Women's Wellness Guide Using Machine Learning

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***Abstract*—Women's mental health is a critical yet often overlooked aspect of well-being. In this project, Women's Wellness Guide, we have developed a comprehensive application designed to provide mental health support for women through innovative AI-driven features. Our system integrates machine learning models, utilizing logistic regression for sentiment analysis on journal entries, generating weekly mental health reports based on users' emotional patterns. Additionally, a personalized recommendation system employs decision tree models to provide tailored suggestions based on age group (15–19, 20–24, 25–30), mental state, daily routine, and severity of mental distress. Unlike existing systems that are largely static and provide only general information about mental health problems faced by women, our solution takes a dynamic approach. Using machine learning models, it offers personalized recommendations to address specific mental health challenges. The application incorporates real-time communication via Socket.IO, enabling seamless chat-based support. Furthermore, we offer professional consultation services and helpline support to assist users in distress. To enhance mental well-being, our platform provides curated content, including therapeutic music, informative articles, and guided exercises. This integrated approach leverages machine learning and real-time interaction technologies to offer personalized, accessible, and effective mental health support for women.**

***Keywords* - Mental health, Sentiment analysis, Machine learning, Logistic regression, Decision tree, Real-time communication, Socket.IO, Consultation, Helpline, Personalized support.**

I. Introduction

Mental health is an essential component of overall well-being, yet it is often overlooked, especially among women. Despite the increasing awareness of mental health issues, many women still face barriers in seeking help due to societal stigma, lack of awareness, and limited access to personalized mental health resources. Stress, anxiety, depression, and other mental health conditions can significantly impact daily life, relationships, and productivity, making it crucial to develop accessible and effective support systems.

Existing mental health applications are predominantly static, providing only general information about mental health issues faced by women. These systems often fail to offer personalized recommendations or actionable insights based on an individual's specific circumstances. Addressing these limitations, we propose Women's Wellness Guide, an AI-driven application designed to provide personalized mental health support through machine learning, sentiment analysis, real-time communication, and recommendation systems. Our platform aims to empower women by enabling them to track, analyze, and manage their mental well-being efficiently.

One of the core functionalities of the system is sentiment analysis, which leverages logistic regression to analyze users' journal entries. By extracting insights from their writing, the system can detect emotional patterns, generating weekly mental health reports that help users monitor their mental state over time. These reports provide valuable feedback, allowing users to reflect on their emotional well-being and take proactive steps toward self-care.

To further enhance mental health management, Women's Wellness Guide incorporates a decision tree-based personalized recommendation system. This system considers key factors such as age group (15–19, 20–24, 25–30), mental state, daily routine, and distress severity to offer tailored recommendations. Whether a user is experiencing mild stress or severe emotional distress, the application suggests suitable interventions, including relaxation techniques, mindfulness exercises, lifestyle adjustments, and professional consultation when necessary.

Recognizing the importance of real-time support, our application integrates Socket.IO-powered chat spaces, allowing users to engage in instant communication with mental health professionals and peer support groups. This feature provides a safe and supportive environment where users can seek guidance, share experiences, and receive immediate emotional support. Additionally, we have incorporated consultation services and helpline support, ensuring that users have access to professional assistance whenever required.

Beyond emotional tracking and consultation, Women's Wellness Guide offers a comprehensive set of well-being resources, including therapeutic music, informative articles, and guided exercises. These resources are curated to promote relaxation, stress management, and self-improvement, fostering a holistic approach to mental health care. By integrating multiple support mechanisms, our platform ensures that users receive both proactive and reactive mental health aid, bridging the gap between self-care and professional intervention.

II. Literature Review

Namlı et al. [3] investigated the impact of bipolar disorder (BD) on spouses, focusing on sexual functions, alexithymia, marital satisfaction, and perceived burden. Their study of 81 BD type 1 patients, their spouses, and 78 healthy controls found that BD patients and their spouses had lower marital satisfaction and higher sexual dysfunction. Regression analysis indicated that alexithymia, depression, and sexual dysfunction influenced marital adjustment in BD patients, while burden and alexithymia affected their spouses' adjustment. The study emphasized the necessity of psychosocial interventions to support caregivers and improve relationship dynamics. Similarly, M. Klose and F. Jacobi [5] explored gender differences in mental health, noting that while women experience higher rates of mood and anxiety disorders, men show higher rates of substance abuse and antisocial disorders. Their study concluded that sociodemographic variables alone do not fully explain the higher prevalence of mental disorders in women.

Verónica Martínez-Borba et al. [1] studied the feasibility and user satisfaction of web-based and mobile platforms for perinatal depression screening via the HappyMom program. Assessments were conducted on 348 web users and 175 app users during pregnancy and postpartum. The study found that web users had higher individual response rates, while app users demonstrated better long-term retention. Although both platforms had high satisfaction, dropout issues remained. Similarly, Martínez [2] analyzed mental health apps like Happify, Shine, Sanvello, and Talkspace, concluding that while these apps provide real-time monitoring and therapeutic support, they do not replace traditional therapy but help reduce stigma and enhance mental health awareness. In a related study, Aktar et al. [9] examined how mobile apps, AI-powered assessments, and virtual support groups improve mental well-being, emphasizing the need for further research to optimize healthcare interventions for women.

De and Mishra [6] explored sentiment analysis in mental health, particularly through emotion detection via facial expressions and social media analytics. They highlighted sentiment analysis as a tool for understanding mental health trends, especially post-COVID-19, but acknowledged the accuracy challenges of existing algorithms. Similarly, Sriteja Kataru et al. [13] explored ML for early mental health detection in children, achieving up to 94.5% accuracy in identifying students needing intervention. Their findings underscore ML's potential in integrating technology into mental health services. Furthermore, Sayeda Farzana Aktar et al. [12] conducted a survey on technology's role in addressing women's health challenges, including reproductive health, mental well-being, and preventative care, providing a broad perspective on the field's advancements and gaps.

McGranahan et al. [8] examined factors affecting adolescent girls' sexual and reproductive health rights (SRHR) in Ugandan slums, identifying barriers like stigma and breaches of confidentiality. Their study stressed the need for targeted interventions to improve awareness and access to SRHR. Meanwhile, Pinto-Foltz, Hines-Martin, and Logsdon [4] analyzed adolescent girls' perceptions of peers with depression, finding that while they understood mental health similarly to adults, their emotional responses varied. This study underscored the importance of tailored mental health education to reduce stigma and encourage help-seeking.

Abdulaziz Almaleh et al. [15] applied ML techniques to develop predictive models for workplace mental health, utilizing classification algorithms like Random Forest, Logistic Regression, and Gradient Boosting to enhance accuracy. Syed Azizur Rahman et al. [14] examined the Kalman Filter's applications in mental health, discussing its role in mood tracking and cognitive interventions while addressing challenges like data privacy and behavior modeling. Finally, Sathya A et al. [11] developed a Health and Wellness Recommendation System that personalizes fitness and diet guidance using the TF-IDF algorithm for customized meal and exercise recommendations, offering a holistic wellness approach.

Advantages of Technology on Mental Health:

- Web-based and mobile platforms like the HappyMom program provide convenient and scalable methods for perinatal depression screening, improving accessibility and user satisfaction.
- Apps such as Happify, Shine, Sanvello, and Talkspace offer real-time monitoring and therapeutic support, helping reduce stigma and promoting mental health awareness.
- Findings emphasize the need for psychosocial interventions to support spouses and caregivers, improving marital satisfaction and reducing perceived burden.
- Understanding adolescent perceptions of mental health and providing tailored education can encourage help-seeking behaviors and reduce stigma.
- While women face higher mood and anxiety disorders, and men struggle with substance abuse, sociocultural factors impact both differently, highlighting the need for gender-sensitive approaches.
- We have proposed a system by leveraging machine learning to recommend women things they could inculcate into their lifestyle to help them improve their mental health.

III. Proposed System

The Women's Wellness Guide is an AI-driven wellness platform designed to provide personalized mental health support for women through sentiment analysis, AI-powered recommendations, real-time communication, and curated self-care content. The system consists of three key modules:

A. *Machine Learning – Sentiment Analysis and Personalized Recommendations*

We compare the performance of three machine learning models—Random Forest, Logistic Regression, and Decision Tree—on the given dataset. Each model is trained using TF-IDF vectorized features, and accuracy scores are calculated for evaluation. The results provide insights into the effectiveness of different classification algorithms for the given task.

```python
from sklearn.ensemble import RandomForestClassifier
from sklearn.linear_model import LogisticRegression
from sklearn.tree import DecisionTreeClassifier
from sklearn.metrics import accuracy_score

# Define models
models = {
    "Random Forest": RandomForestClassifier(n_estimators=100, random_state=42),
    "Logistic Regression": LogisticRegression(random_state=50, max_iter=500),
    "Decision Tree": DecisionTreeClassifier(random_state=50)
}

# Train, predict, and calculate accuracy for each model
for name, model in models.items():
    model.fit(X_train_tfidf, y_train)
    predictions = model.predict(X_test_tfidf)
    accuracy = accuracy_score(y_test, predictions)
    print(f"{name} Accuracy: {accuracy:.2f}")
```

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```
Random Forest Accuracy: 0.77
Logistic Regression Accuracy: 0.80
Decision Tree Accuracy: 0.71
```

Fig. 1. Ml Models Comparison

Key Technologies & Components:

- Sentiment Analysis – Logistic Regression & NLP: Uses tokenization, stop word removal, and lemmatization for text processing. Classifies emotions as positive or negative using a Logistic Regression model. Its simplicity and effectiveness in binary classification tasks make it well-suited for sentiment analysis. Logistic regression provides interpretable results, helping to identify key words or phrases contributing to the classification.
- AI-Based Personalized Recommendations – Decision Tree Algorithm: Considers age group (15–19, 20–24, 25–30), sentiment trends, and activity levels to suggest self-care activities. Recommends breathing exercises, meditation, journaling prompts, and relaxation techniques. The decision tree model was chosen for its interpretability, allowing clear and actionable mental health recommendations. It handles both categorical data, making it suitable for analyzing questionnaire responses. While logistic regression is efficient for binary classification, it may miss complex patterns that decision trees can capture. Decision trees are also computationally efficient and transparent compared to SVMs or neural networks. To prevent overfitting, pruning and cross-validation were applied. Future work may explore ensemble methods like Random Forest or Gradient Boosting for improved accuracy while maintaining interpretability.
- Data Security – Fernet Encryption (Cryptography Library): Ensures end-to-end encryption of journal entries before processing. Uses symmetric key encryption, ensuring data remains confidential and tamper-proof. Fernet encryption ensures that journal entries are securely stored by using a combination of strong cryptographic techniques. It is based on AES-128 encryption in CBC (Cipher Block Chaining) mode, which provides a high level of security by encrypting data in fixed-size blocks with a unique initialization vector for each encryption operation. Additionally, Fernet incorporates HMAC (Hash-based Message Authentication Code), which verifies the integrity of the encrypted data and prevents unauthorized modifications or tampering. This ensures that journal entries remain both confidential and intact, safeguarding sensitive information from unauthorized access.

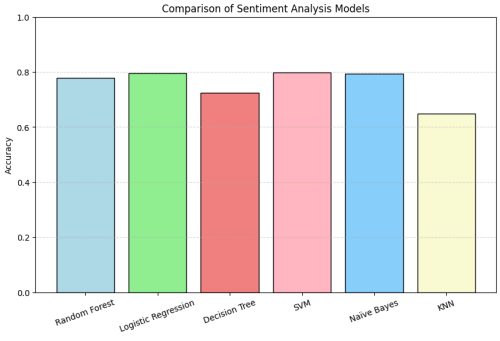

Fig. 2. Comparison between different ml models

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id	username	email	birthdate	password
1	Prerna	mumbaikarprerna@gmail.com	2003-05-24	pbkdf2:sha256:600000$8BCFlrH1XXbQxd4x$605df56daebdaf4e7d43f45
2	Janhavi	janhavi.mugalikar@gmail.com	2003-08-24	pbkdf2:sha256:600000$t8LykSGlmzXXqTUc$e72f67659e8066d175fab57f
3	Tanuja	tanuja@gmail.com	2003-06-11	pbkdf2:sha256:600000$co0LgWPhTuME0fxe$4d0113a99cabb070463fc9a8

Fig. 3. User Database

SQL ▾ 1 / 1 1 - 6 of 6

id	content
1	gAAAAABntGRchR3ZODMkobt2BXoofdcM7SA3kyd5HkVc1GG2wrxbwrQCOhIA7RJEKiyRVl2I9XrGO47tWz2bJq8mQcTPjkTuwQ==
2	gAAAAABnt1hVEMmRIkAmzdmExPWIerTgJ8VGbHk6xiYDqNea6kRdSZ1Fpa8tv5SHhf6CEvJQgNWL75LOw4cy_Ag9n5-XepoSUm77-xR5lx68IjS
3	gAAAAABnt2yrS9x6jCuJWDzcFx42npkQ_eN4mKm95uF-6uK2PeGXxby6d6f9AfN9BcGE75Fjrk_A09h-xKIYqUrbvjGrNY-P9SFRQiy6dtGI47rD
4	gAAAAABnt2zVxRV1TKdFPAU7b1VYV56_ZoquO26DGNFO8vfRhOCFg0cMuDp3gUZJxSXLI7P68dwtP5ihMUp-PGUNHrKNN1ZJ8-aRAQsjPPjKqryd
5	gAAAAABnt2zj7zmDM_y5W-HQ1xaHu0waoOVHB42SkAvXoXIP7hARpmGP7G_37jdtVz81fJ6FQ9Ct-QsCLWVABbBSm0DptjO9EQ==
6	gAAAAABnuLO5ARtDz1vUXQHrpzQ0K7avIHT1cieKEX9uTjZjMkQGBHws9-thxLcL3BF1o6OKfP5LLF2AtlA3EBtG1z7VT9yorTJaL6UBVtXq0Urr

Fig. 4. Encrypted Journal Entries Database

It also includes HMAC (Hash-based Message Authentication Code) to ensure data integrity (prevents tampering).

- Data Visualization – Matplotlib/Plotly: Generates weekly mood reports with visual graphs to track emotional trends.

- Alert System – Rule-Based Triggers: Detects consecutive negative journal entries and suggests interventions or directs users to support services.

B. Web Application – User Interface and Backend

This module focuses on the frontend and backend infrastructure of the web application, ensuring a seamless user experience and secure interaction with ML components.

Key Technologies & Components:

- Frontend – HTML, CSS, JavaScript (React/Angular): Provides an intuitive and responsive interface for user interaction.
- Backend – Python (Flask/Django) or Node.js: Manages communication between ML models and frontend for real-time analysis.
- Database – MySQL: Stores user data, journal entries, sentiment trends, and recommendation history.

C. Real-Time Communication and Support System

To provide instant emotional support, the system integrates Socket.IO-powered chat spaces, enabling users to connect with registered users, including peer groups and mental health professionals.

Core Functionalities:

- User-Based Chat System: Enables registered users to engage in discussions with their names displayed, fostering a sense of community and accountability.
- Journal-Based Sentiment Analysis: Uses journal entries to assess emotional well-being and provide support accordingly.
- Peer Support Groups: Users can join topic-based discussions and share their experiences.
- Professional Consultation: Direct access to mental health professionals for one-on-one guidance.
- Emergency Help & Crisis Support: The system suggests contacting a helpline if a user exhibits prolonged distress.

D. Additional Features

- Curated Self-Care Content: Includes therapeutic music, guided relaxation, informative articles, and breathing exercises.
- User Dashboard: Displays emotional trends, recommendations, and upcoming consultations.

E. System Workflow

The system follows the workflow outlined below:

By combining machine learning, real-time support, and personalized recommendations, the Women's Wellness Guide aims to create a safe, accessible, and stigma-free environment for women to track and enhance their mental well-being.

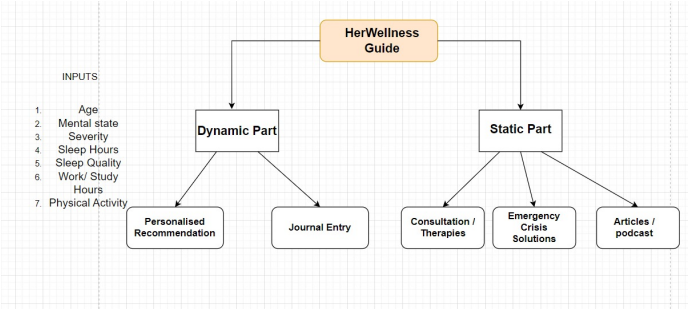

Fig. 5. Flowchart

1) User Writes Journal Entry → Sentiment analysis classifies it as positive or negative.
2) Emotional Trends Analyzed → Generates weekly reports based on mood patterns.
3) Decision Tree Matches User Profile & Sentiment → Suggests personalized self-care activities.
4) Registered Users Engage in Real-Time Chat → Connects users with peer support or professionals for guided discussions.
5) Crisis Detection & Alert System → Prompts self-care tips or emergency support in case of prolonged negative sentiment.

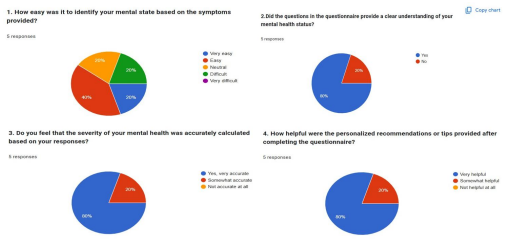

Fig. 6. User Feedback

- User feedback is essential for evaluating the effectiveness and relevance of any website. It provides valuable insights into user experience, allowing for continuous improvement and optimization. The above figure illustrates the relevance of our website based on feedback collected from users. By analyzing this feedback, we can assess how well the platform meets user needs, identify areas for enhancement, and implement necessary modifications to improve overall usability and effectiveness.

IV. Experimental Results

The Proposed Women's Wellness Health Web Application has been implemented using Machine Learning technology.

Upon logging into the website, the user is directed to the login page, which features five sections: Personalized Recommendation, Journal Entry, Music, Exercise, and Research Papers. Selecting the Personalized Recommendation section prompts the user to provide demographic and lifestyle details, including age group, sleep duration, exercise routine, and work hours. Based on this input, the user is presented with a list of

common mental health concerns, each accompanied by a brief description. After selecting a relevant concern, the user completes a questionnaire designed to assess the severity of their condition. Once the severity level is determined, the system generates personalized recommendations to help improve the user's mental well-being by suggesting modifications to their daily routine.

The Journal Entry section allows users to record their daily thoughts and experiences. For current week, the system analyzes their journal entries to assess overall sentiment. A graphical representation of their weekly emotional trends is displayed, along with recommendations based on the sentiment analysis.

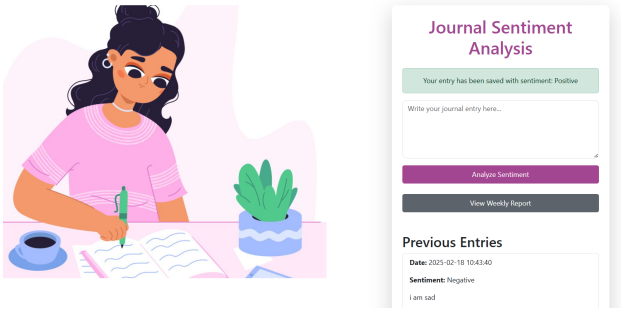

Fig. 7. Journal Entries with Sentiment

- The figure 7 illustrates the interface where users can input their journal entries. This section is designed to provide a structured yet flexible platform for users to document their thoughts, emotions, and daily experiences.

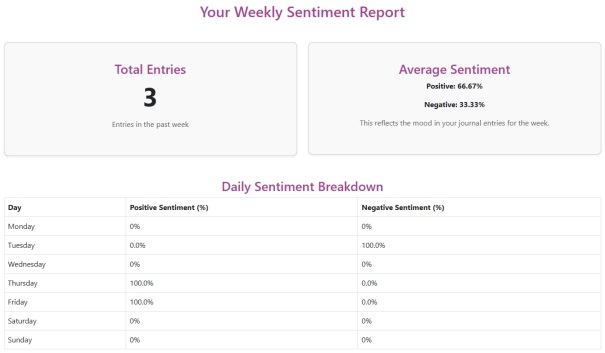

Fig. 8. Weekly Sentiment Analysis

- As figure 8 presents a weekly sentiment analysis report, illustrating how the user's sentiments fluctuated over the course of the week. This report is generated based on journal entries and user interactions, providing a visual representation of emotional trends. By analyzing these fluctuations, users can identify patterns in their mood, potential triggers, and areas for improvement. This feature enables users to gain a deeper understanding of their emotional well-being.

Fig. 9. Suggestions

- Users are provided with predefined suggestions that are generated based on their journal entries. These suggestions are designed to offer actionable insights and coping strategies tailored to the emotions and experiences recorded by the user. By analyzing the journal input, the system presents relevant recommendations that can help improve the user's mental well-being. These static suggestions serve as general guidance, encouraging users to adopt positive habits and make informed decisions to manage their emotional health effectively.

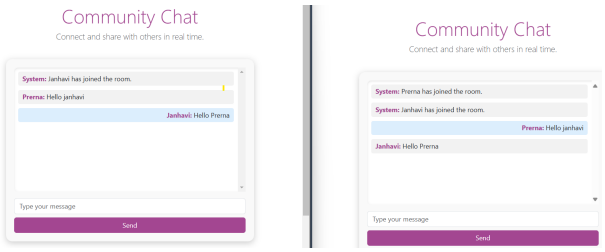

Fig. 10. Community Support

The Figure 10 depicts the community support channel, a platform where users from diverse locations can anonymously connect, chat, and discuss their concerns. This feature fosters a safe and supportive environment for individuals to share their experiences, seek advice, and offer encouragement to others facing similar challenges. By enabling anonymous interactions, the platform ensures privacy and inclusivity, allowing users to engage in open discussions without fear of judgment. This community-driven approach promotes peer support and collective well-being, reinforcing a sense of belonging and mutual understanding among users.

V. Conclusion

Understanding women's mental health across different age groups is crucial, as their challenges and needs evolve over time. By integrating data analysis, personalized recommendations, peer support, and technology, this approach provides comprehensive and effective mental health resources tailored to individual experiences. Sentiment analysis of journal entries helps identify emotional patterns, deepening insights into age-specific mental health issues. The goal is not only to improve individual well-being but also to drive broader societal change in the perception and support of women's mental health.

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