IT4010 – Research Project - 2023

Topic Assessment Form

Project ID : TMP-2023-24-133

1. Topic (12 words max)

AI and VR Enhanced Emotion Recognition And Sentiment Analysis For Relationship Improvement App

2. Research area the project belongs to

Software Systems & Technologies (SST)

3. Team member details

Student Name	Student ID	Specialization
Arachchi A.I.B	IT20647414	IT
H.G.C. Dilini	IT20651442	IT
N.K.A.S. Dilshan	IT20648886	IT
K.P.D. Thimesha	IT20648268	CS

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

In today's fast-paced digital age, romantic relationships often face unique challenges, with communication breakdowns and emotional conflicts being common issues. To address these problems and provide individuals with valuable tools for relationship improvement, this research aims to develop an innovative mobile application that harnesses the power of AI technologies, specifically emotion recognition and sentiment analysis. By integrating these cutting-edge technologies, the app will offer users personalized support and insights to foster healthier and more fulfilling relationships.

The proposed app will employ image processing techniques to analyze users' facial expressions in photos or videos, enabling emotion recognition. Through this analysis, the app will accurately detect emotions such as happiness, sadness, anger, and more, providing users with a deeper understanding of their emotional states and those of their partners. In parallel, sentiment analysis will be applied to assess the tone and context of users' text-based communication, identifying potential issues in conversation patterns that may contribute to relationship challenges.

By leveraging these AI-driven features, the app will provide users with valuable relationship insights and suggestions. For instance, if the app detects elevated levels of negative emotions during a conversation, it might suggest taking a break from the discussion or engaging in a positive activity together to defuse tension. Additionally, the app could recommend communication strategies tailored to individual relationship dynamics, facilitating constructive dialogues and conflict resolution.

The app's user experience will be enhanced through gamification elements. Interactive challenges, quizzes, and relationship-building activities will motivate users to actively participate in the app, making the process of relationship improvement engaging and enjoyable. Furthermore, users will have the option to set personalized relationship goals, and the app will track their progress, providing a sense of accomplishment and encouragement along their journey.

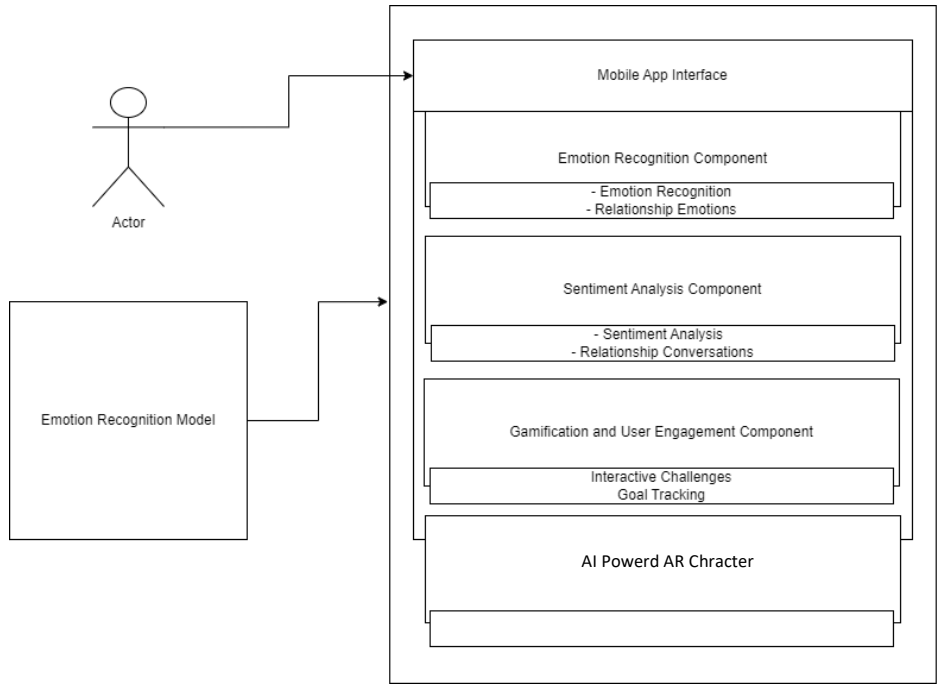
To ensure ethical data usage, the app will prioritize user privacy and consent. Personal data and conversations will be handled securely, and users will have full control over their data sharing preferences. Additionally, this research will conduct user testing to evaluate the app's effectiveness and user experience while adhering to ethical guidelines.

The significance of this research lies in its potential to revolutionize relationship support services by leveraging AI technologies. By offering real-time emotional insights and personalized advice, the AI-enhanced app can empower individuals to make informed decisions and cultivate healthier relationships. Furthermore, this research will contribute to the broader field of AI-driven mental health applications, demonstrating the responsible and beneficial use of AI technologies in promoting emotional well-being.

1. Ekman, P., & Friesen, W. V. (1971). Constants across cultures in the face and emotion. Journal of Personality and Social Psychology, 17(2), 124-129.
2. Pang, B., & Lee, L. (2008). Opinion mining and sentiment analysis. Foundations and Trends® in Information Retrieval, 2(1–2), 1-135.
3. D'Mello, S., & Graesser, A. (2010). Multimodal semi-automated affect detection from conversational cues, gross body language, and facial features. User Modeling and User-Adapted Interaction, 20(2), 147-187.
4. Duh, K., & Pang, C. (2019). Applications of gamification in psychology: A review. Games for Health Journal, 8(3), 165-171.
5. Moller, A. C., Deci, E. L., & Ryan, R. M. (2006). Choice and ego-depletion: The moderating role of autonomy. Personality and Social Psychology Bulletin, 32(8), 1024-1036.

5. Brief description of the nature of the solution including a (250 words max)

The proposed solution is an AI-enhanced mobile application designed to address the problems related to the breakdown of people's relationships by leveraging emotion recognition and sentiment analysis technologies. The app aims to provide users with personalized support, insights, and tools to foster healthier and more fulfilling relationships. By combining cutting-edge AI algorithms with user-friendly interfaces, the solution offers a novel and innovative approach to relationship improvement.



6. Brief description of specialized domain expertise, knowledge, and data requirements (300 words max)

Developing an AI-enhanced relationship support app that leverages emotion recognition and sentiment analysis requires a combination of specialized domain expertise, knowledge, and specific data requirements. To ensure the app's effectiveness and accuracy, interdisciplinary collaboration and access to diverse datasets are essential components of this project.

1. Specialized Domain Expertise:

- **Emotion Recognition**: Domain experts in psychology and affective computing will be invaluable in understanding the intricacies of emotions and facial expressions. Their insights will aid in selecting appropriate emotion recognition models, fine-tuning algorithms, and interpreting the detected emotions accurately.

- **Sentiment Analysis:** Expertise in natural language processing (NLP) and computational linguistics will be necessary to implement robust sentiment analysis.
- **VR Implementation:** VR implementation encompasses knowledge in 3D modeling, spatial interaction design, VR hardware, immersive environments, and optimizing user experience for virtual reality scenarios.

2. Knowledge Requirements:

- **AI and Machine Learning**: In-depth knowledge of AI algorithms, machine learning techniques, and deep learning architectures is crucial for developing emotion recognition and sentiment analysis models. This expertise will facilitate model training, optimization, and integration within the app.
- **Mobile App Development**: Proficiency in mobile app development is required to create an intuitive and user-friendly interface. Knowledge of programming languages such as Java, Swift, or React Native will be essential in building the app for both iOS and Android platforms.
- **VR Design**: Knowledge of emotional psychology, AI modeling, augmented reality, cross-cultural communication, and user-centered design is crucial for advancing AI-powered AR character research.

3. Data Requirements:

- **Emotion Training Datasets:** To build robust emotion recognition models, a diverse and labeled dataset of facial expressions representing various emotions will be required. Such datasets, like CK+, AffectNet, or EmoReact, will aid in training the AI model effectively.
- **Text Corpus for Sentiment Analysis:** Access to a vast and diverse text corpus with labeled sentiment annotations will be essential for training the sentiment analysis module. Datasets like IMDB movie reviews or Amazon product reviews can be useful in this context.
- **User Interaction Data:** Gathering user interaction data within the app will be vital for refining the AI algorithms. User feedback, responses to gamified challenges, and relationship improvement progress will be valuable in enhancing the app's capabilities over time.
- **Ethical Considerations:** Data on privacy and ethical considerations will also be necessary. User consent preferences, data anonymization protocols, and adherence to data protection laws are critical aspects to be incorporated into the app's design and development.

7. Objectives and Novelty

Main Objective: Developing an AI-enhanced relationship support app that leverages emotion recognition and sentiment analysis aims to provide users with personalized support, insights, and tools to foster healthier and more fulfilling relationships.			
Member Name	Sub Objective	Tasks	Novelty
Arachchi A.I.B	Design AI Powerd AR Character	1. Creating an AI to analyze the data entered by the user and exchange ideas according to the user's wishes. 2. A VR character is created according to the data of the AI created above. 3. We train that character to communicate with the user and get much closer to the user and identify feelings	Designing an innovative AI-powered AR character involves exploring aspects like personalized emotional bonds, cultural sensitivity, and AI-generated empathy to enhance emotional interactions and engagement.
H.G.C. Dilini	Develop an Emotion Recognition Model Using Image Processing	1. Conduct a literature review on emotion recognition algorithms and models. 2. Select and preprocess emotion training datasets (e.g., CK+, AffectNet) for model training.	The team aims to develop an emotion recognition model specifically tailored for relationship-related emotions. While emotion recognition models exist, this research will focus on

		3. Implement and fine-tune the chosen emotion recognition model using image processing and deep learning techniques. 4. Evaluate the model's performance and accuracy using validation datasets.	detecting and understanding emotions relevant to romantic relationships, making it a novel application
N.K.A.S. Dilshan	Sentiment Analysis Implementation	5. Gather and preprocess above data for sentiment analysis model training. 6. Develop and optimize the sentiment analysis model using NLP techniques and machine learning algorithms. 7. Evaluate the model's performance and effectiveness in capturing sentiment patterns.	The team will implement sentiment analysis not only on generic text but also on relationship-specific conversations and communication patterns. This adaptation to relationship contexts brings novelty to the sentiment analysis component.
K.P.D. Thimesha	Develop an Emotion Recognition Model Using Audio Recognition	1. Implement an accurate and real-time emotion recognition model to analyze emotions from audio interactions during video Call. 2. Implement and fine-tune the chosen emotion recognition model using Audio recognition. 3. Evaluate the model's performance and accuracy using validation datasets.	Creating an emotion recognition model via audio analysis introduces novelty by decoding emotions solely from voice, expanding emotional AI applications beyond visual cues and enabling diverse user interactions.

8. Supervisor checklist (supervisors should fill sections from 8 to 10)

1. Is this research problem valid?

Yes		No	

2. Is the proposed research group, correct?

Yes		No	

3. Is the proposed research area, correct?

Yes		No	

4. Do the proposed sub-objectives match the students' specialization?

Yes		No	

5. Is the required domain expertise, knowledge, and the data available either through the supervisor or external supervisor?

Yes		No	

6. Is the scope of the solution practical?

Yes		No	

7. Do all sub-objectives have sufficient novelty?

Yes		No	

9. Your final decision:

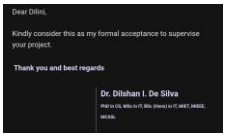
Acceptable: Mark/Select as necessary

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

* Detailed comments given below

Comments

10. Supervisor details

	Title	First Name	Last Name	Signature
Supervisor				
Co-Supervisor	Ms.	Piyumika	Samarasekara	
External Supervisor				
Summary of external supervisor's (if any) experience and expertise				