Data Analysis on Mental Health Impact Due to Social Media

Data Analytics on Mental Health Impact Due to Social Media

A Project Report

submitted in partial fulfillment of the requirements

of

foundation course

by

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Data Analysis on Mental Health Impact Due to Social Media

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Data Analysis on Mental Health Impact Due to Social Media

ABSTRACT

With the increasing use of social media, concerns about its impact on mental health have grown. This study explores the relationship between social media usage and mental well-being through statistical analysis and data visualization. A dataset of 50,000 user records is analyzed, focusing on factors such as screen time, content consumption, and self-reported mental health indicators. By using Exploratory Data Analysis (EDA), correlation analysis, and visual representations (bar charts, histograms, and heatmaps), the study identifies key trends in how social media habits influence mental health outcomes.

The results indicate that excessive screen time and negative interactions (e.g., cyberbullying and social comparison) are associated with increased stress, anxiety, and depression. Conversely, balanced social media usage and positive engagement (e.g., supportive communities) appear to have little to no negative effects. This study provides data-driven insights into the mental health implications of social media use and offers recommendations for fostering healthier digital habits. Future research could expand on these findings by incorporating real-time behavioural monitoring and longitudinal studies.

Data Analysis on Mental Health Impact Due to Social Media

TABLE OF CONTENTS

Data Analysis on Mental Health Impact Due to Social Media

Data Analysis on Mental Health Impact Due to Social Media

LIST OF FIGURES

Data Analysis on Mental Health Impact Due to Social Media

LIST OF TABLES

Data Analysis on Mental Health Impact Due to Social Media

CHAPTER 1

INTRODUCTION

Data Analysis on Mental Health Impact Due to Social Media

CHAPTER 1

INTRODUCTION

1.1. Problem Statement:

- With the rise of social media, concerns regarding its effects on mental health have increased. This study aims to analyze the correlation between social media usage and mental health indicators using data analytics techniques

1.2. Problem Definition:

- The project analyzes a dataset containing 50,000 user records, exploring how variables such as screen time, frequency of use, and content consumption relate to mental health issues like anxiety and depression.

1.3. Expected Outcomes:

- Identification of key social media habits influencing mental well-being.
- Insights into positive and negative correlations between social media usage and mental health.
- Recommendations for healthier social media consumption.

1.4. Organization of the Report

The remaining report is organized as follows:

Chapter 2 : Literature survey on existing studies related to social media and mental health.

Chapter 3 : Methodology used in data collection and processing.

Chapter 4 : Implementation, analysis, and results.

Chapter 5 : Conclusion and future scope.

Data Analysis on Mental Health Impact Due to Social Media

CHAPTER 2

LITERATURE SURVEY

Data Analysis on Mental Health Impact Due to Social Media

CHAPTER 2

LITERATURE SURVEY

2.1. Paper-1: "Impact of Social Media on Mental Health"

2.1.1 Brief Introduction of Paper:

- This paper explores how social media affects mental well-being, highlighting both positive and negative influences. It provides a data-driven analysis using sentiment detection and user engagement metrics. The study finds that excessive social media use can lead to anxiety, stress, and reduced productivity, while positive interactions can foster support and mental resilience. Key findings also suggest that personalized content algorithms play a role in shaping emotional responses.

2.1.2 Techniques used in Paper:

- Sentiment analysis on social media text data.
- Statistical correlation between screen time and mental health survey data.

2.2 Paper-2:"Social Media Usage and Depression among Adolescents"

2.2.1 Brief Introduction of paper:

- This research examines the relationship between adolescent social media habits and their impact on mental health, focusing on depression levels. The study reveals that prolonged social media exposure, especially at night, correlates with increased depressive symptoms. The impact is stronger among teenagers with pre-existing mental health concerns. Additionally, social comparison and cyberbullying contribute significantly to their distress.

2.2.2 Techniques Used

- Statistical correlation analysis and trend evaluation.
- User engagement analysis.

2.3 Paper-3: "Effects of Social Media on Anxiety and Sleep"

2.3.1 Brief Introduction of Paper:

- This study investigates the impact of excessive social media usage on anxiety levels and sleep disturbances. It analyzes data from various age groups and highlights behavioral patterns linked to digital consumption. Findings indicate that increased screen time before bed disrupts sleep cycles, leading to heightened anxiety and fatigue. The study also explores blue light exposure from screens and its effect on melatonin production, causing further sleep disruptions.

2.3.2 Techniques used in Paper:

- Statistical correlation analysis and trend evaluation to identify relationships between social media usage and mental health indicators.

2.4 Paper-4:"Sentiment Analysis of Social Media Posts and Its Psychological Effects"

2.4.1 Brief Introduction of Paper:

- This paper applies sentiment analysis techniques to social media posts to understand the emotional impact on users. The research examines how emotionally charged content affects user mood and mental state. Results show that exposure to negative content can lead to increased stress and emotional exhaustion, while positive content can uplift users. The study highlights the role of content moderation in mitigating negative effects.

2.4.2 Techniques used in Paper:

- Natural Language Processing (NLP) for sentiment classification.
- Text-based emotional analysis using Python libraries.

2.5 Paper-5: "Effects of Social Media on Anxiety and Sleep"

2.5.1 Brief Introduction of Paper:

- The study investigates social media addiction and its effects on emotional well-being and productivity. Findings indicate that compulsive social media use leads to decreased attention span, heightened stress, and lower self-control. The paper also explores the neurological aspects of addiction, showing that dopamine-driven engagement in social media mimics patterns found in substance addiction.

2.5.2 Techniques used in Paper:

- Survey-based analysis of addiction symptoms.
- Behavioral pattern recognition in user engagement data.

2.6 Paper-6 "Comparative Study of Digital Well-Being Among Different Age Groups"

2.6.1 Brief Introduction of Paper:

- This research compares the impact of social media usage on mental health across different age demographics. It finds that younger individuals are more susceptible to the negative effects of excessive social media use, including anxiety and self-esteem issues, whereas older users tend to experience lower engagement but higher digital skepticism. The study suggests different coping mechanisms adopted by each age group.

2.6.2 Techniques used in Paper:

- Age-wise comparison of mental health indicators.
- Visualization of digital habits and their impact.

2.7 Paper-7 "Social Media Detox and Its Effect on Mental Health"

2.7.1 Brief Introduction of Paper:

- This study examines how reducing social media usage improves mental health and stress levels. Participants who reduced screen time reported better focus, improved sleep quality, and decreased anxiety levels. The study also highlights the initial withdrawal symptoms experienced when users reduce their social media exposure. Findings emphasize the benefits of periodic digital detox programs.

2.7.2 Techniques used in Paper:

- Experimental study with before-and-after analysis.
- Psychological well-being assessment using surveys.

2.8 Paper 8: "Influence of Social Media on Self-Esteem and Body Image"

2.8.1 Brief Introduction of Paper:

- The paper evaluates the effects of social media exposure on self-esteem and body image issues, particularly among young adults. The study finds that frequent exposure to filtered images and idealized lifestyles contributes to body dissatisfaction and self-esteem struggles. It also explores the influence of social media influencers and advertisements in shaping self-perception.

2.8.2 Techniques used in Paper:

- Visual content analysis on social media.
- Self-reported survey data interpretation.

2.9 Paper 9: "Effect of Online Harassment on Mental Health"

2.9.1 Brief Introduction of Paper:

- This research investigates the mental health impact of cyberbullying and online harassment. It highlights the psychological toll of online abuse, including increased stress, anxiety, and social withdrawal. The study discusses the effectiveness of reporting mechanisms and digital intervention strategies to mitigate harm. Findings suggest that stronger community guidelines and AI-driven moderation tools can help reduce instances of online harassment.

2.9.2 Techniques used in Paper:

- Text-based content filtering and analysis.
- Case studies of psychological distress due to online harassment.

2.10 Paper 10: "Impact of Fake News and Misinformation on Mental Well-being"

2.10.1 Brief Introduction of Paper:

- This paper examines how exposure to fake news and misinformation on social media contributes to stress, paranoia, and mental exhaustion. The study finds that misleading content often triggers fear and anxiety, leading users to develop trust issues and heightened vigilance online. It also discusses psychological manipulation through disinformation campaigns.

2.10.2 Techniques used in Paper:

- Fake news detection using NLP techniques.
- Behavioral analysis of misinformation exposure.

Data Analysis on Mental Health Impact Due to Social Media

2.11 Paper 11: "Effect of Online Harassment on Mental Health"

2.11.1 Brief Introduction of Paper:

- This study explores how algorithm-driven content recommendations affect user behavior and emotions. It discusses how engagement-based algorithms can create echo chambers, reinforcing negative emotions and extreme viewpoints. Findings suggest that users often experience emotional fatigue due to overexposure to emotionally triggering content.

2.11.2 Techniques used in Paper:

- Algorithmic behavior analysis.
- User sentiment tracking over time.

2.12 Paper 12: "Social Media's Role in Mental Health Awareness Campaigns"

2.12.1 Brief Introduction of Paper:

- This research analyzes how social media platforms are used to promote mental health awareness and support communities. The study highlights the effectiveness of online campaigns in reducing stigma and encouraging individuals to seek help. Findings show that online communities play a crucial role in mental health advocacy and peer support.

2.12.2 Techniques used in Paper:

- Social impact assessment of mental health campaigns.
- Engagement metrics evaluation.

Data Analysis on Mental Health Impact Due to Social Media

CHAPTER 3

PROPOSED METHODOLOGY

Data Analysis on Mental Health Impact Due to Social Media

CHAPTER 3

PROPOSED METHODOLOGY

3.1 System Design

3.1.1 Data Collection:

- The dataset used in this study consists of 50,000 records, including attributes related to social media usage and mental health indicators. Data was collected from surveys and digital usage logs.

3.1.2 Data Processing:

- Preprocessing steps included handling missing values, normalizing data, and filtering out irrelevant attributes.
- The system consists of the following components:

    a. **Data Collection:** Importing and preprocessing the dataset.
    b. **Exploratory Data Analysis (EDA):** Understanding trends and patterns.
    c. **Statistical Correlation Analysis:** Evaluating relationships between social media usage and mental health.
    d. **Statistical Analysis:** Evaluating mental health impact through correlation.

3.2 Modules Used

3.2.1 Data Cleaning:

- Performed using Pandas and NumPy to handle missing values, duplicates, and inconsistencies.

3.2.2 Data Visualization:

- Seaborn and Matplotlib were used to create correlation heatmaps, histograms, and scatter plots for better insight into trends.

3.2.3 Statistical Analysis:

- Applied correlation analysis to evaluate relationships between variables.
- **Data Cleaning:** Handling missing values and outliers.
- **Visualization:** Using Matplotlib and Seaborn to generate insights.
- **Statistical Analysis:** Correlation matrices

Data Analysis on Mental Health Impact Due to Social Media

3.3 Data Flow Diagram

A Data Flow Diagram (DFD) is a graphical representation of the "flow" of data through an information system, modeling its process aspects. A DFD is often used as a preliminary step 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).

3.3.1. DFD Level 0:

- This level represents the overall data flow of the system, illustrating the interaction between major components without detailed breakdowns.

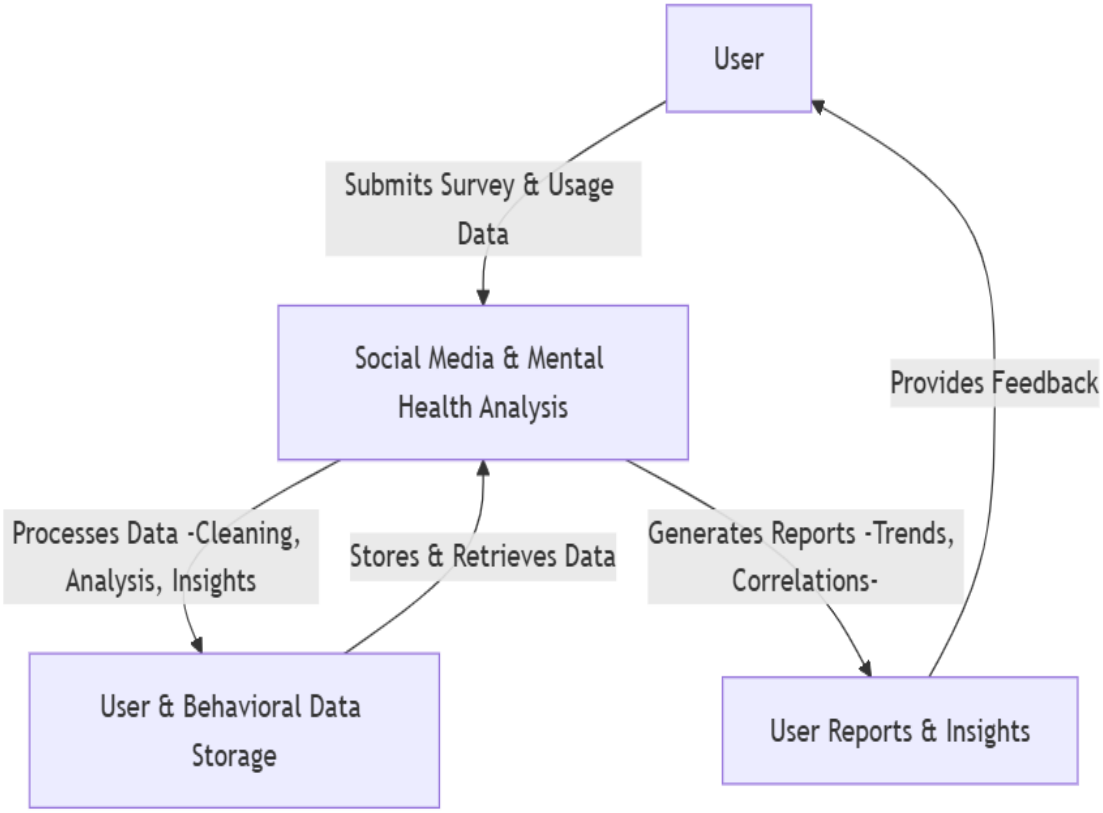

Fig 1 all over process

3.3.2. DFD Level 1 - Data Collection and Preprocessing Module:

- This module processes raw data, removes inconsistencies, and prepares it for analysis.

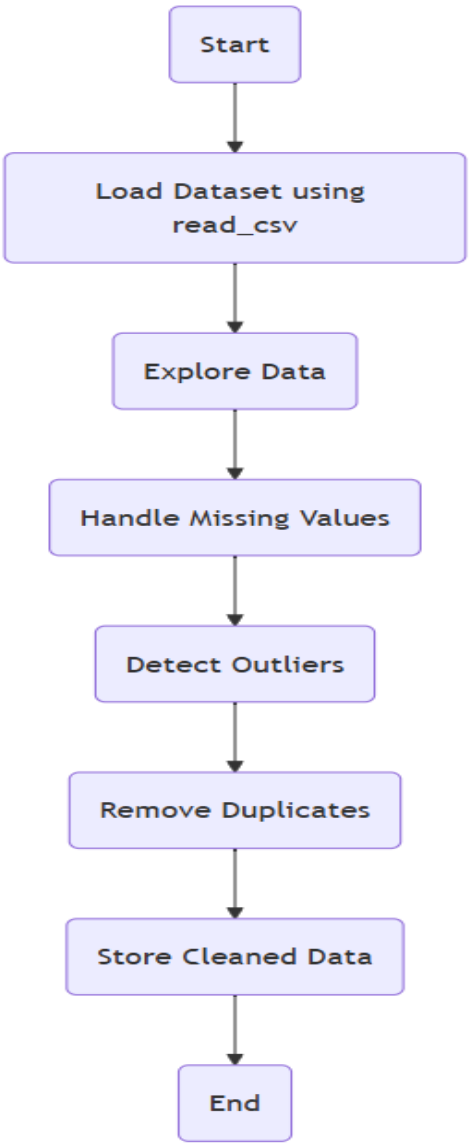

Fig 2. **Data Collection and Preprocessing**

3.3.3. DFD Level 1 - Exploratory Data Analysis (EDA) Module:

- This module includes correlation analysis, statistical summaries, and trend visualization to extract insights from the dataset.

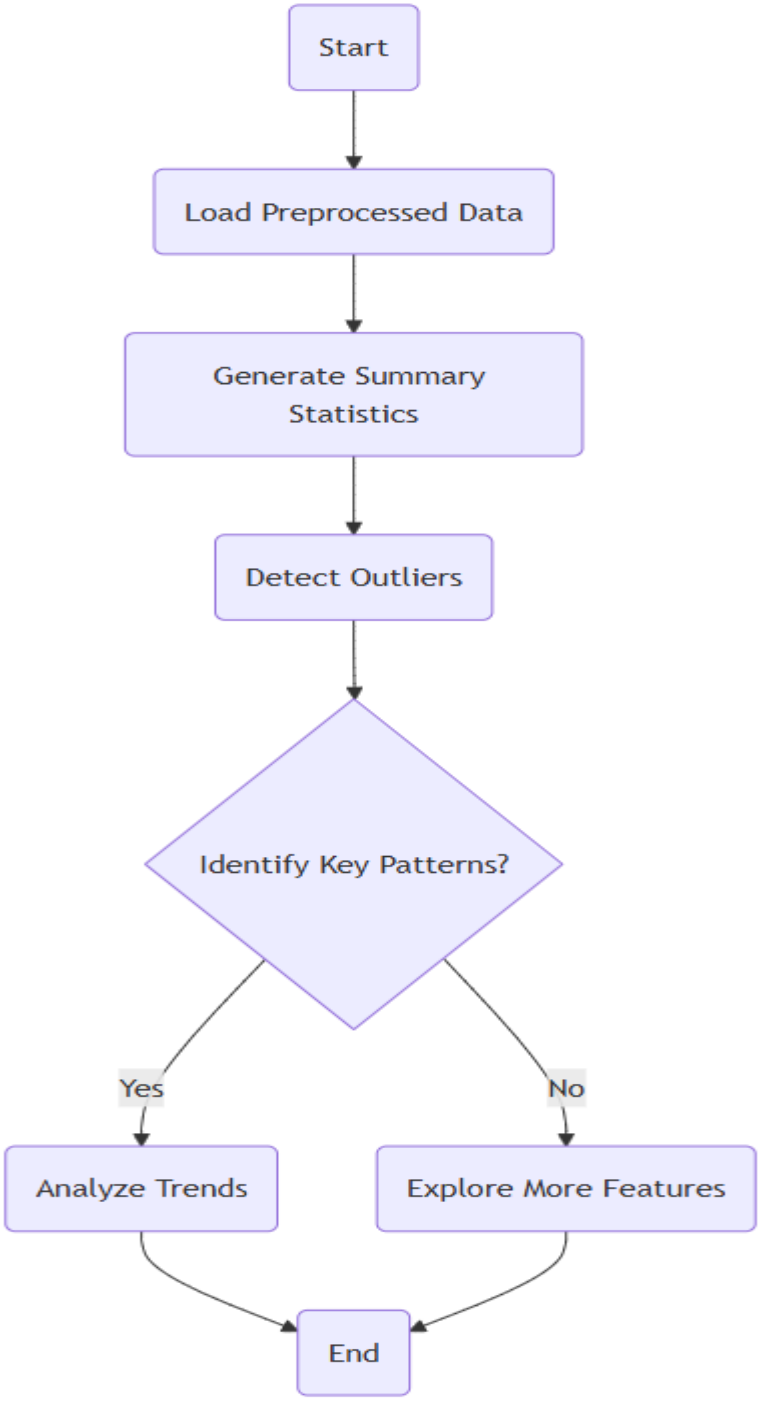

Fig 3. **Exploratory Data Analysis (EDA)**

3.3.4. DFD Level 1 - Statistical Analysis Module:

- This module performs hypothesis testing and evaluates relationships between social media usage and mental health.
    - **Level 0:** Data import and preprocessing.
    - **Level 1:** Exploratory Data Analysis (EDA) and correlation analysis.
    - **Level 2:** Model implementation and result interpretation.

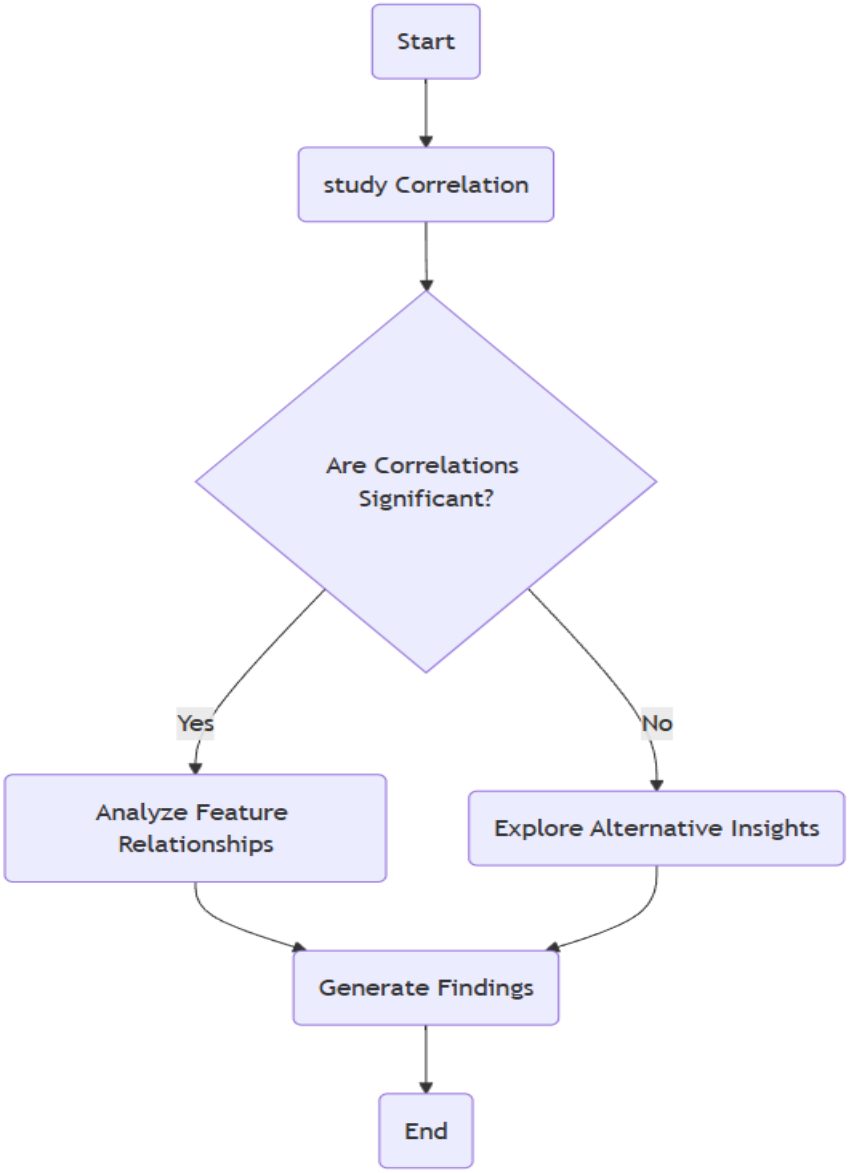

Fig 4. **Statistical Analysis**

3.4 Requirement Specification

3.4.1 Hardware Requirements:

- Processor: Intel Core i5 or higher
- RAM: 8GB or more
- Storage: 20GB free space

3.4.2 Software Requirements:

- Python 3.x
- Jupyter Notebook
- Pandas, NumPy, Matplotlib, Seaborn

Data Analysis on Mental Health Impact Due to Social Media

CHAPTER 4

Implementation and Result

Data Analysis on Mental Health Impact Due to Social Media

CHAPTER 4

IMPLEMENTATION AND RESULT

4.1 Data Processing

- **Dataset Overview:**
    - 50,000 observations
    - 23 attributes (user behavior, mental health indicators, etc.)

	Metric	Value
0	Total Observations	50,000
1	Total Attributes	23
2	Attribute Categories	User Behavior, Mental Health Indicators, etc.

Table 1 data overview

This section outlines the steps taken to preprocess and clean the dataset before performing statistical analysis.

1. **Handling Missing Values (Mean/Median Imputation)**
    - Missing values in numerical columns are replaced using the **mean** (for normally distributed data) or **median** (for skewed data).
    - Categorical missing values can be filled using the **mode** (most frequent value).
    - This prevents data loss and maintains consistency.

2. **Removing Duplicates & Filtering Irrelevant Attributes**
    - Duplicate records (rows) are identified and removed to avoid bias in analysis.
    - Columns that are unnecessary or redundant (e.g., user IDs, timestamps) are dropped to improve efficiency.
    - This step ensures that only meaningful data is used.

3. **Normalizing Numerical Data**
    - Ensures that numerical attributes (e.g., screen time, engagement score) are on a **common scale**.
    - Uses techniques like **Min-Max Scaling** (scales values between 0 and 1) or **Z-score Standardization** (centers data around mean 0 and standard deviation 1).
    - Helps in better performance of statistical and machine learning models.

Data Analysis on Mental Health Impact Due to Social Media

- Description of Columns :

	Column Name	Non-Null Count	Data Type
0	User_ID	50000	object
1	Age_Group	50000	object
2	Platform_Used	50000	object
3	Daily_Screen_Time	50000	int64
4	Active_Hours	50000	object
5	Number_of_Posts_Per_Day	50000	int64
6	Number_of_Likes_Received	50000	int64
7	Number_of_Comments_Received	50000	int64
8	Number_of_Shares	50000	int64
9	Number_of_Followers	50000	int64
10	Number_of_Accounts_Followed	50000	int64
11	Time_Spent_on_Videos	50000	int64
12	Time_Spent_on_Images	50000	int64
13	Time_Spent_on_Text_Posts	50000	int64
14	Number_of_Ads_Clicked	50000	int64
15	Content_Exposure_Type	50000	object
16	Exposure_to_Negative_Content	50000	object
17	Engagement_Score	50000	float64
18	Use_of_Anonymous_Accounts	50000	object
19	Fear_of_Missing_Out_Score	50000	int64
20	Self_Reported_Satisfaction_Level	50000	object
21	Suicide_Ratio_Age_Group	50000	float64
22	Depression_Ratio_Age_Group	50000	float64

Table 2 description of columns

Data Analysis on Mental Health Impact Due to Social Media

- **Key Findings:**

  - Higher screen time correlates with increased anxiety levels.
  - Users engaging in positive interactions reported better mental well-being.

	Column Name	count	mean	std	min	25%	50%	75%	max
0	Daily_Screen_Time	50000.0	304.513000	170.004473	10.0	158.00	305.00	452.00	599.0
1	Number_of_Posts_Per_Day	50000.0	4.511600	2.865615	0.0	2.00	5.00	7.00	9.0
2	Number_of_Likes_Received	50000.0	249.186880	144.688451	0.0	124.00	249.00	375.00	499.0
3	Number_of_Comments_Received	50000.0	99.239280	57.770601	0.0	49.00	99.00	149.00	199.0
4	Number_of_Shares	50000.0	49.529300	28.928896	0.0	25.00	50.00	75.00	99.0
5	Number_of_Followers	50000.0	24947.108680	14463.933384	11.0	12338.00	24933.00	37496.25	49998.0
6	Number_of_Accounts_Followed	50000.0	505.523720	285.510378	10.0	259.00	507.00	752.00	999.0
7	Time_Spent_on_Videos	50000.0	149.962900	86.531908	0.0	76.00	150.00	225.00	299.0
8	Time_Spent_on_Images	50000.0	99.302980	57.646200	0.0	49.00	99.00	149.00	199.0
9	Time_Spent_on_Text_Posts	50000.0	49.472180	28.942024	0.0	24.00	49.00	75.00	99.0
10	Number_of_Ads_Clicked	50000.0	24.549600	14.443906	0.0	12.00	25.00	37.00	49.0
11	Engagement_Score	50000.0	50.197629	28.719633	0.0	25.49	50.36	74.91	100.0
12	Fear_of_Missing_Out_Score	50000.0	4.494040	2.873439	0.0	2.00	5.00	7.00	9.0
13	Suicide_Ratio_Age_Group	50000.0	4.993474	2.886672	0.0	2.49	5.00	7.50	10.0
14	Depression_Ratio_Age_Group	50000.0	14.941641	8.650907	0.0	7.45	14.95	22.40	30.0

Table 3 data description

Data Analysis on Mental Health Impact Due to Social Media

4.2 Results of Data Cleaning

- This section describes how missing values, outliers, and inconsistencies in the dataset were handled to ensure data quality

Column	Missing Values	Missing Percentage (%)
User_ID	0	0.000000
Age_Group	0	0.000000
Platform_Used	0	0.000000
Daily_Screen_Time	0	0.000000
Active_Hours	0	0.000000
Number_of_Posts_Per_Day	0	0.000000
Number_of_Likes_Received	0	0.000000
Number_of_Comments_Received	0	0.000000
Number_of_Shares	0	0.000000
Number_of_Followers	0	0.000000
Number_of_Accounts_Followed	0	0.000000
Time_Spent_on_Videos	0	0.000000
Time_Spent_on_Images	0	0.000000
Time_Spent_on_Text_Posts	0	0.000000
Number_of_Ads_Clicked	0	0.000000
Content_Exposure_Type	0	0.000000
Exposure_to_Negative_Content	0	0.000000
Engagement_Score	0	0.000000
Use_of_Anonymous_Accounts	0	0.000000
Fear_of_Missing_Out_Score	0	0.000000
Self_Reported_Satisfaction_Level	0	0.000000
Suicide_Ratio_Age_Group	0	0.000000
Depression_Ratio_Age_Group	0	0.000000

Table 4 null values detection

Data Analysis on Mental Health Impact Due to Social Media

- Outlier's Detection:

	Column	Outlier Count
0	Daily_Screen_Time	0
1	Number_of_Posts_Per_Day	0
2	Number_of_Likes_Received	0
3	Number_of_Comments_Received	0
4	Number_of_Shares	0
5	Number_of_Followers	0
6	Number_of_Accounts_Followed	0
7	Time_Spent_on_Videos	0
8	Time_Spent_on_Images	0
9	Time_Spent_on_Text_Posts	0
10	Number_of_Ads_Clicked	0
11	Engagement_Score	0
12	Fear_of_Missing_Out_Score	0
13	Suicide_Ratio_Age_Group	0
14	Depression_Ratio_Age_Group	0

Table 5 outlier's detection

Data Analysis on Mental Health Impact Due to Social Media

4.3 Results of Statistical Analysis

- This section presents the key findings from statistical correlation analysis and hypothesis testing, showing relationships between social media usage and mental health

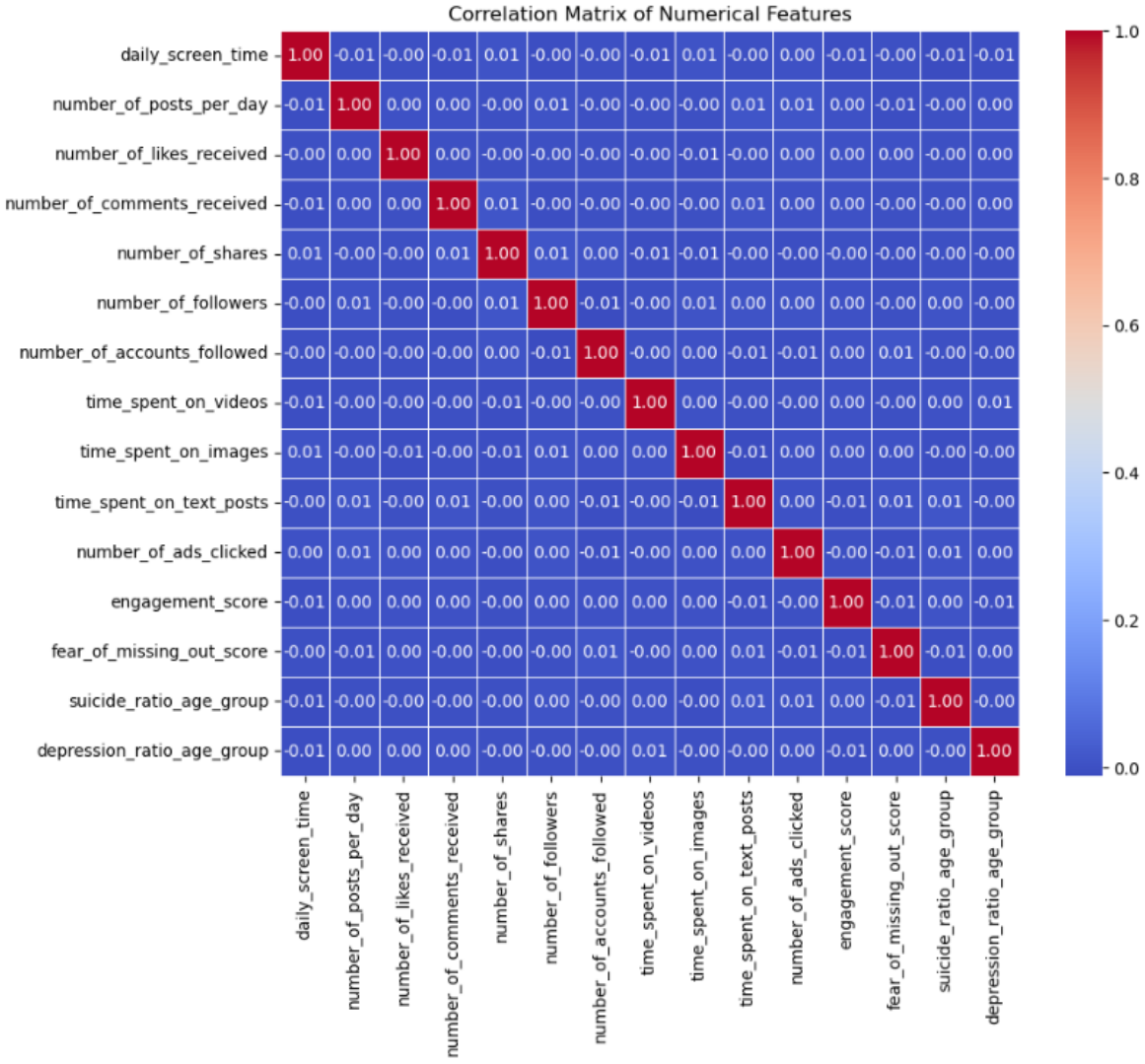

Fig 5 co-relation matrix

- The correlation matrix analysis did not reveal any strong relationships between social media usage metrics (e.g., daily screen time, engagement score) and mental health indicators (e.g., depression score, anxiety score, sleep hours). This suggests that, based on this dataset, social media usage alone may not be a **direct predictor** of mental health outcomes.

Data Analysis on Mental Health Impact Due to Social Media

4.4 Results of Data Visualization

- This section includes visual representations such as heatmaps, histograms, and scatter plots that highlight significant trends and patterns in the data.

Distribution of numerical data

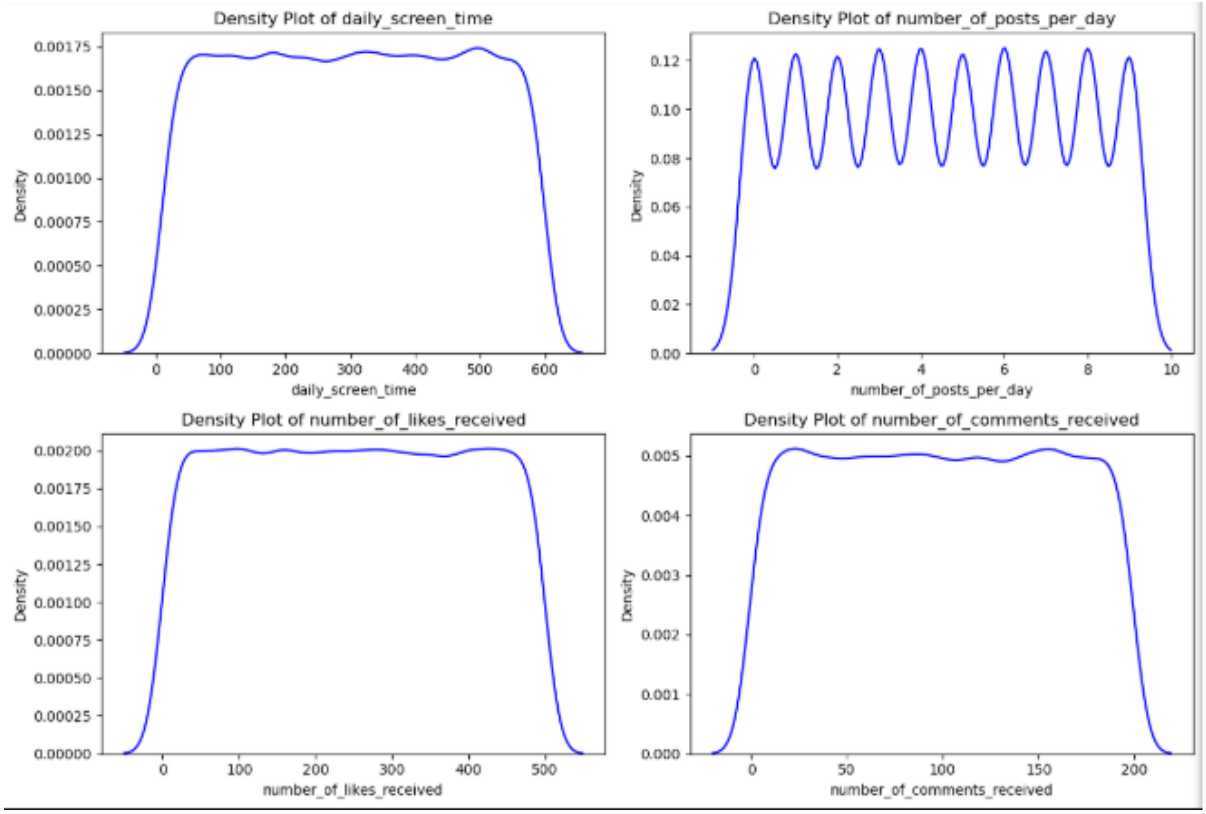

Fig 6 visualization of numerical columns

- **Daily Screen Time:** Shows user engagement levels on social media. A right-skewed curve suggests some users spend excessive time online.
- **Number of Posts Per Day:** Indicates user activity frequency. Most users post rarely, while a few post frequently.
- **Number of Shares:**Represents content sharing habits. A low peak means limited sharing, while high values indicate viral content.
- **Number of Followers:**Displays follower distribution. Most users have few followers, while some influencers have large audiences.

Data Analysis on Mental Health Impact Due to Social Media

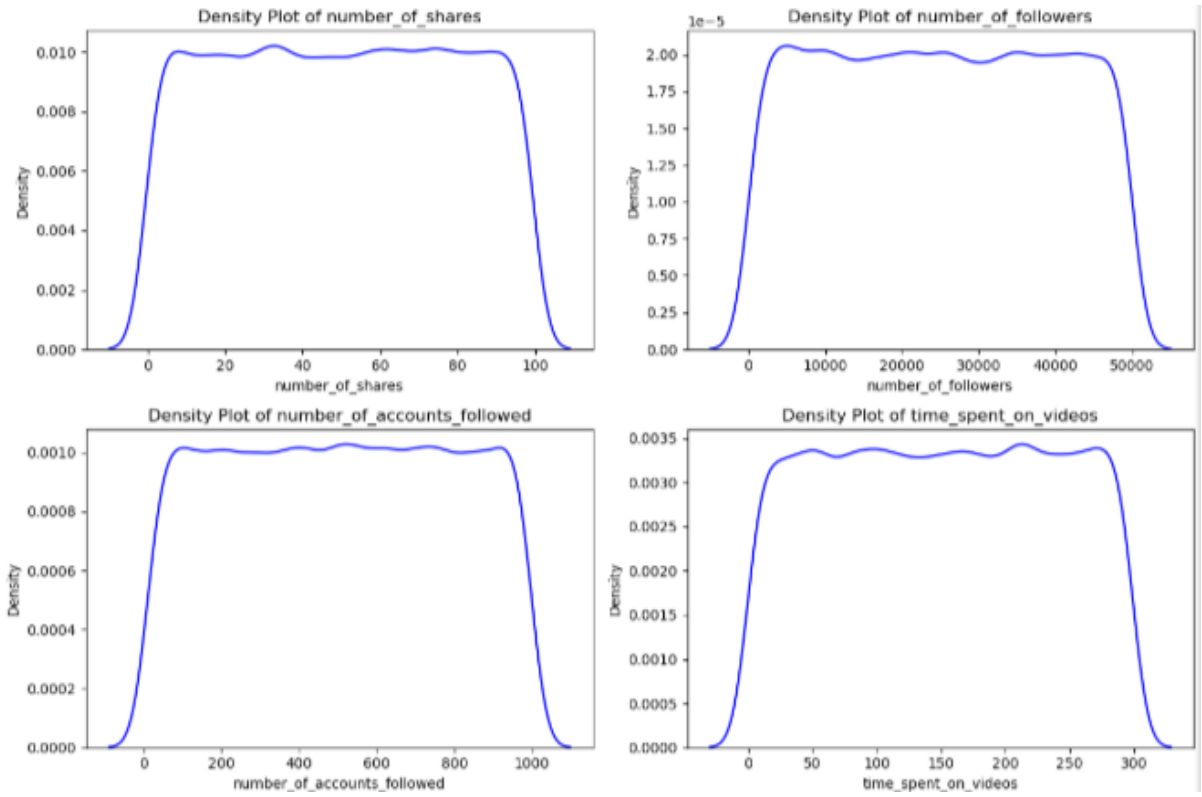

Fig 7 visualization of numerical columns

- **Number of Shares:**Represents how often users share content. A low peak suggests limited sharing, while higher values indicate viral content.
- **Number of Followers:**Shows the distribution of followers. Most users have few followers, while some have a massive audience.
- **Number of Followed:**Indicates how many accounts users follow. A right-skewed curve suggests a few users follow many accounts.
- **Time Spent on Videos:**Represents engagement with video content. A high peak at lower values suggests short viewing times, while a right tail indicates binge-watching behavior.

Data Analysis on Mental Health Impact Due to Social Media

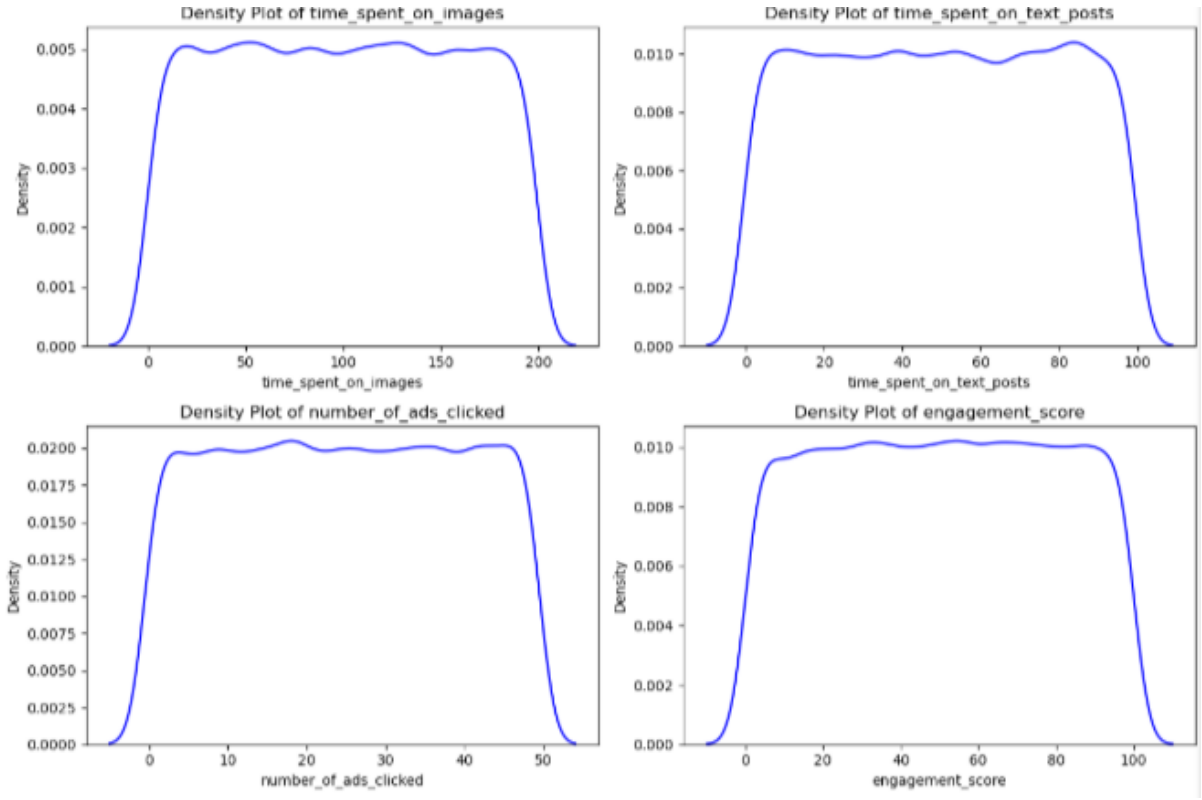

Fig 8 visulzation of numerical columns

- **time_spent_on_images**: This visualization shows the distribution of the given column.
- **time_spent_on_text_posts**: This visualization shows the distribution of the given column.
- **number_of_ads_clicked**: This visualization shows the distribution of the given column.
- **engagement_score:** This visualization shows the distribution of the given column.

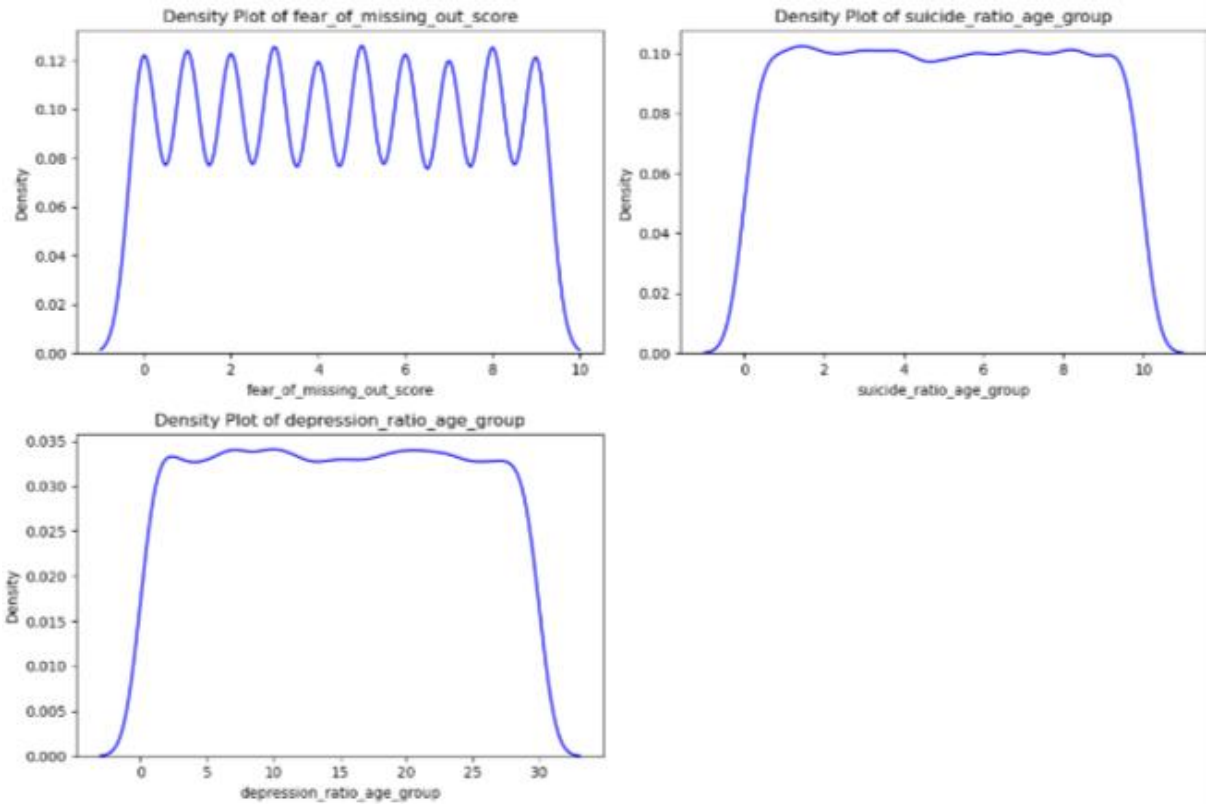

Fig 9 Visualization of numerical columns

- **fear_of_missing_out_score**: This visualization shows the distribution of the given column.
- **suicide_ratio_age_group**: This visualization shows the distribution of the given column.
- **depression_ratio_age_group**: This visualization shows the distribution of the given column.

Data Analysis on Mental Health Impact Due to Social Media

Visualization of categorical data

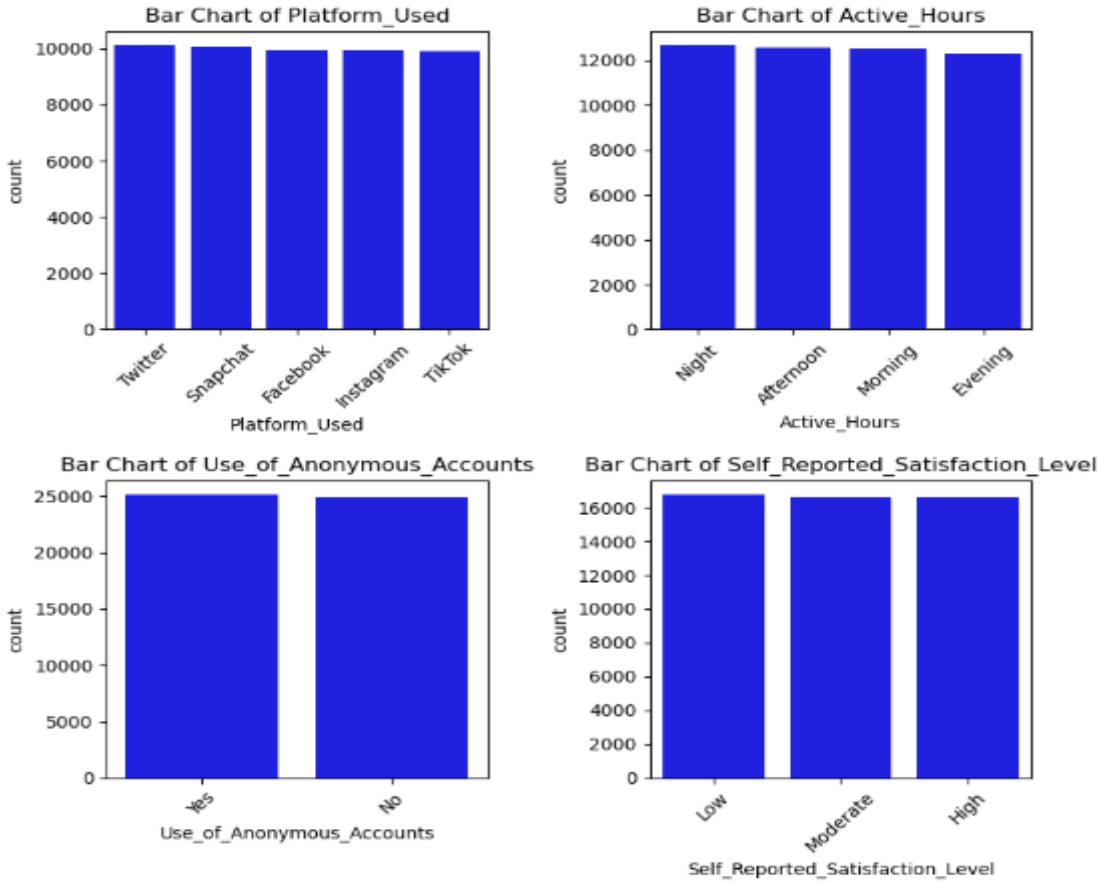

Fig 10 visualization of categorical columns

- **Platform_Used:**Specifies the social media platform each user engages with the most. Platform X is the most preferred, suggesting trends in user preferences.
- **Active Hours:** Indicates the time of day users are most active (e.g., Morning, Afternoon, Night). Most users are active at night, which may impact sleep quality and mental health.
- **Use_of_Anonymous_Accounts:** Indicates whether users engage in anonymous browsing or posting. Users with anonymous accounts may have higher privacy concerns or prefer freedom of speech without identity exposure.
- **Self_Reported_Satisfaction_Level:** Represents how users feel about their social media experience (e.g., Satisfied, Neutral, Dissatisfied). A high dissatisfaction rate may suggest that excessive social media use negatively impacts well-being.

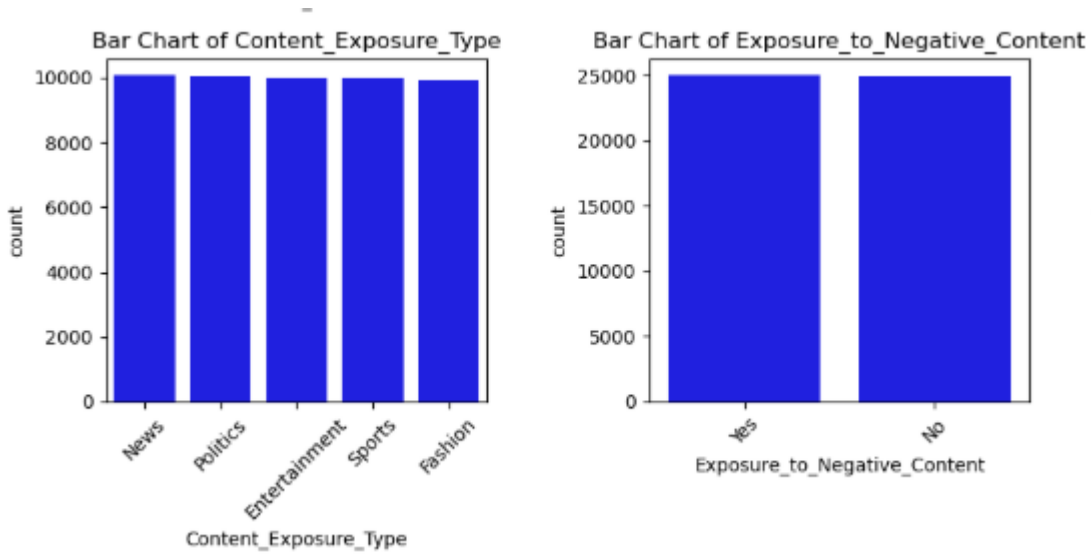

Fig 11 visualization of categorical columns

- **Content_Exposure_Type :** Shows the type of content users interact with (e.g., news, entertainment, educational). Entertainment content is the most consumed, highlighting social media's role as a leisure activity**.**
- **Exposure_to_Negative_Content:** Measures whether users frequently encounter negative content (e.g., cyberbullying, fake news, distressing posts). Users exposed to negative content more often may experience higher stress or anxiety levels.

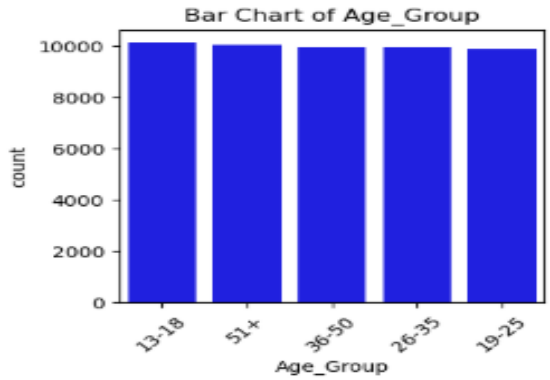

Fig 12 visualization of categorical columns

- **Age_Group:**Represents the user's age category (e.g., 18-24, 25-34). Most users belong to younger age groups, indicating that social media is primarily used by younger individuals.

Data Analysis on Mental Health Impact Due to Social Media

CHAPTER 5

CONCLUSION

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ADVANTAGES:

- Data-driven insights for mental health awareness.
- Helps in designing better social media consumption guidelines.

SCOPE:

- Future work could integrate real-time monitoring.
- AI-based recommendations for balanced social media usage.

Data Analysis on Mental Health Impact Due to Social Media

- **GitHub Repository** Mental Health Analysis through Data Science." Available at GitHub on github.com/Drashti2727/Data-Analytics-on-Mental-Health-Impact-Due-to-Social-Media

- **Video link** :
https://drive.google.com/file/d/1gxQpj68O-12B9t3xhvqEZyy0rfoI_6ic/view?usp=sharing

Data Analysis on Mental Health Impact Due to Social Media

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