IT4010 – Research Project - 2024

Topic Assessment Form

Project ID:

24-25J-293

1. Topic (12 words max)

Utilizing Machine Learning for the Development of a Mobile Application and Web Extension for Predictive Mental Health Monitoring and Personalized Support

2. Research group the project belongs to

Software Systems & Technologies (SST)

3. Research area the project belongs to

Machine Learning (ML)

4. If a continuation of a previous project:

Project ID	
Year	

5. Brief description of the research problem including references (200 – 500 words max) – references not included in word count.

In the modern era, many kids, adults, and especially students and workers face various kinds of mental health problems. These issues often lead to significant difficulties in their lives, and in some severe cases, they can result in suicide. The widespread use of digital devices and the internet in contemporary society has further exacerbated these mental health challenges. Many users develop addictions to these technologies, which in turn contribute to mental health problems.

Currently, there are several apps available that allow users to check their screentime, track the most visited sites and used apps, and monitor their mental health through self-reported inputs. However, there is still a significant gap in the market for products that can analyze user behaviors and screen times when using web browsers and mobile devices. These tools could provide predictive insights to help users avoid mental health issues and maintain a healthy mental state.

The existing apps focus primarily on user-reported data, which can be subjective and inaccurate. There is a need for a more sophisticated approach that utilizes advanced algorithms and machine learning to objectively analyze user behavior patterns. By examining the time spent on different websites, the frequency of app usage, and other online activities, such tools could identify unhealthy digital habits. This data-driven analysis could then be used to offer personalized recommendations to users, helping them to adjust their online behaviors before they lead to significant mental health problems.

6. Brief description of the nature of the solution including a conceptual diagram (250 words max)

Develop a mobile application and web extension to track user behaviour and patterns, analysing their mental health status using machine learning. By examining data from digital interactions such as emails, messages, social media posts, web searches, physical activities, songs, self-assessments, and screen time, the solution gauges the user's emotional state. If the user's mental health is normal or not at a critical level, the app offers support through music and activities tailored to improve their mood and overall well-being. Personalized playlists, guided meditation, and engaging exercises are provided to help users manage stress and maintain a positive outlook. However, if the user is in a critical state, the app immediately directs them to the appropriate professional for help, such as a therapist or counsellor. This direct intervention ensures that users receive timely and effective support, potentially preventing further mental health deterioration. By combining continuous monitoring with personalized assistance, this solution aims to enhance mental health care and provide a comprehensive support system for users.
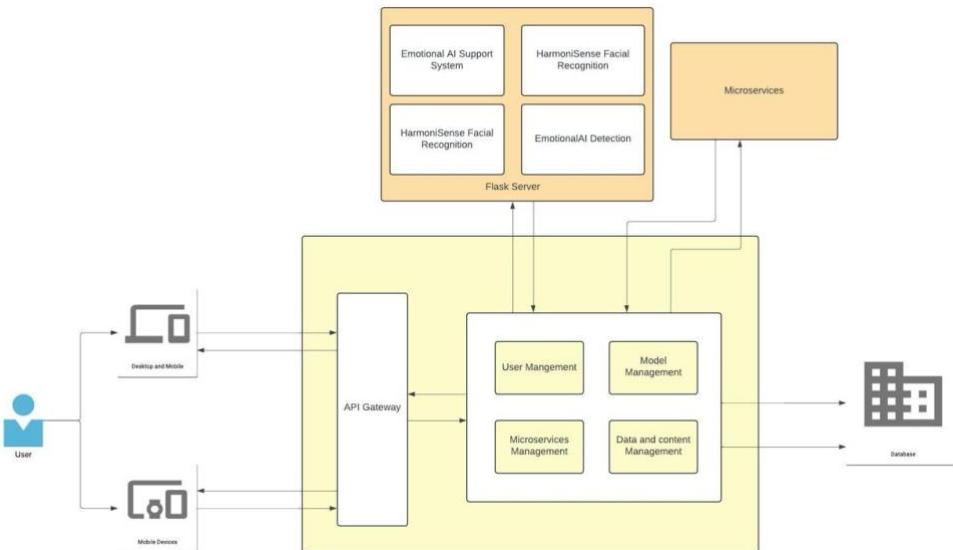
7. Brief description of specialized domain expertise, knowledge, and data requirements (300 words max)

Domain Expertise:

This project requires expertise in both **Machine Learning** and **Psychology**. Machine Learning experts will design algorithms to analyze user behavior data and predict potential mental health issues. Psychologists will interpret these patterns within a mental health context, ensuring insights are accurate and relevant. They will also guide the development of personalized recommendations to improve mental well-being.

Knowledge:
- **Software Development**: Proficiency in building scalable and secure web and mobile applications for data collection and processing.
- **Machine Learning**: Expertise in supervised and unsupervised learning, natural language processing, and neural networks to analyze user behavior data.
- **Data Analysis**: Skills in statistical analysis and data visualization to interpret machine learning results and translate them into actionable insights.

Data Requirements:
- **Access to Digital Interaction Datasets:** Detailed records of user interactions, such as time spent on websites and app usage frequency, are needed to train and validate machine learning models.
- **Ethical and Privacy Considerations**: Adherence to ethical guidelines and privacy regulations is crucial. This includes obtaining informed consent, anonymizing data to protect user identities, and ensuring data security. Compliance with regulations like GDPR or HIPAA is essential to maintain user trust and research integrity.

8. Objectives and Novelty

Main Objective : Develop a mobile app and browser extension to predict users' mental health status, indicate potential mental health issues and provide support. The platform will leverage AI and ML to analyze various data sources, including digital interactions, physical health metrics and self-assessments to offer real-time insights and personalized interventions for users who are older than 18 years.

Member Name	Sub Objective	Tasks	Novelty
Alwis P.K.D.L.W.	To develop a machine learning model that accurately gauges the emotional state of users and to create a generative AI chatbot that provides support to users in critical mental health situations.	• Develop a machine learning model to accurately gauge the emotional state of users. • Train and validate the machine learning model using diverse data sources, including screentime, app usage statistics, and online activities. • Design and implement a generative AI chatbot.	The integration of a machine learning model with a generative AI chatbot to provide a comprehensive mental health support system. This approach predicts the user's emotional state with high accuracy and offers immediate, personalized support in critical situations, filling a significant gap in current mental health technologies.

		• Integrate the generative AI chatbot to provide real-time support for users in critical mental health situations. • Evaluate the effectiveness of the AI chatbot in delivering timely and effective support. • Continuously refine the machine learning model and AI chatbot based on user feedback and new data.	
De Alwis K.C.	To develop AI models to predict the risk of mental health crises or relapses based on historical data and utilize this predictive capability to offer personalized mental health support and interventions guided by user data and behavior analysis.	• Create machine learning algorithms capable of predicting the risk of mental health crises or deteriorations using historical data. • Gather comprehensive datasets of user behavior and mental health outcomes to	The integration of AI models for predicting mental health crises based on historical data, facilitating personalized interventions tailored to individual user behaviors. By combining advanced machine learning techniques with real-time application in mental health monitoring, it aims

		train the AI models effectively.	to offer proactive support and potentially mitigate risks before crises occur, thereby enhancing overall mental well-being.
		• Utilize the collected data to train and optimize the AI models for accurate prediction of mental health risks.	
		• Integrate the trained AI models into the mobile application and web extension to provide real-time prediction of mental health risks based on ongoing user data.	
		• Analyze user data and behavior patterns to tailor personalized mental health interventions and support strategies.	
		• Implement the personalized support strategies within the application, including proactive measures to mitigate identified	

		risks and promote mental well-being.	
Ameen F.A.	To incorporate solfeggio frequencies into music listened by users and employ facial recognition technology to analyze users' facial expressions.	• Develop and integrate specific solfeggio frequencies into music compositions to study their psychological effects. • Utilize facial recognition technology to capture and analyze users' facial expressions while they listen to the music. • Train machine learning algorithms to analyze facial expression data and correlate it with exposure to solfeggio frequencies. • Integrate the developed machine learning models into a mobile application or web extension to predict users'	The integration of solfeggio frequencies into music to explore their psychological impact, coupled with real-time facial expression analysis using AI. This innovative approach aims to predict and enhance users' emotional well-being through personalized music interventions based on facial feedback.

		emotional states based on facial expressions. • Assess the accuracy and effectiveness of the AI prediction model in predicting emotional responses and validating correlations between solfeggio frequencies and psychological well-being indicators.	
Jahani M.J.A.	Employ machine learning to detect significant changes in user behavior, utilizing device-captured physical health data, as indicators of potential mental health concerns.	• Gather device-captured physical health data from users, including metrics such as heart rate, sleep patterns, activity levels, and any other relevant biometric data. • Identify and extract meaningful features from the collected data that are indicative of mental health status or potential deviations in user behavior.	Integrating device-captured physical health data into machine learning models for real-time detection of mental health concerns represents a novel approach to proactive digital mental health monitoring.

		• Develop and train a machine learning model that can analyze the extracted features to detect significant changes or patterns that may signal mental health issues. • Validate the performance of the machine learning model using appropriate metrics and datasets to ensure its accuracy and reliability in detecting mental health concerns. • Implement the model into the mobile application or web extension framework, integrate it with real-time data streams, and conduct thorough testing to assess its effectiveness in practical scenarios.	

9. Supervisor checklist

a) Does the chosen research topic possess a comprehensive scope suitable for a final-year project?

Yes	✓	No	

b) Does the proposed topic exhibit novelty?

Yes	✓	No	

c) Do you believe they have the capability to successfully execute the proposed project?

Yes	✓	No	
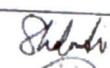
d) Do the proposed sub-objectives reflect the students' areas of specialization?

Yes	✓	No	

e) Supervisor's Evaluation and Recommendation for the Research topic:

> Recomended.

10. Supervisor details

	Title	First Name	Last Name	Signature
Supervisor	Ms	Thilini	Jayalath	*Thilini* 24/06.
Co-Supervisor	Mr.	Deemantha	Sihvardana	*(signed)* 24/05/24
External Supervisor	1. Licensed Clinical Psychologist	Shalindi	Pandithakoralage	*(signed)*

	&Team Lead – Helping Hands.			
External Supervisor	2. Clinical Psychologist at Helping Hands	Senethra Sachini Ohara Pathiraja	Ganee Arachchi Pathiranehalage	*[signature]*

Summary of external supervisor's (if any) experience and expertise

Ms. Shalindi Pandithakoralage: A licensed clinical psychologist with over 10 years' experience working with adolescents and adults in the fields of education, mental health care, and psychosocial support. She has extensive experience working with students and professionals in national and multinational organisations in the international development, education, and IT sectors and at present leads the Helping Hands well-being centre.

SLIIT UNI

T H E   K N O W L E D G E   U N I V E R S I T Y

This part is to be filled by the Topic Screening Panel members.

Acceptable: Mark/Select as necessary

Topic Assessment Accepted	
Topic Assessment Accepted with minor changes (should be followed up by the supervisor)*	
Topic Assessment to be Resubmitted with major changes*	
Topic Assessment Rejected. Topic must be changed	

* Detailed comments given below

Comments

The Review Panel Details

Member's Name	Signature

***Important**:

1. According to the comments given by the panel, make the necessary modifications and get the approval by the **Supervisor** or the **Same Panel**.

2. If the project topic is rejected, identify a new topic, and follow the same procedure until the topic is approved by the assessment panel.