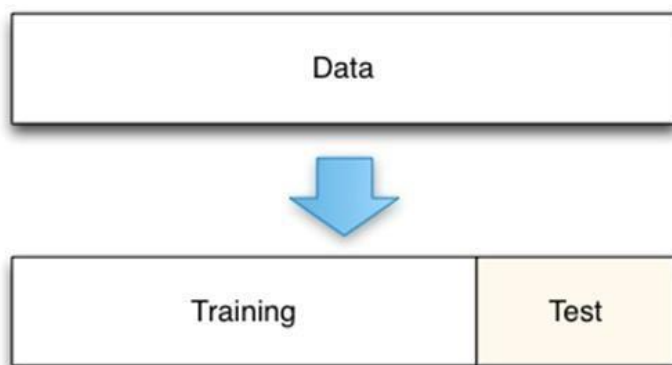
4.5.5 ADABOOST

AdaBoost is a particular kind of boosting that functions as an ensemble model to advance any machine learning technique's prediction.

33	M
37	male
23	Male
43	M
32	Male
26	Male
32	Male
37	F
29	Male
34	Male
27	male
30	male
29	Male
32	Male
-1726	male
25	Male
37	male
29	Male
27	Man

Here in both the age and gender column we have invalid data. For to remove those values from our dataset we need to perform pre-processing. After filtering our data we need to do Ordinal Encoding on our attributes because majority of the attributes are categorical values. By using ordinal encoding, it will convert the categorical values to numerical values so that it can be easy to train our model. And Label Encoding is performed only on the target value i.e. treatment.

4.2.2 Splitting the data :



Splitting the data makes sense since we are looking for a pattern that will accurately reflect the majority of the data points while minimising error when we train a machine learning model. Two common mistakes occur throughout this process: overfitting and underfitting.

4.5.6 GRADIENT BOOSTING

It is a method of machine learning that is applied to classification and regression issues. It provides a very ineffective ensemble of models for prediction in the form of a prediction model.

4.5.7 XGBOOST

It is an enhanced distributed gradient boosting library created for effective and scalable machine learning model training. In an ensemble model, weak predictions from various weak models are combined to yield a stronger forecast.

5. RESULTS

Thus, we applied a variety of machine learning models in this case, including Random Forest, Logistic Regression, Decision Tree, SVM, Adaboost, Gradient Boosting, and XGboost. Among these models, XGboost has the highest accuracy and best results thanks to its 86% accuracy.

Methods	Accuracy (%)
Logistic Regression	82
Random Forest	85
Decision Tree	85
Gradient Boosting	85
XG Boost	86
SVM	84

In the above table we can see that how much accuracy that each models has and also random forest, decision tree and gradient boosting is having same accuracy.

6. OUTPUT SCREENS

Mental Health Prediction

Age

45

Gender

Female

Are you self employed ?

Yes

Do you have a family history of mental illness?

Yes

If you have a mental health condition, do you feel that it interferes with your work ?

Rarely

How many employees does your company have ?

1-25

Do you work remotely (outside of an office) at least 50% of the time ?

Yes

Is your employer primarily a tech company organization ?

Yes

Does your company provide mental health benefits ?

No

Do you know the options for mental health care your employer provides ?

Not sure

Has your employer ever discussed mental health as a part of an employee wellness program ?

Don't know

Does your company provide resources to learn more about mental health issues and how to seek help ?

Yes

Figure – filling form

Mental Health Prediction

NO NEED ANY TREATMENT

Figure – output screen

7. REFERENCES

[1] Stevie Chancellor, Eric PS Baumer, and Munmun De Choudhury. Who is the” human” in human-centered machine learning: The case of predicting mental health from social media. Proceedings of the ACM on Human-Computer Interaction, 3(CSCW):1–32, 2019.

[2] Sarah Graham, Colin Depp, Ellen E Lee, Camille Nebeker, Xin Tu, Ho-Cheol Kim, and Dilip V Jeste. Artificial intelligence for mental health and mental illnesses: an overview. Current psychiatry reports, 21(11):1–18, 2019.

[3] Theodoros Iliou, Georgia Konstantopoulou, Mandani Ntekouli, Christina Lymperopoulou, Konstantinos Assimakopoulos, Dimitrios Galiatsatos, and George Anastassopoulos. Iliou machine learning preprocessing method for depression type prediction. Evolving Systems, 10(1):29–39, 2019.

[4] T Nagar. Prediction of mental health problems among children using machine learning techniques.

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