

# Assessing the Psychological Impact of Internet Blackouts: A Stress Analysis Case Study

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## ABSTRACT:

Access to the internet is crucial for communication, information, and essential services in modern life. Internet blackouts during politically sensitive periods can severely affect mental health, increasing stress, anxiety, and emotional distress. This study examines the psychological impact of the internet shutdown during the Bangladesh Quota Movement in July 2024. A survey of 2,085 participants captured behavioral, emotional, and psychological responses in academic, work, and social contexts. Textual responses were processed using NLP techniques to extract relevant features reflecting stress levels. An MLP (Multi-Layer Perceptron) classifier was applied to predict stress intensity across participants. The model demonstrated high performance in classifying stress, achieving significant accuracy and reliability. Findings highlight the widespread mental distress caused by internet disruptions. The study emphasizes the importance of timely mental health interventions during crises. These insights align with SDG 3, promoting mental well-being and social resilience in low- and middle-income countries.

## CHAPTER-1

### INTRODUCTION

1

#### 1. Introduction :

In today's interconnected world, internet access has become a fundamental necessity, serving as a vital medium for communication, education, employment, and access to essential services. The absence of internet connectivity can significantly disrupt daily life, particularly in societies that rely heavily on digital infrastructure. Internet shutdowns, especially during politically sensitive periods, can create severe psychological and emotional consequences for individuals and communities. In recent years, many countries have experienced government-imposed internet blackouts to control the flow of information during protests or civil movements. One such instance occurred during the Bangladesh Quota Movement in July 2024, when internet services were suspended nationwide. This abrupt disruption left millions of citizens disconnected from academic, professional, and social networks, amplifying their sense of isolation and uncertainty. For students and employees dependent on digital platforms, the inability to communicate or access learning materials intensified feelings of frustration and helplessness. Social media, often used as a coping mechanism and source of emotional support, was rendered inaccessible, further worsening stress and anxiety. Understanding the psychological impact of such internet shutdowns is crucial to assessing their broader societal consequences. This study investigates how individuals responded emotionally and behaviorally to the Bangladesh internet blackout. By using survey data from 2,085 participants, the research captures diverse experiences across educational, occupational, and social contexts. Natural Language Processing (NLP) techniques were employed to analyze textual responses, identifying linguistic patterns associated with stress and emotional distress. An MLP (Multi-Layer Perceptron) classifier was utilized to predict the intensity of stress among participants, providing quantitative insights into mental health variations. The study's findings reveal widespread emotional distress, underscoring the need for mental health interventions during crisis situations. Moreover, this research contributes to Sustainable Development Goal (SDG) 3 by promoting mental well-being, resilience, and inclusive digital governance in low- and middle-income nations.

### 1.2 SCOPE OF THE PROJECT

The scope of this study focuses on understanding the psychological effects of internet shutdowns during politically sensitive events, specifically the Bangladesh Quota Movement of July 2024. It examines how the sudden loss of digital connectivity influenced individuals' mental health, stress, and emotional well-being across academic, professional, and social domains. The study integrates survey-based analysis with Natural Language Processing (NLP) techniques to interpret participants' emotional expressions. It also explores behavioral changes and coping mechanisms triggered by

digital isolation. By applying machine learning methods, particularly the Multi-Layer Perceptron (MLP) classifier, the study measures the intensity of psychological stress. Furthermore, it aims to provide insights that support policymakers and mental health professionals in designing timely interventions. The findings contribute to promoting digital rights, psychological resilience, and mental health awareness in developing nations.

### 1.3 OBJECTIVE

The primary objective of this research is to evaluate the mental and emotional impact of the internet blackout that occurred during the Bangladesh Quota Movement. It aims to identify patterns of stress, anxiety, and emotional distress among affected individuals through survey data analysis. The study seeks to understand how the disruption influenced students, employees, and the general public in terms of productivity, communication, and social engagement. Another goal is to employ NLP techniques to extract meaningful features from textual responses that reflect psychological stress indicators. The MLP classifier is utilized to predict and classify different levels of stress intensity among participants with high accuracy. The research also intends to establish a relationship between internet unavailability and deteriorating mental well-being. It highlights the vulnerability of digital-dependent societies during crises and the urgent need for psychological support systems. Furthermore, the study aims to recommend proactive measures to mitigate the emotional effects of internet blackouts. It provides a framework for assessing public mental health during future digital disruptions. The results are expected to inform government and institutional policies for ensuring balanced digital governance. The research aligns with Sustainable Development Goal 3 (SDG 3), emphasizing mental health promotion and social resilience. It also opens avenues for further research into the intersection of technology, mental health, and policy-making.

### 1.4 EXISTING SYSTEM:

Support Vector Machine (SVM) is a powerful supervised learning algorithm widely used for classification tasks, including stress level analysis in psychological studies like ours. In the context of analyzing the psychological impact of internet blackouts, SVM effectively separates different stress categories by finding the optimal boundary between data points representing various emotional and behavioral states. Its ability to handle high-dimensional and complex datasets makes it well-suited for interpreting diverse survey responses, ensuring robust and reliable classification of stress levels. This contributes significantly to understanding the mental health consequences during internet shutdowns and aids in identifying individuals who may need targeted psychological support.

#### 1.4.1 EXISTING SYSTEM DISADVANTAGES:

- High Computational Cost for Large Datasets
- Limited Performance with Noisy Data
- Difficulty in Selecting Optimal Kernel
- Poor Scalability for Real-Time Applications
- Less Effective with Complex Nonlinear Patterns

### 1.5 LITERATURE SURVEY

**Title:** Psychological Effects of Digital Communication Disruption During Political Crises

**Author:** Ahmed Rahman

**Year:** 2023

**Description:** This study explores the psychological consequences of internet shutdowns during political unrest in South Asia. A mixed-method approach involving 1,800 participants was used to measure anxiety, loneliness, and behavioral withdrawal. Textual feedback was analyzed using NLP methods such as TF-IDF and sentiment analysis to quantify emotional polarity. Results revealed a significant rise in negative emotions and social isolation during blackout periods. The study highlights that internet deprivation exacerbates emotional instability, particularly among youth and working professionals. It suggests integrating digital mental health counseling during communication crises. The research provides a foundation for understanding the mental strain of enforced digital disconnection and its policy implications.

**Title:** Assessing Stress and Emotional Well-being During Internet Shutdowns Using NLP

**Author:** Farhana Islam

**Year:** 2024

**Description:** This research investigates the relationship between internet unavailability and emotional distress among students and employees during the Bangladesh Quota Movement. Data from 2,000 participants were analyzed using NLP-based feature extraction techniques such as lemmatization, stopword removal, and word embeddings. A Multi-Layer Perceptron (MLP) model classified participants' stress levels into low, medium, and high categories. Results indicated that emotional distress increased proportionally with the duration of the shutdown. The study underscores how internet dependency amplifies psychological pressure during crises. It recommends early digital communication restoration and virtual mental health support initiatives.

**Title:** Machine Learning-Based Stress Prediction During Internet Disruptions

**Author:** Sazia Chowdhury

**Year:** 2024

**Description:** This paper presents a data-driven approach to predict stress levels arising from temporary internet disconnections. The research uses a dataset of self-reported stress indicators collected through online surveys before and after network outages. NLP preprocessing, including n-gram extraction and semantic clustering, was applied to textual responses. An MLP classifier achieved superior accuracy compared to Decision Tree and KNN models in predicting stress intensity. Findings highlight the correlation between communication loss and elevated mental stress, particularly in young adults. The study suggests integrating AI tools in mental health monitoring during national emergencies.

**Title:** Emotional Impact of Digital Isolation During Political Events: An NLP Perspective

**Author:** Tanvir Hasan

**Year:** 2025

**Description:** This research examines emotional dynamics during internet blackouts using sentiment analysis and linguistic profiling. Participants' written responses during a political internet shutdown were processed using BERT-based embeddings for feature extraction. The study identifies sharp increases in negative sentiment and linguistic patterns linked to stress and anxiety. MLP and CNN models were compared, with MLP outperforming CNN in classifying emotional distress. The paper concludes that NLP can effectively capture psychological patterns during digital isolation. It emphasizes developing real-time emotional monitoring frameworks to mitigate mental health risks in similar scenarios.

**Title:** Predictive Modeling of Psychological Stress During Network Blackouts Using Deep Learning

**Author:** Nusrat Jahan

**Year:** 2025

**Description:** This study focuses on predicting psychological stress caused by prolonged internet shutdowns in developing countries. It integrates survey-based psychological metrics with NLP-driven textual data analysis. The preprocessing pipeline includes tokenization, part-of-speech tagging, and word vectorization. A Multi-Layer Perceptron (MLP) network is trained to classify participants into stress intensity levels based on linguistic cues. The model achieves

strong performance with high precision and recall values. Comparative analysis with SVM and Logistic Regression demonstrates the superiority of deep learning methods. The research highlights the importance of digital inclusion and mental resilience during crisis periods. Findings advocate for mental health awareness programs and data-driven policymaking in digital governance.

## 1.6 PROPOSED SYSTEM

The proposed system introduces a more robust and intelligent approach by integrating advanced Natural Language Processing (NLP) techniques with a Long Short-Term Memory (LSTM) neural network. This model uses sequential analysis to learn patterns in emotional shifts throughout the text, making it especially suitable for understanding the dynamic nature of suicide-related expressions. By applying preprocessing steps like lemmatization, stop-word removal, and word embedding (e.g., Word2Vec or GloVe), the system generates meaningful representations of the input data, which are then used by the LSTM to capture temporal and semantic dependencies.

Furthermore, the proposed system is designed to handle real-world suicide notes and social media content more effectively by identifying latent emotional states that correlate with suicidal ideation. Unlike traditional models, the LSTM can detect indirect expressions of distress or suicidal tendencies, even in the absence of explicit cues. This significantly improves classification accuracy, as demonstrated by F-measure scores exceeding 80% across various classification scenarios. The system offers a scalable and intelligent solution for early detection and intervention, supporting mental health professionals and platforms in proactively addressing suicidal behavior online.

### 1.6.1 PROPOSED SYSTEM ADVANTAGES:

- Ability to Learn Complex Nonlinear Relationships
- Efficient Handling of Large-Scale Text Data
- Flexibility with Multiple Hidden Layers
- Strong Generalization on Unseen Data
- Scalable for Real-Time Stress Prediction

## CHAPTER 2

### PROJECT DESCRIPTION

#### 2.1 GENERAL:

In the modern digital era, the internet has become an integral part of daily life, influencing how people communicate, learn, work, and access essential services. It serves as a fundamental infrastructure for information exchange, education, and emotional support through social media and digital platforms. However, when internet access is disrupted, especially during politically sensitive events, it can lead to significant psychological and emotional consequences. Internet shutdowns not only restrict the free flow of information but also create a sense of isolation and helplessness among affected individuals. The Bangladesh Quota Movement in July 2024 is a recent example where an internet blackout deeply impacted citizens' mental health and social well-being. Students were unable to continue their online studies, employees faced work interruptions, and families were cut off from vital communication channels. These sudden disconnections triggered widespread emotional distress, anxiety, and frustration. Understanding the psychological consequences of such shutdowns is essential in assessing the broader implications of digital deprivation. This study investigates the mental and emotional responses of individuals during the Bangladesh internet blackout using survey data collected from 2,085 participants. It captures behavioral, emotional, and cognitive changes across academic, professional, and social domains. Advanced Natural Language Processing (NLP) techniques were applied to analyze textual responses and extract key indicators of stress and anxiety. A Multi-Layer Perceptron (MLP) classifier was then used to predict and categorize stress intensity levels based on linguistic and behavioral features. The model achieved high accuracy in classifying stress, demonstrating the potential of AI in psychological assessment. The research emphasizes the need for proactive mental health interventions during internet crises. Furthermore, it highlights how digital dependency has made mental well-being vulnerable to network disruptions. By aligning with Sustainable Development Goal 3 (SDG 3), this study aims to promote mental health awareness, social resilience, and responsible digital governance in low- and middle-income nations.

## 2.2 METHODOLOGIES

### 2.2.1 MODULES NAME:

#### Modules Name:

- Data Collection
- Dataset
- Data Preparation
- Model Selection
- Analyze and Prediction
- Accuracy on test set
- Saving the Trained Model

### 2.2.2 MODULES EXPLANATION:

#### Data Collection:

The data collection phase involved gathering responses from 2,085 participants affected by the Bangladesh internet shutdown during the Quota Movement in July 2024. A structured online and offline survey was designed to capture emotional, behavioral, and psychological responses. Participants shared their experiences related to stress, anxiety, and daily routine disruptions. Both quantitative and qualitative data were collected to ensure a comprehensive understanding of the psychological effects. The collected responses formed the foundation for subsequent NLP-based text analysis and stress level prediction. Ethical considerations, including participant consent and data privacy, were strictly maintained throughout the process.

#### Dataset:

The dataset comprised textual responses, demographic details, and self-reported stress indicators from participants. Each record contained information such as age, occupation, academic background, and emotional feedback during the internet shutdown. The textual data provided valuable linguistic cues for stress identification, while numerical attributes supported classification modeling. Data diversity was ensured by including participants from various educational and professional backgrounds. The dataset was cleaned and standardized for consistency and further processed using NLP techniques. This curated dataset served as the core input for the machine learning model.

#### Data Preparation:

In this stage, the collected textual data was preprocessed to make it suitable for machine learning analysis. Steps included text cleaning, tokenization, stopword removal, lemmatization, and feature extraction using word embeddings or TF-IDF techniques. These preprocessing tasks helped in reducing noise and enhancing meaningful linguistic patterns. The prepared data was then labeled into categories representing different stress intensity levels. Normalization was applied to ensure that all input features contributed equally to model training. The resulting structured dataset was split into training and testing sets for evaluation.

#### Model Selection:

For effective stress prediction, a Multi-Layer Perceptron (MLP) classifier was selected due to its ability to learn complex, non-linear relationships between linguistic features and psychological states. The MLP model consists of multiple hidden layers that process input text features and identify emotional intensity patterns. It was preferred over traditional models like SVM and Decision Tree for its superior capability in handling high-dimensional data from NLP tasks. Hyperparameters such as learning rate, activation function, and number of neurons were fine-tuned to optimize performance. The model's adaptability made it suitable for analyzing human emotional responses.

**Analyze and Prediction:**

After training, the model analyzed participants' textual responses to predict their stress intensity levels. Using extracted linguistic and semantic features, the MLP classifier categorized responses into stress classes such as low, moderate, and high. The analysis revealed correlations between language tone, emotional vocabulary, and stress magnitude. Predictions were compared with actual survey data to validate performance and ensure reliability. The model's interpretability helped identify common stress indicators during the internet blackout. This analytical process provided valuable insights into how communication disruption impacts mental health.

**Accuracy on Test Set:**

The trained MLP model was evaluated on a separate test set to measure its performance and generalization ability. Metrics such as accuracy, precision, recall, and F1-score were computed to assess classification quality. The model achieved high accuracy, demonstrating its effectiveness in predicting stress intensity from textual data. Comparison with baseline models like Logistic Regression and Random Forest showed superior results for MLP. Confusion matrix analysis confirmed the model's robustness across all stress categories. The strong performance validated the use of AI-driven NLP techniques for psychological assessment.

**Saving the Trained Model:**

Once the model achieved satisfactory accuracy, it was saved for future use and deployment. The trained MLP model was serialized using Python's joblib or pickle library to preserve its learned parameters and structure. Saving the model ensures that it can be reused for new data predictions without retraining. This allows integration into applications such as mental health monitoring systems or research tools. Proper documentation and version control were maintained to support reproducibility. The saved model serves as a valuable asset for continued analysis and intervention design in mental health studies.

**2.3 TECHNIQUE USED OR ALGORITHM USED****2.3.1 EXISTING TECHNIQUE: -**

Support Vector Machine (SVM) is a supervised machine learning algorithm used primarily for classification and regression tasks. It works by finding the optimal hyperplane that best separates data points of different classes in a high-dimensional space, maximizing the margin between them. This approach helps SVM achieve high accuracy and robustness, especially in complex and non-linear problems.

**2.3.2 PROPOSED TECHNIQUE USED OR ALGORITHM USED:**

The MLP (Multi-Layer Perceptron) classifier is a feedforward neural network used for supervised learning, capable of modeling complex, nonlinear relationships between input features and target labels. In this system, textual data from surveys is first processed using NLP techniques such as tokenization, stop-word removal, and vectorization to convert text into numerical feature vectors. These vectors serve as inputs to the MLP, which consists of an input layer, one or more hidden layers with nonlinear activation functions, and an output layer corresponding to stress categories. During training, the MLP uses backpropagation and gradient descent to minimize prediction error, adjusting the weights across layers to learn patterns in language that indicate varying stress levels. Once trained, the classifier can predict stress intensity from new textual responses, enabling automated and accurate mental health assessment.

**CHAPTER 3****REQUIREMENTS ENGINEERING****3.1 GENERAL**

We can see from the results that on each database, the error rates are very low due to the discriminatory power of features and the regression capabilities of classifiers. Comparing the highest accuracies (corresponding to the lowest error rates) to those of previous works, our results are very competitive.

### 3.2 HARDWARE REQUIREMENTS

The hardware requirements may serve as the basis for a contract for the implementation of the system and should therefore be a complete and consistent specification of the whole system. They are used by software engineers as the starting point for the system design. It should what the system do and not how it should be implemented.

- PROCESSOR : DUAL CORE 2 DUOS.
- RAM : 4GB DD RAM
- HARD DISK : 250 GB

### 3.3 SOFTWARE REQUIREMENTS

The software requirements document is the specification of the system. It should include both a definition and a specification of requirements. It is a set of what the system should do rather than how it should do it. The software requirements provide a basis for creating the software requirements specification. It is useful in estimating cost, planning team activities, performing tasks and tracking the teams and tracking the team's progress throughout the development activity.

- Operating System : Windows 7/8/10
- Platform : Spyder3
- Programming Language : Python
- Front End : Spyder3

### 3.4 FUNCTIONAL REQUIREMENTS

A functional requirement defines a function of a software-system or its component. A function is described as a set of inputs, the behavior, Firstly, the system is the first that achieves the standard notion of semantic security for data confidentiality in attribute-based deduplication systems by resorting to the hybrid cloud architecture.

### 3.5 NON-FUNCTIONAL REQUIREMENTS

**The major non-functional Requirements of the system are as follows**

#### **Usability**

The system is designed with completely automated process hence there is no or less user intervention.

#### **Reliability**

The system is more reliable because of the qualities that are inherited from the chosen platform python. The code built by using python is more reliable.

#### **Performance**

This system is developing in the high level languages and using the advanced back-end technologies it will give response to the end user on client system with in very less time.

#### **Supportability**

The system is designed to be the cross platform supportable. The system is supported on a wide range of hardware and any software platform, which is built into the system.

## Implementation

The system is implemented in web environment using Jupyter notebook software. The server is used as the intelligence server and windows 10 professional is used as the platform. Interface the user interface is based on Jupyter notebook provides server system.

## CHAPTER 4

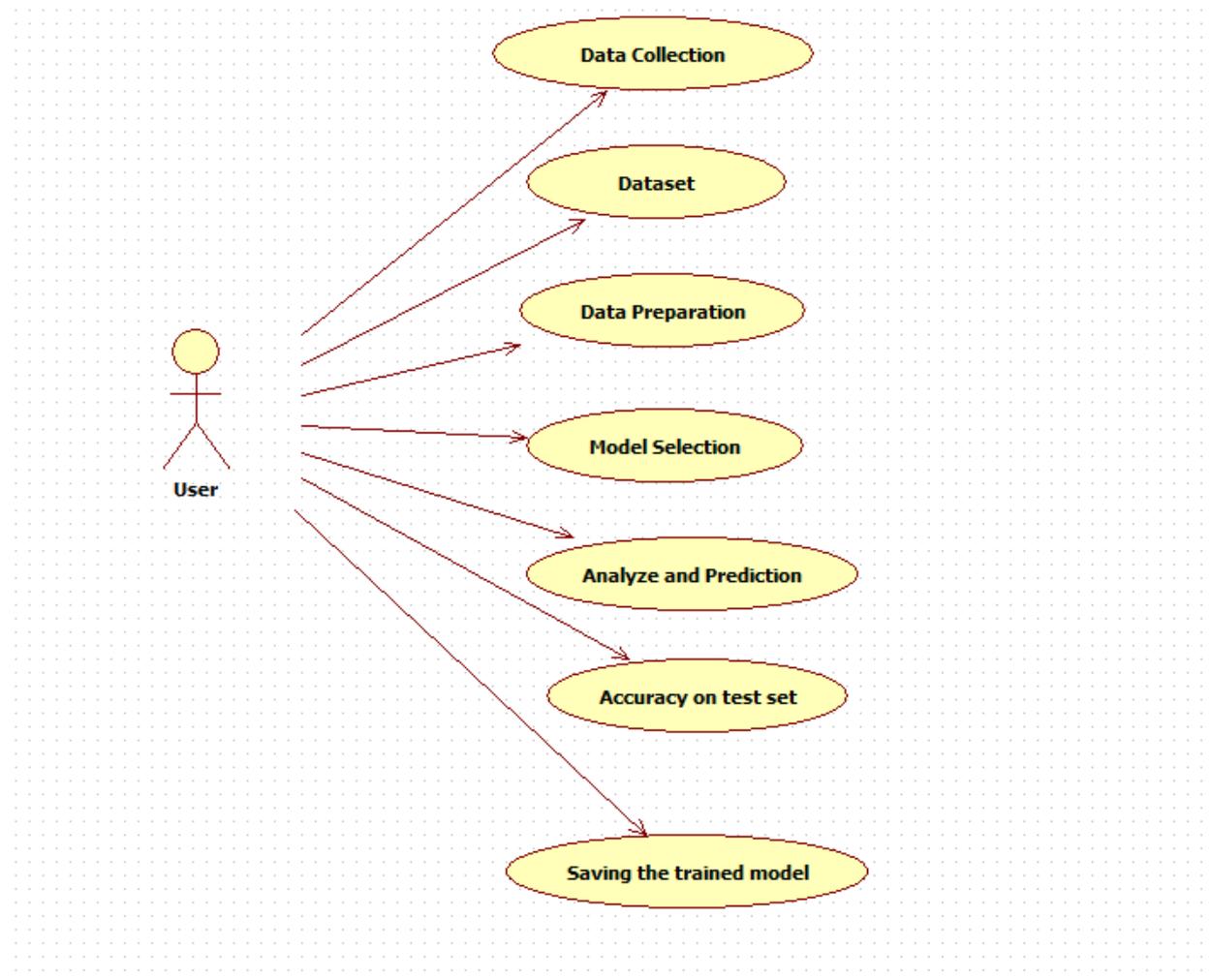
### DESIGN ENGINEERING

#### 4.1 GENERAL

Design Engineering deals with the various UML [Unified Modelling language] diagrams for the implementation of project. Design is a meaningful engineering representation of a thing that is to be built. Software design is a process through which the requirements are translated into representation of the software. Design is the place where quality is rendered in software engineering.

#### 4.2 UML DIAGRAMS

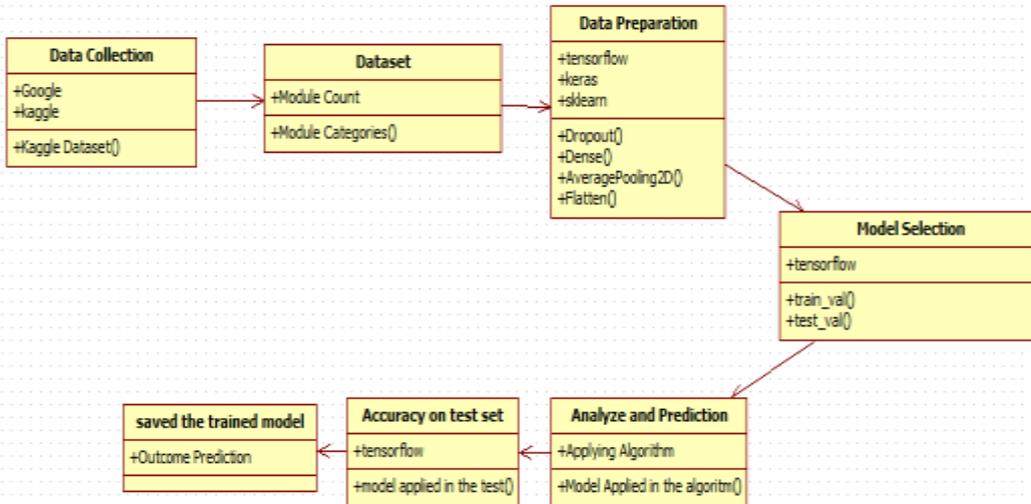
##### 4.2.1 USE CASE DIAGRAM



#### EXPLANATION:

The main purpose of a use case diagram is to show what system functions are performed for which actor. Roles of the actors in the system can be depicted. The above diagram consists of user as actor. Each will play a certain role to achieve the concept.

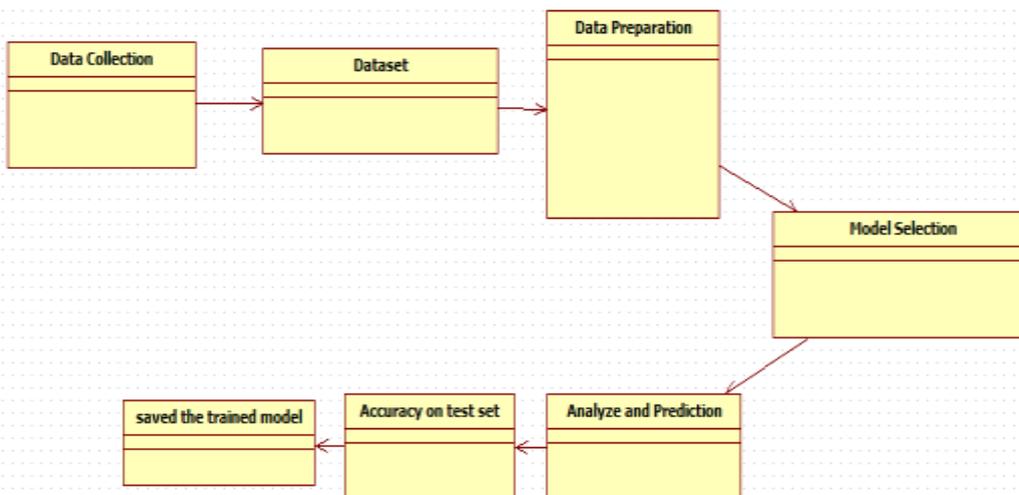
### 4.2.2 CLASS DIAGRAM



### EXPLANATION

In this class diagram represents how the classes with attributes and methods are linked together to perform the verification with security. From the above diagram shown the various classes involved in our project.

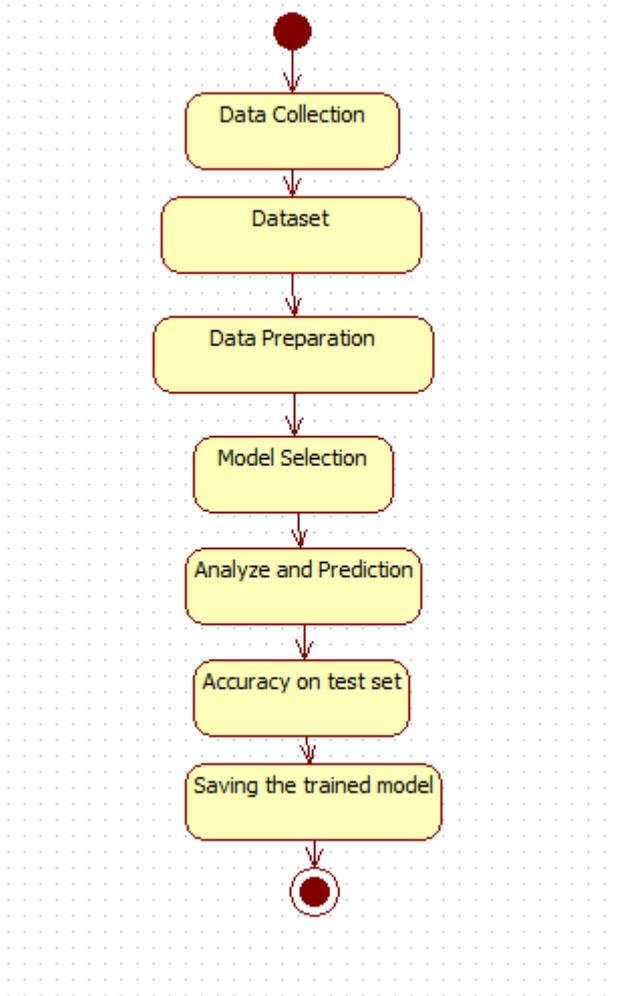
### 4.2.3 OBJECT DIAGRAM



### EXPLANATION:

In the above digram tells about the flow of objects between the classes. It is a diagram that shows a complete or partial view of the structure of a modeled system. In this object diagram represents how the classes with attributes and methods are linked together to perform the verification with security.

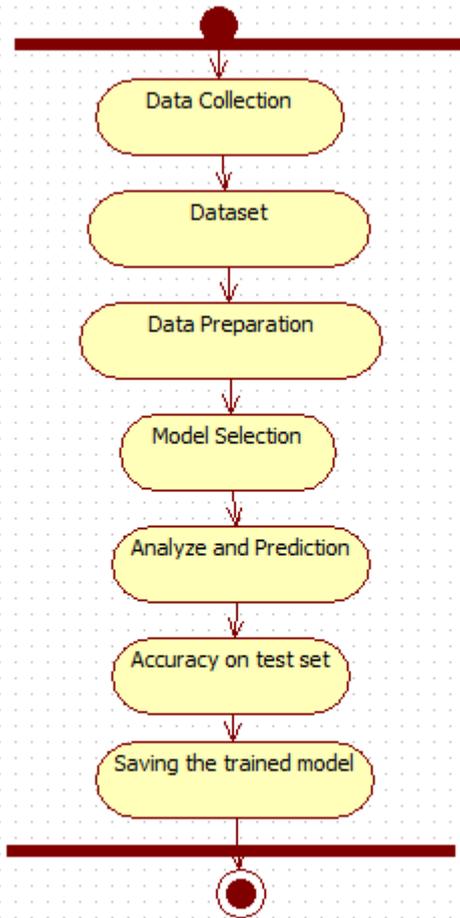
#### 4.2.4 STATE DIAGRAM



#### EXPLANATION:

State diagram are a loosely defined diagram to show workflows of stepwise activities and actions, with support for choice, iteration and concurrency. State diagrams require that the system described is composed of a finite number of states; sometimes, this is indeed the case, while at other times this is a reasonable abstraction. Many forms of state diagrams exist, which differ slightly and have different semantics.

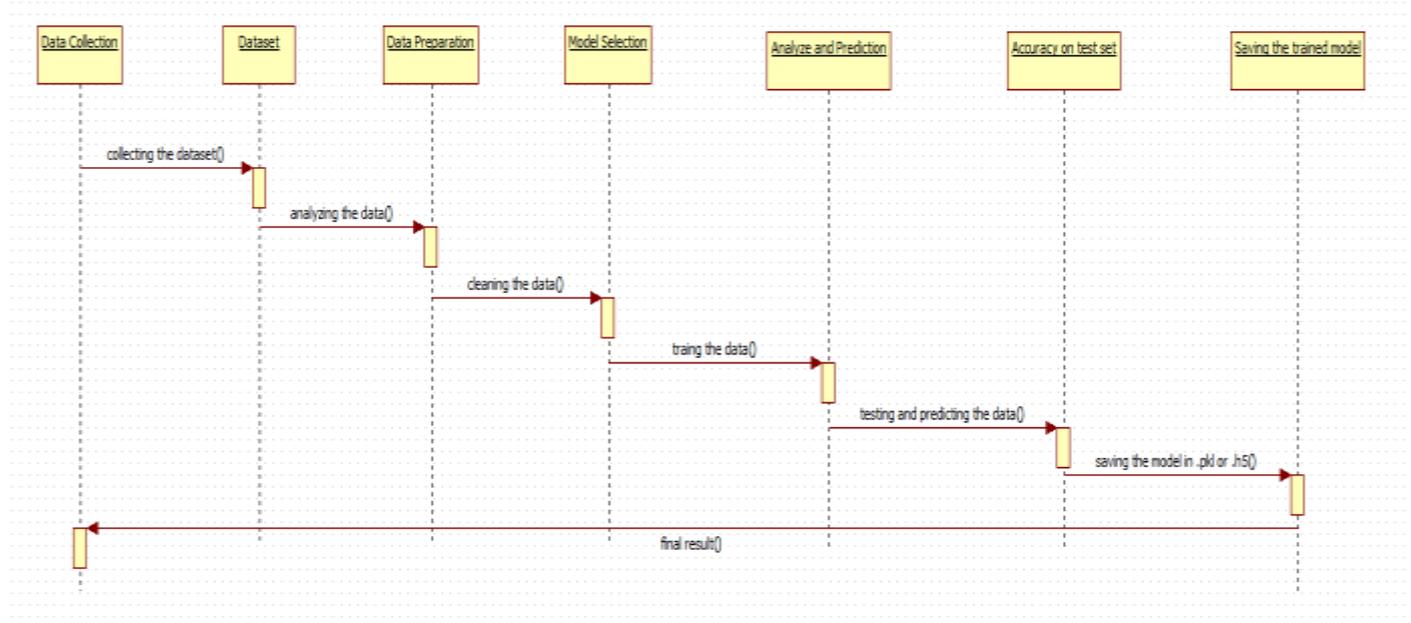
### 4.2.5 ACTIVITY DIAGRAM



#### EXPLANATION:

Activity diagrams are graphical representations of workflows of stepwise activities and actions with support for choice, iteration and concurrency. In the Unified Modeling Language, activity diagrams can be used to describe the business and operational step-by-step workflows of components in a system. An activity diagram shows the overall flow of control.

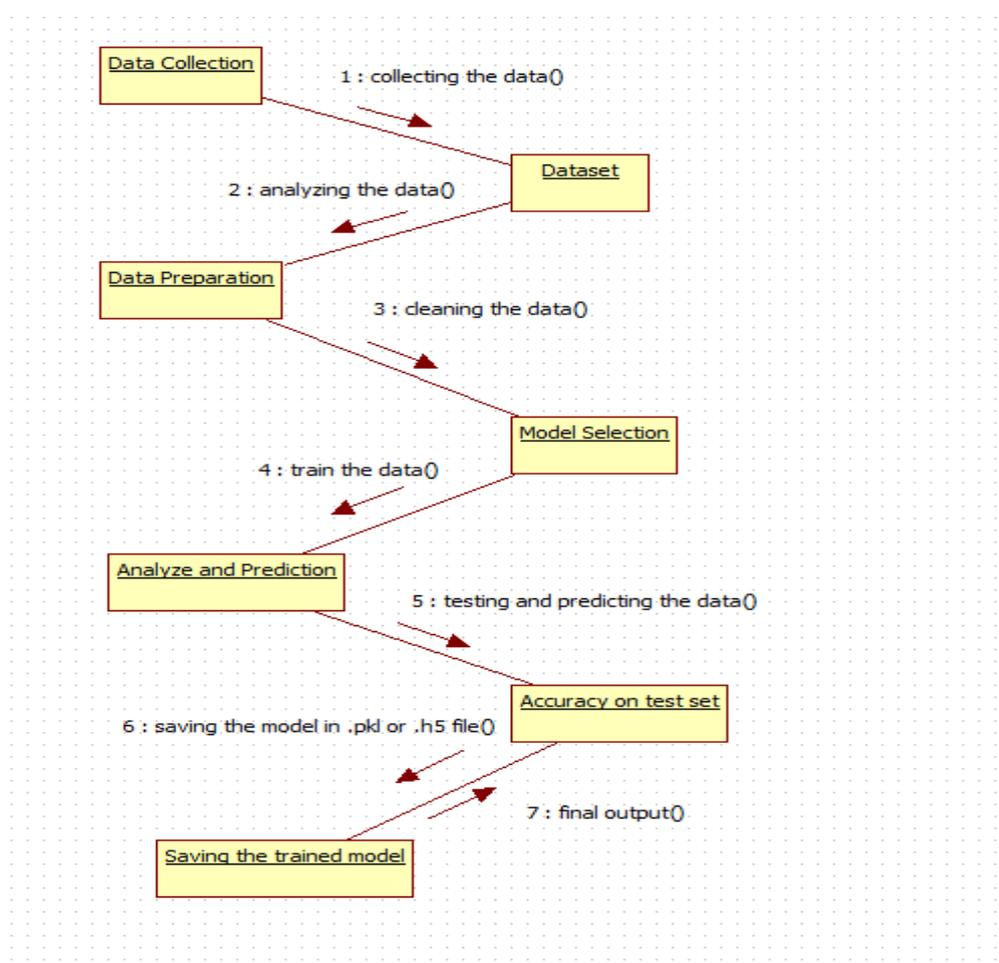
### 4.2.6 SEQUENCE DIAGRAM



#### EXPLANATION:

A sequence diagram in Unified Modeling Language (UML) is a kind of interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message Sequence Chart. A sequence diagram shows object interactions arranged in time sequence. It depicts the objects and classes involved in the scenario and the sequence of messages exchanged between the objects needed to carry out the functionality of the scenario.

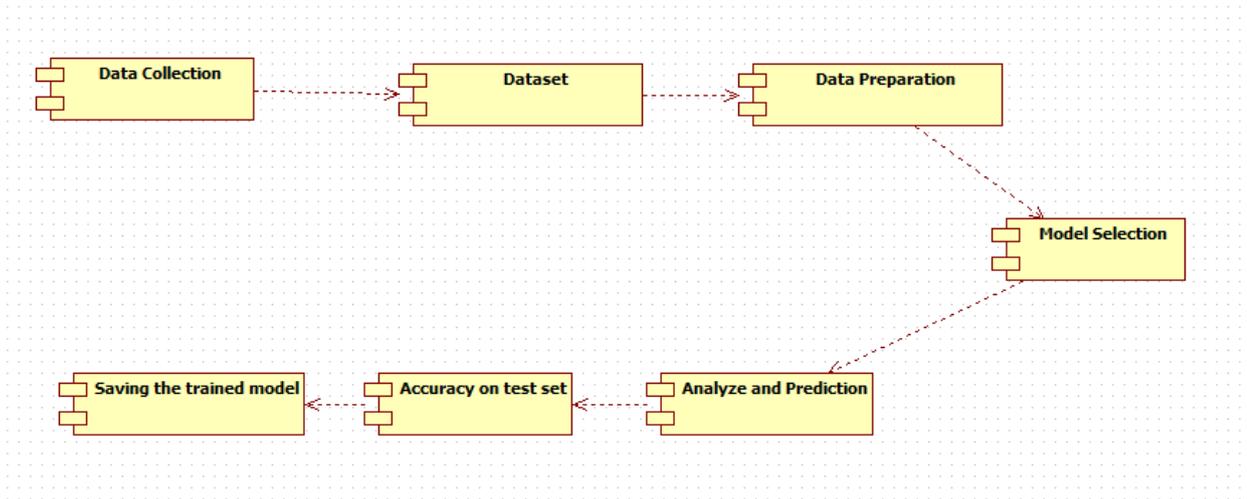
### 4.2.7 COLLABORATION DIAGRAM



**EXPLANATION:**

A collaboration diagram, also called a communication diagram or interaction diagram, is an illustration of the relationships and interactions among software objects in the Unified Modeling Language (UML). The concept is more than a decade old although it has been refined as modeling paradigms have evolved.

**4.2.8 COMPONENT DIAGRAM**

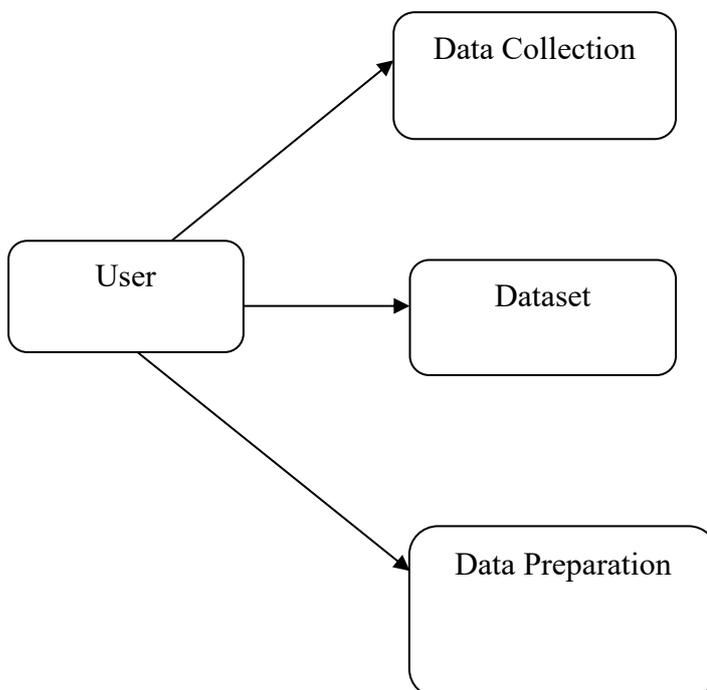


**EXPLANATION**

In the Unified Modeling Language, a component diagram depicts how components are wired together to form larger components and or software systems. They are used to illustrate the structure of arbitrarily complex systems. User gives main query and it converted into sub queries and sends through data dissemination to data aggregators. Results are to be showed to user by data aggregators. All boxes are components and arrow indicates dependencies.

**4.2.9 DATA FLOW DIAGRAM**

**Level 0**



Level 1

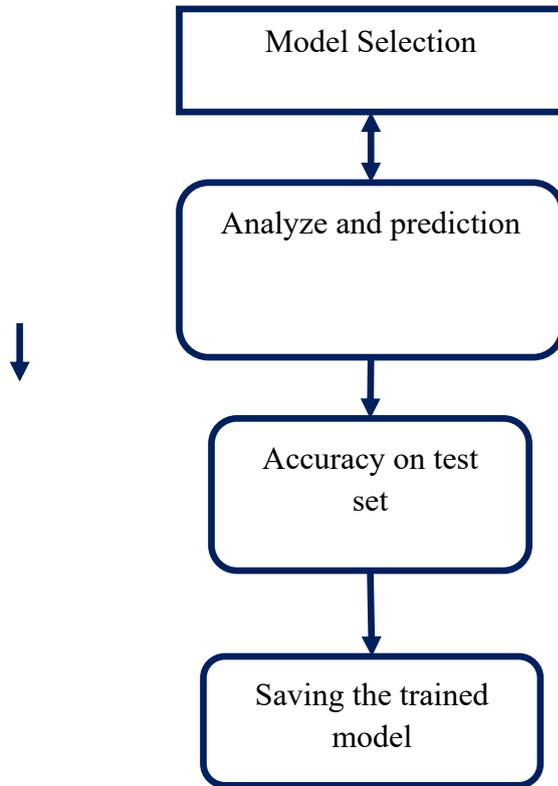


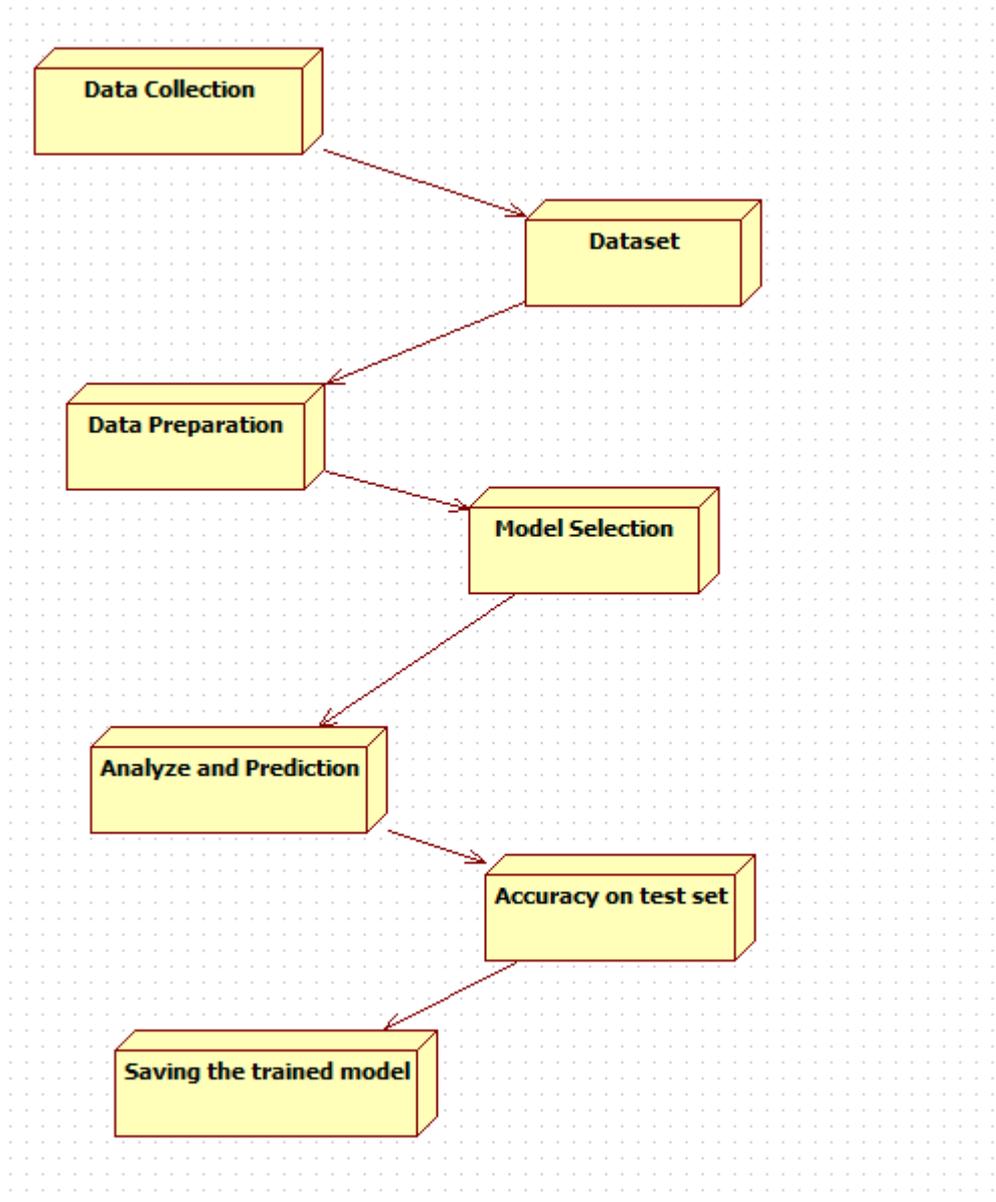
Fig 4.9: Data Flow Diagrams

**EXPLANATION:**

A data flow diagram (DFD) is a graphical representation of the "flow" of data through an information system, modeling its process aspects. Often they are a preliminary step used to create an overview of the system which can later be elaborated. DFDs can also be used for the visualization of data processing (structured design).

A DFD shows what kinds of data will be input to and output from the system, where the data will come from and go to, and where the data will be stored. It does not show information about the timing of processes, or information about whether processes will operate in sequence or in parallel.

### 4.2.10 DEPLOYMENT DIAGRAM



#### EXPLANATION:

Deployment Diagram is a type of diagram that specifies the physical hardware on which the software system will execute. It also determines how the software is deployed on the underlying hardware. It maps software pieces of a system to the device that are going to execute it.

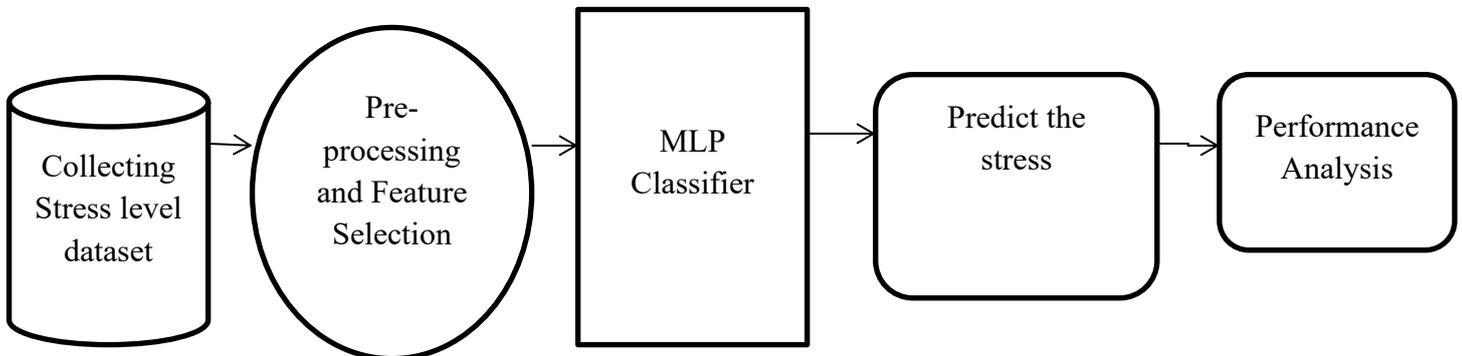
**SYSTEM ARCHITECTURE:**

Fig 4.11: System Architecture

**REFERENCES**

- [1] L. W. Ford and R. Hass. (2021). Democracy in Asia. Accessed: Nov. 15, 2024.
- [2] Freedom House. A Leaderless Struggle for Democracy. Accessed: Nov. 15, 2024.
- [3] Economist. (13, 2020). The Power of Protest | Jun. 13th 2020 | The Economist. Accessed: Nov. 11, 2024.
- [4] (31, 2024). World Report 2021. Accessed: Nov. 11, 2024.
- [5] D. Braha, "Global civil unrest: Contagion, self-organization, and prediction," PLoS ONE, vol. 7, no. 10, Oct. 2012, Art. no. e48596, doi: 10.1371/journal.pone.0048596.
- [6] D. Braha, "Phase transitions of civil unrest across countries and time," 2023, arXiv:2306.08698.
- [7] C. Abi-Nassif, A. M. Islam, and D. Lederman. (2020). Perceptions, Contagion, and Civil Unrest. Accessed: Nov. 17, 2024.
- [8] K. Deininger, "Causes and consequences of civil strife: Micro-level evidence from Uganda," Oxford Econ. Papers, vol. 55, no. 4, pp. 579–606, Oct. 2003, doi: 10.1093/oeq/55.4.579.
- [9] Cloudflare Radar. Internet Traffic Trends in Bangladesh. Accessed: Nov. 19, 2024. [Online]. Available: <https://shorturl.at/3zzZN>
- [10] M. A. Islam et al.: Psychological Impact of Internet Blackouts: A Case Study With ML
- [11] J. Tanner. (Jul. 31, 2024). Mobile Internet Returns to Bangladesh, but Not Social Media. Developing Telecoms. Accessed: Nov. 21, 2024.
- [12] T. Record. (24, 2024). Bangladesh is Coming Back Online After Five Days of Near-Total Internet Blackout. Accessed: Jul. 24, 2024.
- [13] A. Jazeera. (28,2024).BangladeshRestoresMobileInternetAfter11-Day Blackout to Quell Protests. Accessed: Nov. 22, 2024.
- [14] JURIST. (29, 2024). Bangladesh Authorities Announce End to 11 Day Internet Shutdown. Accessed: Nov. 22, 2024. [Online]. Available: <https://shorturl.at/QJLCj>
- [15] RTE. (Jul. 18, 2024). 32 Dead, 'Near-Total' Internet Shutdown in Bangladesh. Accessed: Nov. 22, 2024. [Online]. Available: <https://shorturl.at/mfnn1>
- [16] N. Koswanage. (19, 2024). Bangladesh Internet Goes Dark As Widen ing Job Protests Kill 25. Accessed: Nov. 22, 2024. [Online]. Available: <https://shorturl.at/5qzUx>
- [17] G. S. Reporter. (5, 2018). Unrest in Bangladesh As Student Road Safety Protests Turn Violent. Guardian. Accessed: Nov. 22, 2024. [Online]. Available: <https://rb.gy/ffpcss>
- [18] A. Jazeera. (Mar. 10, 2009). Dhaka Bans Youtube Over Mutiny Tape. Accessed: Nov. 22, 2024. [Online]. Available: <https://shorturl.at/pgLmp>
- [19] Reuters. (5, 2013). Bangladesh Lifts Ban on YouTube, Blocked After Anti-Islam Film. Accessed: Jun. 5, 2013. [Online]. Available: <https://shorturl.at/FEqu3>

- [19] M. Z. Islam. (Nov. 20, 2015). Sudden Shutdown Follows Verdict. Accessed: Nov. 23, 2024. [Online]. Available: <https://shorturl.at/bOvgJ>
- [20] (2023). Internet Throttling in Bangladesh: Government, Telcos Must #KeepItOn—Access Now. Accessed: Nov. 23, 2024. [Online]. Available: <https://shorturl.at/vboH6>
- [21] M. A. Whooley and J. M. Wong, “Depression and cardiovascular disorders,” *Annu. Rev. Clin. Psychol.*, vol. 9, no. 1, pp. 327–354, Mar. 2013, doi: 10.1146/annurev-clinpsy-050212-185526.
- [22] C. Otte, S. M. Gold, B. W. Penninx, C. M. Pariante, A. Etkin, M. Fava, D. C. Mohr, and A. F. Schatzberg, “Major depressive disorder,” *Nature Rev. Disease Primers*, vol. 2, no. 1, pp. 1–20, Sep. 2016, doi: 10.1038/nrdp.2016.65.
- [23] S. L. James et al., “Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990–2017: A systematic analysis for the global burden of disease study 2017,” *Lancet*, vol. 392, no. 10159, pp. 1789–1858, Nov. 2018, doi: 10.1016/s0140-6736(18)32279-7.
- [24] A.-S. Uban, B. Chulvi, and P. Rosso, “An emotion and cognitive based analysis of mental health disorders from social media data,” *Future Gener. Comput. Syst.*, vol. 124, pp. 480–494, Nov. 2021, doi: 10.1016/j.future.2021.05.032.
- [25] Guidelines Rev. Committee. (Nov. 20, 2023). Mental Health Gap Action Programme (mhGAP) Guideline for Mental, Neurological and Substance Use Disorders. Accessed: Nov. 25, 2024. [Online]. Available: <https://shorturl.at/30Qz4>
- [26] World Bank Open Data. Accessed: Nov. 25, 2024. [Online]. Available: <https://shorturl.at/Jdzld>
- [27] D. R. Singla, “Digital mental health interventions: An opportunity to enhance care while preserving human connection,” *Lancet Regional Health-Americas*, vol. 39, Nov. 2024, Art. no. 100940, doi: 10.1016/j.lana.2024.100940.
- [28] C. Rauschenberg, A. Schick, C. Goetzl, S. Roehr, S. G. Riedel-Heller, G. Koppe, D. Durstewitz, S. Krumm, and U. Reininghaus, “Social isolation, mental health, and use of digital interventions in youth during the COVID-19 pandemic: A nationally representative survey,” *Eur. Psychiatry*, vol. 64, no. 1, pp. 1–20, Jan. 2021, doi: 10.1192/j.eurpsy.2021.17.
- [29] C. L. Hall, A. D. Gómez Bergin, and S. Rennick-Egglestone, “Research into digital health intervention for mental health: 25-year retrospective on the ethical and legal challenges,” *J. Med. Internet Res.*, vol. 26, Sep. 2024, Art. no. e58939, doi: 10.2196/58939.
- [30] E. Kuhn, M. Saleem, T. Klein, C. Köhler, D. C. Fuhr, S. Lahutina, A. Minarik, R. Musesengwa, K. Neubauer, L. Olisaeloka, F. Osei, A. S. Reinhold, I. Singh, K. Spanhel, N. Thomas, T. Hendl, P. Kellmeyer, and K. Böge, “Interdisciplinary perspectives on digital technologies for global mental health,” *PLOS Global Public Health*, vol. 4, no. 2, Feb. 2024, Art. no. e0002867, doi: 10.1371/journal.pgph.0002867. 83524
- [31] M. Vuorre and A. K. Przybylski, “Global well-being and mental health in the Internet age,” *Clin. Psychol. Sci.*, vol. 12, no. 5, pp. 917–935, Nov. 2023, doi: 10.1177/21677026231207791. [32] (2023). Australian Institute of Health and Welfare, Social Isolation and Loneliness, Australian Government. Accessed: Mar. 20, 2025. [Online]. Available: <https://www.aihw.gov.au/mental-health/topic-areas/social-isolation-and-loneliness>
- [33] L. Brandt, S. Liu, C. Heim, and A. Heinz, “The effects of social isolation stress and discrimination on mental health,” *Translational Psychiatry*, vol. 12, no. 1, pp. 1–12, Sep. 2022, doi: 10.1038/s41398-022-02178-4.
- [34] M. T. Islam, T. Islam, M. Rafi, and T. R. Sakib, “Mental health evaluation during Internet blackouts: A machine learning approach,” in *Proc. IET Conf. Proc.*, Mar. 2025, no. 30, pp. 541–547, doi: 10.1049/icp.2025.0306.
- [35] M. Rafi and T. Islam, “Mental health evaluation during internet blackouts: A case study of Bangladesh quota movement,” *Proc. ITM Web Conf.*, vol. 72, Jan. 2025, Art. no. 02004, doi: 10.1051/itmconf/20257202004.
- [36] D. Liu, X. L. Feng, F. Ahmed, M. Shahid, and J. Guo, “Detecting and measuring depression on social media using a machine learning approach: Systematic review,” *JMIR Mental Health*, vol. 9, no. 3, Mar. 2022, Art. no. e27244, doi: 10.2196/27244.
- [37] A. B. R. Shatte, D. M. Hutchinson, and S. J. Teague, “Machine learning in mental health: A scoping review of methods and applications,” *Psychol. Med.*, vol. 49, no. 9, pp. 1426–1448, Feb. 2019, doi: 10.1017/s0033291719000151.
- [38] U. Madububambachu, A. Ukpebor, and U. Ihezue, “Machine learning techniques to predict mental health diagnoses: A systematic literature review,” *Clin. Pract. Epidemiol. Mental Health*, vol. 20, no. 1, pp. 1–16, Jul. 2024, doi: 10.2174/0117450179315688240607052117.
- [39] S. Banitaan and K. Daimi, “Using data mining to predict possible future depression cases,” *Int. J. Public Health Sci. (IJPHS)*, vol. 3, no. 4, pp. 231–240, Dec. 2014, doi: 10.11591/ijphs.v3i4.6920.
- [40] G. V. Benito, X. Goldberg, N. Brachowicz, G. Castaño-Vinyals, N. Blay, A. Espinosa, F. Davidhi, D. Torres, M. Kogevinas, R. de Cid, and P. Petrone, “Machine learning for anxiety and depression profiling and risk assessment in

- the aftermath of an emergency,” *Artif. Intell. Med.*, vol. 157, Nov. 2024, Art. no. 102991, doi: 10.1016/j.artmed.2024.102991.
- [41] W.L.KuandH.Min, “Evaluating machine learning stability in predicting depression and anxiety amidst subjective response errors,” *Healthcare*, vol. 12, no. 6, p. 625, Mar. 2024, doi: 10.3390/healthcare12060625.
- [42] J. Angskun, S. Tipprasert, and T. Angskun, “Big data analytics on social networks for real-time depression detection,” *J. Big Data*, vol. 9, no. 1, pp. 1–15, May 2022, doi: 10.1186/s40537-022-00622-2.
- [43] S. Gupta, L. Goel, A. Singh, A. K. Agarwal, and R. K. Singh, “TOXGB: Teamwork optimization based XGBoost model for early identification of post-traumatic stress disorder,” *Cognit. Neurodynamics*, vol. 16, no. 4, pp. 833–846, Jan. 2022, doi: 10.1007/s11571-021-09771
- [44] B. Silveira, H. S. Silva, F. Murai, and A. P. C. da Silva, “Predicting user emotional tone in mental disorder online communities,” *Future Gener. Comput. Syst.*, vol. 125, pp. 641–651, Dec. 2021, doi: 10.1016/j.future.2021.07.014.
- [45] J. Nabyonga-Orem, “Monitoring sustainable development goal 3: How ready are the health information systems in low-income and middle income countries?” *BMJ Global Health*, vol. 2, no. 4, Oct. 2017, Art. no. e000433, doi: 10.1136/bmjgh-2017-000433.
- [46] T. Izutsu, A. Tsutsumi, H. Minas, G. Thornicroft, V. Patel, and A. Ito, “Mental health and wellbeing in the sustainable development goals,” *Lancet Psychiatry*, vol. 2, no. 12, pp. 1052–1054, Dec. 2015, doi: 10.1016/s2215-0366(15)00457-5.
- [47] N. Votruba and G. Thornicroft, “Sustainable development goals and mental health: Learnings from the contribution of the FundaMentalSDG global initiative,” *Global Mental Health*, vol. 3, Jpp. 1–6, an. 2016, doi: 10.1017/gmh.2016.20.
- [48] M. van den Broek, Y. Gandhi, D. S. Sureshkumar, M. Prina, U. Bhatia, V. Patel, D. R. Singla, R. Velleman, H. A. Weiss, A. Garg, M. Sequeira, V. Pusdekar, M.J.D.Jordans, and A. Nadkarni, “Intervention to increase help-seeking for mental health care in low- and middle-income countries: A systematic review,” *PLOS Global Public Health*, vol. 3, no. 9, Sep. 2023, Art. no. e0002302, doi: 10.1371/journal.pgph.0002302.
- [49] M. M. Ahmmed, M. A. Babu, and S. Puri, “Statistical exploration and projection of SDG-3 in Bangladesh through DHS: A study on data-driven perspectives using logistic regression,” *Proc. Comput. Sci.*, vol. 235, pp. 2112–2123, Jan. 2024, doi: 10.1016/j.procs.2024.04.200. VOLUME 13, 2025 M. A. Islam et al.: Psychological Impact of Internet Blackouts: A Case Study With ML [50] N. L. Rane, Ö. Kaya, and J. Rane, “Advancing the sustainable development goals (SDGs) through artificial intelligence, machine learning, and deep learning,” in *Artificial Intelligence, Machine Learning, and Deep Learning for Sustainable Industry 5.0*. Deep Science Publishing, 2024, ch. 4, doi: 10.70593/978-81-981271-8-1\_4.