

Mental and Emotional Health in Lebanon

EECE 490 HAMAL(HumAn Centered MACHine Learning)
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Abstract — Lebanese people are suffering every day, with external and internal factors constantly pressuring them to function through madness. This makes their mental and emotional health prone to trouble, and it is our job to listen to their concerns and engineer new methods to help them; hence help our community altogether[1][2]. After defining 3 different Prototypes to solve the problem under study and getting user feedback on each, we chose our final solution to be an application that allows users to write in their journals (to be sentimentally analyzed later), set personal goals, get personalized recommendations, and track their overall mental health. Afterwards, we developed the Machine Learning aspect of the chosen prototype, where we tried several models for sentiment analysis, compared results, and concluded. We then again asked for real-world user feedback and concluded with mentioning our future plans.

I. EMPATHIZE PHASE WITH HUMAN CENTERED SURVEYS

A. Choice of Real-World Problem

Mental and Emotional Health in Lebanon and the region:

Lebanese people are said to be “resilient”, but this does not change the fact that they can also get hurt and seek help. Mental and emotional health are often neglected in Lebanon and the region, even though they are equally important to physical health. After COVID-19 pandemic invasion, economic crisis and currency devalue, online learning and social isolation, political instability, and the last but not most hurtful Beirut Port’s explosion, shedding light on our mental health is now as crucial as ever.

B. List of Stakeholders:

- Individuals affected by Beirut’s explosion (Mrs. Dalal Younes, Mr. Rawad Olabi, and Mr. Jad)
- Youth looking for a future (Mr. Ahmad Alayan)
- Psychologists / Psychiatrists
- Individuals suffering from mental health issues
- In general, everyone living in Lebanon

C. Interviews conducted:

We conducted 4 interviews with Lebanese citizens from different age groups (19, 31, 34, and 54 years old) so that we could get a rough idea of the problems almost everyone is facing.

Interviewers focused on the individuals’ current mental and emotional health.

| | Interviewee | Interviewer | Duration |
|-------------|--------------|----------------------------|------------------------|
| Interview 1 | Dalal Younes | Dina Younes Shaza Fakih | 10 minutes |
| Interview 2 | Ahmad Alayan | Ali Wehbi | 10 minutes |
| Interview 3 | Rawad Olabi | Reeda Al Saintbai | 8 minutes + short text |
| Interview 4 | Jad | Youssef Jaafar | 14 mins |

D. Summary of Top 3 interviews:

- Interview 1:
We met: Dalal Younes Age: 54
Profession: Professor at the Lebanese University
Interesting facts about the person: She is a journalist, professor, and a project team leader at Information Management Ltd aside from being a passionate Mom.
We were struck by the fact that during the explosion, fear wasn’t her dominant emotion. She rather believed that she was driven by so much anger as she recalled her past experiences with the Lebanese war and didn’t want her children to experience it.
We wonder if this means that Beirut’s explosion unleashed the trauma of Dalal’s previous painful experiences. Add to that, Dalal’s inability to focus, those might be symptoms of an underlying mental health condition.

From here we would like to help Dalal achieve a sense of mental stability to help deviate her focus from worrying about “all what is wrong” to reviving her hopefulness and sense of control on her emotions. We would want to see Dalal being able to complete her project and encourage her children to move forward and let go of the trauma they were subjected to. (Beirut’s Explosion).

- Interview 2:
We met: Ahmad Alayan Age: 19
Profession: University Student
Interesting facts about the person: Obsessed about music starting from listening, writing to singing and everything in between.
We were struck by how Ahmad is trying everything he can to make himself feel better during this period, although he has been through a lot in his life. Ahmad went into a very mentally unstable period that led him into a “very dark place” where he suffered from extreme apathy and anxiety.
We wonder if this means that youth people from Ahmad’s age are also facing the same problems, and they are considering leaving the country.
From here we would like to help Ahmad to overcome the difficulties he is facing by giving him emotional support and help him control his feelings, forget the past issues, and prevent any difficult circumstances from stopping him from the person he wants to be in the future.

- Interview 3:
We met: Rawad Olabi Age: 31
Profession: Electrical Engineer at EDL
Interesting facts about the person: Rawad is also an AUB Student (Graduate Program)!
We were struck by the positive and optimistic state he is currently in, but if he ever feels anxious then he talks to someone about it, watches entertainment shows, or reads. Also, after we had asked him to write a short text describing his experience during Beirut’s Port explosion, he wrote a 1310 words essay!!! Rawad told us, “sorry if it were too long - I had to write it in detail, this is an opportunity to write.”
We wonder if this means having someone to talk to makes a problem less hurtful. Also, resorting to entertainment and reading is one of the methods people use to feel better.
From here we would like to help Rawad continue his healing process by providing him with whatever makes him feel more positive and tranquil: a space to write, someone to talk to, or even recommendations on readings and videos that might get him engaged.

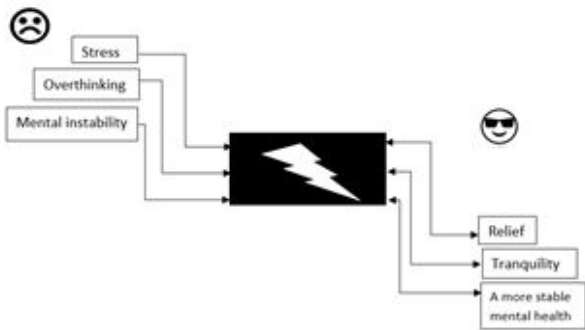
II. DEFINE PHASE

After our four interviews, we noticed the variety of mental and emotional concerns that these individuals have, regardless of their age, profession, or background.

Almost everyone living in Lebanon is getting their energy drained, after listening to the 8pm news, talking to their beloved abroad people through a screen, or simply trying to cope with daily activities which are partially engaging due to COVID-19.

Therefore, we would like to explore ways to assist Dalal, Ahmad, Rawad, Jad, and every other Lebanese individual to carry on with education, work, and other daily activities when faced with mental and emotional struggles due to the ongoing financial and political crises, COVID-19 pandemic, and the distressing port explosion. Anxiety, depression, loneliness, overthinking, and any relatable topic will be our main problem to be solved, for us all to achieve and maintain a celebrated well being. (fig.1)

Fig. 1: Representation of the problem’s input and output.



III. IDEATE & PROTOTYPE

To better understand how we can help Lebanese individuals to carry on with their daily activities and better cope with stress and anxiety, we first explored previously implemented solutions, and after that we suggested 3 prototypes.

The previously implemented solutions are the following:

Calm App: offers a variety of meditation programs and sleep stories to achieve lower stress levels and help with sleeping problems. There is no clear description on whether the app uses a certain type of machine learning models. [3]

BetterHelp is an online website that is accessible for any person who feels that he/she is suffering from mental health problems. The user will be matched with any counselor to chat with.[4]

Woebot app is an artificial intelligent chatbot app that uses principles of cognitive-behavioral therapy (CBT) to help people cope with their feelings of hopelessness, anxiety, stress, and depression, through interactive chat engagement. We did not find the exact models used in Woebot, but after some research we learned that an intelligent chatbot like Woebot would use a mix of dialogue planning models, form-filling models and FAQ models.[5]

Happify: A Machine Learning based (deep neural network) application and website that provides users with engaging and entertaining programs for an overall better well-being. It is scientifically designed, and it follows the concepts/methods used in cognitive behavioral therapy, positive psychology, and mindfulness for stress reduction.[6] [7]

Please check the appendix C.2 for further details on each of the previously implemented solutions.

The following table provides a summary of the existing solutions for mental health problems.

| | 1 | 2 | 3 | 4 | 5 | 6 |
|------------|---|---|---|---|---|---|
| Calm | ✓ | ✓ | ✗ | ✗ | ✗ | ✓ |
| Woebot | ✓ | ✓ | ✗ | ✓ | ✓ | ✓ |
| BetterHelp | ✓ | ✗ | ✓ | ✗ | ✓ | ✓ |
| Happify | ✓ | ✓ | ✗ | ✗ | ✓ | ✓ |
| Our Method | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

Please check the appendix C.3 for a more detailed table of challenges.

Description of challenges:

Challenge 1: Physical attendance needed (e.g. to meet up with a psychologist)

Challenge 2: Fear of judgement or lack of confidentiality

Challenge 3: Lack of ability or space to express what one is thinking or feeling.

Challenge 4: Costly subscription or payment

Challenge 5: Trying to tackle the problem without looking deep into its root cause (the psychological, scientific reason)

Challenge 6: Not monitoring user’s progress (whether he/she has improved and if so, by how much)

✗ = challenge not solved

✓ = challenge solved

After brainstorming, doing a literature review, and contacting our stakeholders to know more about mental health problems in Lebanon, we arrived into the following 3 prototypes: (Please check Appendix C.4 for a variety of screenshots).

Prototype 1:

- Texting between the app user and chatbot. The chatbot can recommend tasks/actions the user can do.
- ML aspect: In general, this prototype uses natural language processing to implement the solution. Moreover, its model is a sequential neural network or multi-layer perceptron .The inputs are words(that a user sends), and its output is another set of words(that the bot replies with).To help train the model, we will create a set of conversation scenarios(between psychologists and their patients for example) ,or we can use a set of previous conversations.

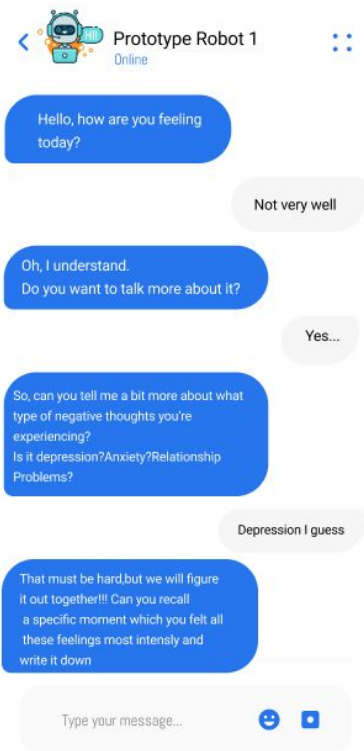
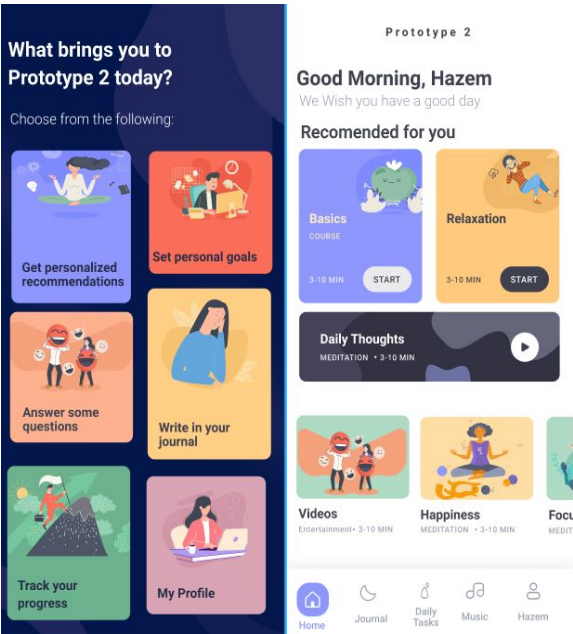


fig. 2: Prototype 1

Prototype 2:

- Daily MCQ questions to track user progress. Based on the user’s response, the app tracks the users mood, recommends tasks or exercises to help them feel better. In severe cases, it provides external resources that may help.
- In addition, it can detect patterns in the emotional state of the user & regularly surveys the user.
- The users need space to express their thoughts, and journal every day.
- ML aspect: This prototype will implement a recommender system, specifically a content-based system. The inputs to this system are answers from surveys, some chosen words from the journal (a user writes), results of the mood tracker, and some historical data based on the user’s interactions to previous recommendations. The output of the system is a personalized recommendation (types of exercises, some pieces of advice, tips to lift the mood..)

Fig.3: Prototype 2



Prototype 3:

- The user is prompted to answer MCQ questions and then linked to different groups: groups with anonymous users who share similar responses. Users can chat and discuss matching interests. groups with other anonymous users who lived similar experiences, and a psychologist that will try to help the whole group.
- The user can later retake the same questions in case they feel better or if they think they did not accurately answer the questions.
- ML aspect: The prototype is based on a classification model that will map a person to a group chat; it joins other users with the same interests/issues ,and a specialized psychologist. The input to this model is basically the answers to the diagnosis MCQ questions(May include type of interests, type of mental illnesses, gender, age, etc....).The output of the system is the group that the user will be mapped to. Practically, this model is a simple example of multi-class classification.

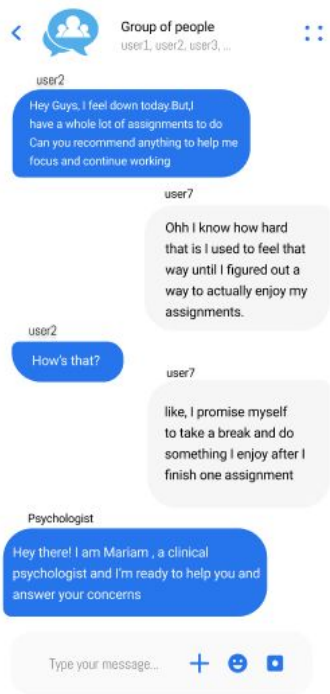


Fig. 4: Prototype 3

Common between all prototypes:.

- Users data is private. Storing and processing users responses is necessary for the app to provide meaningful recommendations and to share insights and patterns with the user.

IV. TEST PHASE OF LOW-RES PROTOTYPES

To better understand the needs of our users, we conducted **19 interviews** with various individuals. We asked them for their opinion on the three prototypes, and they helped us compare the benefits of each to reach a sound conclusion of which prototype is best to choose

as our final solution. The following table shows 5 key interviews, under which we have a summary for each prototype’s interviews.

| (19 in total) | Interviewee | Interviewer | Duration | Prototype |
|---------------|--------------|-------------------|----------|-----------|
| Interview 1 | Hiba Houhou | Dina Younes | 10 min | 2 |
| Interview 2 | Majd Harake | Shaza El Fakih | 10 min | 2 |
| Interview 3 | Zeina Kojok | Ali Wehbi | 10 min | 3 |
| Interview 4 | Nataly Dalal | Reeda Al Saintbai | 10 min | 2 |
| Interview 5 | Jad | Youssef Jaafar | 10 min | 1 |

Since we conducted 19 user feedback interviews, we thought it’s best to provide a summary feedback of all users on each prototype which is less biased than providing a summary of top 3 interviews. The following are summaries of feedbacks on all 3 prototypes:

Summary of feedback on Prototype 1:

The prototype 1 had an overall good review, the users think the chatbot is friendly, and it’s available 24/7. However, they are concerned about its limitations. They do not think it can replace human therapists, since a chatbot cannot empathize and interact like humans. They believe a chatbot has a limited capacity in fully understanding everything the user is typing.

Summary of feedback on Prototype 2:

Most stakeholders liked the idea of having a variety of options to begin with. The journal, progress tracking, and setting personal goals sections got good reviews from the fact that: it’s an effective platform to express feelings and get recommendations based on what’s written, it will help you monitor your feelings and realize if you’re actually on the right track, it is seen as a motivational way to remind you of your tasks. “Well-organized”,” relaxing interface”, and “user-friendly” were common positive descriptions among many of the interviews. Moreover, the fact that the recommendations are personalized and based on each user’s preferences was seen as interesting and intriguing. Some ideas to better improve the prototype were: adding a feedback section for the prototype evaluation, adding a section that suggests psychologists if needed, and allowing the user to choose his/her own time for recommendations.

Summary of feedback on Prototype 3:

The interviewees liked the idea and considered the app as a “personal comfort zone”. They liked the fact that they can interact with other strangers that share similar interests and support each other under the supervision of a psychologist that can monitor their behaviors and help them when needed. Also, they’ve considered it profitable, as Zeina said: “The fact that I have my support team in my hands thus I’ll be saving time and money compared to going up to see a therapist”

However, some of them were reluctant about the fact that some “creeps” might mess around with others, so a report/kick option should be introduced; and strict regulations should be followed. Finally, we received some recommendations on how we might improve the prototype, some suggested having an archive for each user of previous chats that only experts can access, in order to track users’ progress over time and help them in the most convenient way.

Summary of key feedback from stakeholders:

After conducting interviews and filtering out the various feedback we got, it turned out that many user needs were common regardless of the prototype. For example, users want the application to be user-friendly and welcoming (for them to navigate or express freely), and accessible anywhere and anytime without the need of physically visiting a

psychologist. Despite the latter, they also prefer to have a section where one can contact a real psychologist (currently present in Prot 3 and could be added to others). Finally, users would like to get personalized recommendations, get their progress tracked (with security measures), and would like to be notified about it so that they can catch up and get full benefit.

Conclusion on the chosen Prototype and future goals:

The attained key feedback and previous research led us to choose Prototype 2 as our final chosen prototype, a step towards the final solution. This prototype has the most features mentioned in the key feedback, specifically: user-friendliness, accessibility, progress tracking, personalized recommendation, notifications, and a space to express. It is also a flexible space for us to use Machine Learning, where ML would be used for recommending, catching and analyzing phrases from input, and other ways to be specified in the coming milestones. We could also add a feature for getting in touch with an actual psychologist, and by that we would satisfy the greatest number of users and get closer to our main final goal: a support system towards a better mental health.

V. IDEATE PHASE AND IMPLEMENTATION OF FINAL SOLUTION USING MACHINE LEARNING

After choosing prototype 2 as our final prototype, we intended to work on the machine learning aspect of the application. We brainstormed on different types of supervised learning techniques we can use. The prototype included 3 aspects which are: recommending activities or videos based on daily MCQ questions, analyzing sentiments from user’s journal, and tracking mental health performance of users. Throughout the first aspect, users are asked various MCQ questions. Based on their responses, our model would recommend activities or videos or anything that would make the user feel better (Aspect 1), in addition to adding the conclusion on user’s wellbeing to our ML tracker (Aspect 3). However, previous users’ feedback has shown that when only answering questions, some might get annoyed or bored because the regular MCQ can get irrelevant in the sense that they are not targeting specific user needs. Also, users might feel unable to express themselves and flush out the negativity. Thus, throughout the second aspect, users will be directed to a journal part in which they can write whatever they feel. One approach to use ML is to classify the input text into diverse emotional classes (Aspect 2). Once the text is classified, our app can then suggest recommendations for activities & tasks for the user and add information to the tracker. By referring to previous users feedback, we noticed that users liked this part of prototype 2 and described it as a well-organized and a friendly space to freely express their thoughts. In other words, aspect 2 can complete aspect 1. Thus, we decided to develop aspect 2 for now through taking users’ texts (as inputs), analyzing their key words through the ML model, and classifying users’ status (as outputs) into diverse emotional classes: joy, sadness, fear, shame, anger, guilt, and disgust.

Concept Product

To illustrate our final concept product that the user would experience, and after updating prototype 2 given user feedback, we have created a short video showing some aspects of our application. You can watch it here: <https://www.youtube.com/watch?v=qs4FsGv4ryo&feature=youtu.be>

LITERATURE REVIEW

In a paper done by Hajj et. al in 2014, the team performed semantic and syntactic analysis of sentences. This was done using ontologies such as ConceptNet and Wordnet when classifying emotions. What is interesting is that evaluating the relationship between the words of the sentence contributed to a better accuracy than allocating a specific emotion for each word. They used k-nearest neighbors (KNN) classifiers to compare the detected emotion with a set of reference emotions obtained from a training set[11].

In a different paper “Emotion Detection and Recognition from Text using Machine Learning”, given the wide use of twitter platforms to

express emotions and opinions, a research study by Abdul Salam and Gupta aimed at using some recent and past tweets to train a model to classify one of the eight emotions behind these texts .To achieve this, the researchers used different approaches such as SVM, K-means, and Naive Bayes.At the end, the results of the test proved that SVM and NB with 5-F were the most accurate;with 66% accuracy for SVC (5-F)and 64% for NBC(5-F) compared to 40.1% and 40% for the different values of k in the K-means approach. [16]More details in appendix

Last but not least, Abdul Salam and Gupta studied emotion analysis using different approaches of machine learning, particularly neural networks approach, applied on ISEAR dataset. At first, the data was pre-processed: parsing, tokenization and stemming followed by word embedding. Out of Dumb Baseline Random Forest, Naïve bayes and multiclass SVM models, the highest accuracy, 0.567021, was that of Random Forest along with word2vec preprocessing technique, and Naïve Bayes with TF-IDF preprocessing technique (0.567021 also). The SVM model was the third best model with an accuracy of 0.5648. One of the Deep learning models used was Convolutional neural networks (CNN).[17] For more details please check appendix C.6.

We have noticed that supervised algorithms are extensively used to solve the emotion detection from text problem [9]. Thus, we can implement a multiclass classification algorithm such as SVM, k-nearest neighbors, decision trees, or naive Bayes [10].

PROPOSED FINAL ML SOLUTION:

After reading multiple papers that tackled the problem of text-based emotion detection, we decided to implement a Support Vector Machine model, since it outperformed k-means and naive Bayes in emotion recognition from text. Also, SVM is more likely to bring off better results since it can deal with non-linearity in the data.

Dataset description: The dataset we used is ISEAR (International Survey on Emotion Antecedents and Reactions) which contains 7516 sentence samples along with the labelled emotion associated with each sample. The data was collected from a questionnaire done by Wallbott and Schere on 3000 participants across 37 countries[12][13]. This dataset is one of the most famous datasets used for emotion detection from text samples[14]. There are 7 labelled emotions in this dataset which are fear, joy, anger, disgust, sadness, shame, and guilt. The first few rows of the dataset are displayed below

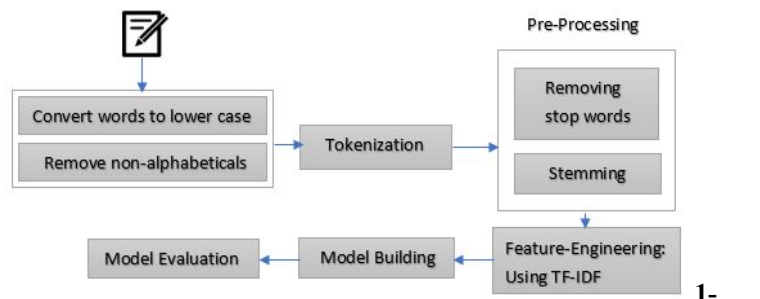
| | label | text |
|---|---------|---|
| 0 | joy | On days when I feel close to my partner and ot... |
| 1 | fear | Every time I imagine that someone I love or I ... |
| 2 | anger | When I had been obviously unjustly treated and... |
| 3 | sadness | When I think about the short time that we live... |
| 4 | disgust | At a gathering I found myself involuntarily si... |

Please find below the link of the dataset on Google Drive: [15] This dataset was previously used in CNN and LSTM deep learning models to detect emotions from text [8].

DESIGN AND IMPLEMENTATION:

The following are the detailed steps of identifying emotions from text.

fig. 5: Steps Summary



1- Cleaning, Tokenizing and Preprocessing:

First, we created a function “DataPreProcessing” that takes in an input text, cleans it, and returns a preprocessed version of it. Afterwards, we used this function on all the samples. The steps are:

- *Converting words into lower-case*: to avoid case-sensitivity (e.g. “happy” “Happy”)
- *Removing non-alphabetical words*: they do not contribute for the meaning (e.g. “22nov”)
- *Tokenizing the text*: create “tokens”, so that words will have identified meaning
- *Stemming*: create a stemmer “PorterStemmer” then perform stemming on the tokens obtained, to return words into their root origin. (e.g. “cooler” and “cooling” into “cool”)
- Returning the cleaned words into text, by attaching them to one another via space character

2- Feature Engineering:

Next, we used the TF-IDF statistical measure to focus on the frequency and rarity of words. The steps are:

- Split the data into training (80%) and testing (20%). This would let us train on 6013 samples and test on the rest 1503 ones.
- Instantiate a TfidfVectorizer, where we chose ‘min_df=2’ to ignore insignificant words that appear in at most 2 samples, and ‘max_idf=0.9’ to ignore words appearing in more than 90% of the samples, because these bias our learning (we cannot put it too low though like 70% because most individuals would use “common” words to describe their feeling, e.g. “sad”/”depressed”/”lonely” to indicate a low mood)

3- Building the model and Predicting

We have chosen to use a Support Vector Machine (SVM) model to tackle our supervised classification problem. The steps are:

- Initialize the SVM model and fit it on the training data.
- Use it to predict on the test data, and then print a classification report for the results:

| | precision | recall | f1-score | support |
|--------------|-----------|--------|----------|---------|
| anger | 0.39 | 0.54 | 0.45 | 193 |
| disgust | 0.59 | 0.52 | 0.55 | 215 |
| fear | 0.66 | 0.72 | 0.69 | 208 |
| guilt | 0.47 | 0.44 | 0.46 | 214 |
| joy | 0.70 | 0.69 | 0.69 | 205 |
| sadness | 0.68 | 0.62 | 0.65 | 228 |
| shame | 0.53 | 0.46 | 0.49 | 241 |
| accuracy | | | 0.57 | 1504 |
| macro avg | 0.57 | 0.57 | 0.57 | 1504 |
| weighted avg | 0.58 | 0.57 | 0.57 | 1504 |

The results we got were fair. For an emotion analysis problem using written text, it is hard to precisely predict the emotion of a person, especially in our case where the data we used is biased towards negative emotions (which is fine knowing that we are targeting low mental health states in order to make them better). Also, some of the main challenges we faced is the inability to detect different meanings of what is written vs what is meant (Sarcastic comments like “I feel awesome today!”) and the negations of words (ex: ”Not good”).

- Get a confusion matrix to track the occurrence of false positives, false negatives, true positives, and true negatives.

```
[[105 38 15 45 7 18 43]
 [ 18 111 7 10 9 10 23]
 [ 9 12 150 17 11 17 13]
 [ 24 16 11 94 12 15 27]
 [ 7 7 8 5 141 19 15]
 [ 12 9 7 15 14 141 9]
 [ 18 22 10 28 11 8 111]]
Accuracy: 0.567154255319149
```

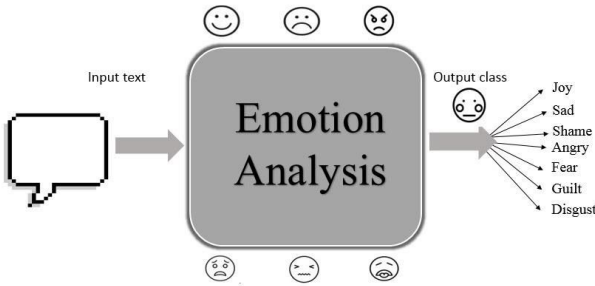
4- Testing on real-user input:

We created a “predict” function to test our model on possible users’ inputs, where we tried several statements that users might input in their journal. An example:

```
text3 = "I have a presentation tomorrow, im feeling nervous. I want it to go well, but i might fail."
print("Emotion predicted: ",predict(model,T_vectorizer,text3))

Emotion predicted: fear
```

fig. 6: Model Summary showing the input & output



VI. TEST PHASE OF FINAL ML SOLUTION WITH REAL WORLD EVALUATION

After completing Milestone 3, we worked on improving our machine learning aspect of the application. We attempted different approaches. We tried using SVM along with Bag of words, SVM with TFIDF vectorizer, Neural Network with TF-IDF vectorizer, and finally Long Short Term Memory (LSTM) and Global Vectors for Word Representation (GloVe).

COMPARISON OF RESULTS

Table: Accuracies and Processing Approaches for our Models

| Model | Processing Approach | Accuracy |
|-------|---------------------|----------|
| SVM | Bag of words | 53% |
| SVM | TF-IDF | 58% |
| NN | TF-IDF | 56% |
| LSTM | GloVe | 63% |

In M3, we have implemented an SVM model with TF-IDF, and we got an accuracy of 56.7%. For M4, we reconfigured our SVM model and improved the accuracy to 58%. Then, we tried different models and approaches to improve the results; we trained a new SVM model but now using the Bag of Words approach (CountVectorizer) instead of TF-IDF, we got an accuracy of 53%

| | | | | |
|--------------|------|------|------|------|
| accuracy | | | 0.53 | 1504 |
| macro avg | 0.54 | 0.53 | 0.53 | 1504 |
| weighted avg | 0.54 | 0.53 | 0.53 | 1504 |

Clearly, the first model performed better, and TF-IDF is more convenient to use because it focuses not only on term frequency, but also inverse document frequency (how rare a word appears).

Then, we tried to use a deep neural network model with the same processing approach TF-IDF. We encoded the output classes to numbers to be able to use them as output in the neural networks.

```
#the encoding will be: 0:anger, 1:disgust, 2:fear, 3: guilt,
# 4: joy, 5: sadness, 6:shame
```

We implemented 3 hidden layers (1000, 500, 50 neurons respectively) with a dropout of 0.5 for each to avoid overfitting. After training and testing the model, we got an accuracy value of 56%.

| nDeep Neural Network - Test Classification Report | | | | |
|---|-----------|--------|----------|---------|
| | precision | recall | f1-score | support |
| 0 | 0.47 | 0.45 | 0.46 | 346 |
| 1 | 0.55 | 0.53 | 0.54 | 304 |
| 2 | 0.68 | 0.70 | 0.69 | 326 |
| 3 | 0.47 | 0.40 | 0.43 | 308 |
| 4 | 0.61 | 0.73 | 0.67 | 328 |
| 5 | 0.69 | 0.55 | 0.62 | 330 |
| 6 | 0.42 | 0.51 | 0.46 | 313 |
| accuracy | | | 0.56 | 2255 |
| macro avg | 0.56 | 0.55 | 0.55 | 2255 |
| weighted avg | 0.56 | 0.56 | 0.55 | 2255 |

However, we were not satisfied with the current accuracy and we still wanted to improve it. Thus, we implemented a different approach:

LSTM & GloVe:

GloVe word embedding known as “Global Vectors for Word Representation”[19], where every sentence is mapped to a real-valued vector in a vector space. Every word is mapped to 1 vector, and the vectors are able to represent the relationship between the words [20].

The first step was preprocessing: we used a function clean_words to clean the sentences, such as removing excessive spacing, splitting words from punctuations, and converting letters to lowercase. Below is an example:

```
example sentence1:
I've broken my leg, while skiing the previous winter-
cleaned sentence1:
i 've broken my leg , while skiing the previous winter
example sentence2:
I suffered a lot!! Don't you want to help? (Please)
cleaned sentence2:
'i suffered a lot ! ! do n't you want to help \\\? \\\( please \\\)'
```

In our case, we used a vector of length 300 for each word. Thus, we end up with a matrix of vectors representing unique words. We then plug this matrix to an Embedding layer to transform the matrix to word embedding. Layer 1 is the embedding layer that uses vectors of length 300, and the next layer is the LSTM model:

| Model: "sequential_2" | | |
|---------------------------------|------------------|---------|
| Layer (type) | Output Shape | Param # |
| embedding_2 (Embedding) | (None, 100, 300) | 2700000 |
| lstm_2 (LSTM) | (None, 128) | 219648 |
| dense_2 (Dense) | (None, 7) | 903 |
| activation_2 (Activation) | (None, 7) | 0 |
| Total params: 2,920,551 | | |
| Trainable params: 220,551 | | |
| Non-trainable params: 2,700,000 | | |

Overall, LSTM achieves better performance than SVM typically, since it is able to remember or forget data more efficiently than SVM [21].

We tried training the model using 70:30, 80:20, and finally 90:10 train & test split. Next, we used a 90:10 split for training and validation dataset. We used the validation set to optimize the hyperparameters, in addition to the Adam optimizer for the Gradient descent algorithm.

We continued with a 90:10 train & test split, and 128 memory units since they resulted in the best performance of the LSTM model. We also used a 0.6 dropout probability which increased the accuracy of our model. We have 7 different outputs that represent the 7 different classes in the ISEAR dataset. Hence, we used a Dense output layer which is used for classification, and a softmax activation function to represent the output as a 7-dimensional vector.

All in all, the LSTM model has 3 hidden layers: embedding, lstm, and dense output layers.

Find below different iterations of tuning the parameters on the ISEAR dataset, using the LSTM model and GloVe embeddings.

e = number of epochs
Dropout prob. = dp
recurrent dropout = rp
activation function = af

| parameters | accuracy on test set | accuracy on training set |
|--------------------------------------|----------------------|--------------------------|
| e: 30 & 128 mem. units & af: sigmoid | 0.578 | 0.85 |
| e: 50 & 128 mem. units & af: sigmoid | 0.574 | 0.939 |
| e: 30 & 256 mem. units & af: softmax | 0.599 | 0.9 |
| e: 30 & dp: 0.5 & rp: 0.5 | 0.62 | 0.784 |
| e: 40 & dp: 0.6 & rp: 0.6 | 0.63 | 0.778 |

FINAL ML SOLUTION

To conclude, using GloVe word embeddings along with LSTM resulted in a better overall performance than the previous models we used, since it resulted in 65% accuracy on the test set and a 78% on the training set in the last epochs, and a 63% as an average accuracy of all the epochs. LSTM is not overfitting the dataset, which means it is the best model we used.

Please find below the accuracy in the last 10 epochs. accuracy is the training accuracy and val_accuracy is the test accuracy, the last “accuracy” is the average test accuracy of all epochs, which is equal to 63%

fig: Accuracy of the LSTM model in the last few epochs.

| | | | | | | | |
|------------------|---------|-------|------------|----------------|--------------------|--------------------|------------------------|
| 48/48 | [=====] | - 16s | 326ms/step | - loss: 0.7665 | - accuracy: 0.7224 | - val_loss: 1.0444 | - val_accuracy: 0.6514 |
| Epoch 29/40 | | | | | | | |
| 48/48 | [=====] | - 15s | 321ms/step | - loss: 0.7638 | - accuracy: 0.7293 | - val_loss: 1.0458 | - val_accuracy: 0.6292 |
| Epoch 30/40 | | | | | | | |
| 48/48 | [=====] | - 16s | 330ms/step | - loss: 0.7495 | - accuracy: 0.7335 | - val_loss: 1.0380 | - val_accuracy: 0.6381 |
| Epoch 31/40 | | | | | | | |
| 48/48 | [=====] | - 16s | 326ms/step | - loss: 0.7477 | - accuracy: 0.7337 | - val_loss: 1.0653 | - val_accuracy: 0.6411 |
| Epoch 32/40 | | | | | | | |
| 48/48 | [=====] | - 16s | 327ms/step | - loss: 0.7284 | - accuracy: 0.7421 | - val_loss: 1.0681 | - val_accuracy: 0.6411 |
| Epoch 33/40 | | | | | | | |
| 48/48 | [=====] | - 16s | 324ms/step | - loss: 0.7217 | - accuracy: 0.7500 | - val_loss: 1.0822 | - val_accuracy: 0.6396 |
| Epoch 34/40 | | | | | | | |
| 48/48 | [=====] | - 16s | 323ms/step | - loss: 0.7019 | - accuracy: 0.7490 | - val_loss: 1.0516 | - val_accuracy: 0.6396 |
| Epoch 35/40 | | | | | | | |
| 48/48 | [=====] | - 15s | 322ms/step | - loss: 0.6746 | - accuracy: 0.7670 | - val_loss: 1.0610 | - val_accuracy: 0.6455 |
| Epoch 36/40 | | | | | | | |
| 48/48 | [=====] | - 16s | 323ms/step | - loss: 0.6848 | - accuracy: 0.7562 | - val_loss: 1.0950 | - val_accuracy: 0.6381 |
| Epoch 37/40 | | | | | | | |
| 48/48 | [=====] | - 16s | 333ms/step | - loss: 0.6666 | - accuracy: 0.7603 | - val_loss: 1.0816 | - val_accuracy: 0.6337 |
| Epoch 38/40 | | | | | | | |
| 48/48 | [=====] | - 15s | 321ms/step | - loss: 0.6552 | - accuracy: 0.7695 | - val_loss: 1.1106 | - val_accuracy: 0.6322 |
| Epoch 39/40 | | | | | | | |
| 48/48 | [=====] | - 16s | 325ms/step | - loss: 0.6459 | - accuracy: 0.7751 | - val_loss: 1.1228 | - val_accuracy: 0.6189 |
| Epoch 40/40 | | | | | | | |
| 48/48 | [=====] | - 15s | 321ms/step | - loss: 0.6212 | - accuracy: 0.7782 | - val_loss: 1.0990 | - val_accuracy: 0.6337 |
| accuracy: 63.56% | | | | | | | |

REAL-WORLD TESTING AND FEEDBACK:

In order to test our final solution in the real world, we asked for users’ feedback. So, we conducted a total of 13 interviews (see appendix D for details), for us to measure how sufficient the performance is to user needs. Moreover, we would like to mention that our solution works for real-world input, where we have already tested it as shown in section ‘V.Design and Implementation’ under ‘Testing on real user input’.

The following are 5 of our top interviews:

| | Interviewee | Interviewer | Duration |
|-------------|-------------------|-------------------|----------|
| Interview 1 | Maarouf Yassine | Dina Younes | 10 min |
| Interview 2 | Ali Mazloun | Shaza El Fakih | 10 min |
| Interview 3 | Celena Mehirsi | Ali Wehbi | 10 min |
| Interview 4 | Paul Karim Khaled | Reeda Al Saintbai | 10 min |
| Interview 5 | Nader | Youssef Jaafar | 10 min |

Summary of feedback:

All the users we have interviewed had several positive comments as well as suggestions. They considered the journal as a free space to write, especially that “people can’t always express to others”. They also liked the variety of options the app presents, and they explained that having an app that recommends makes them feel other people were also in their shoes at some time. What came to our notice is an interesting idea suggested by different users in two opposing ways: one user suggested that the journal disappears after writing (so the user would write and then forever forget about it), while others suggested that the app keeps the journals, and even summarizes the text, so that the user him/herself can look back at old memories and personally examine their progress. To fit all user needs, we will have both

options! After the journal undergoes sentiment analysis, users get to choose whether to keep, lock, or delete the journaling forever.

FUTURE PLANS AND CONCLUSION

The main aspects of our application are: the journal, mood tracking and personalized recommendations. For this milestone, we managed to implement one of the machine learning aspects of the journal part, which is detecting emotions from text. Our aim is to use these detected emotions in two ways: tracking the user’s progress and offering customized recommendations based on these emotions. To learn more about the user’s preferences, he/she will also be prompted to answer daily MCQ questions related to his/her mood, interests, and whether the previous recommendations were relevant to them or not. So, the recommendations done will be based on an implemented recommender system that uses the previous data (result of ML model of the detected emotions, MCQ answers, mood tracker that detects patterns in the user’s emotional state). Our solution will be in the form of an application, so will also have to create a database (SQL or other) to allow the user to sign in and store his/her credentials. Moreover, we were interested in 3 additional options provided by the users from the interview. So, we could add a section for detecting emotions from a voice record (speech recognition) in case someone wants to speak instead of write in the journal, a keep/lock/delete for journals, and some psychologists’ contact info.

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APPENDIX A

- *Contributions Milestone 1:*
 - Survey: Ali, Shaza, Dina (questions), and Youssef (created it)
 - Translation of survey to arabic: Dina & Shaza
 - Inquiry for interviews and useful data (to be used later) with psychologists (all had interview conflicts): Dina & Reeda
 - Interviews: Youssef, Ali, Shaza, Dina, and Reeda
 - Report: Youssef and Reeda
 - Problem definition: Reeda
 - Idea suggestion: All team members researched and suggested, and final chosen idea was Ali's
- *Contributions Milestone 2:*
 - **Dina:**-Participated in designing prototypes 1 2 and 3 on Figma./conducted 4 interviews on prototypes 1 and 2/brainstormed possible solutions along with the group/wrote the ML aspects of the previously implemented solutions/wrote ML aspects and defined the inputs and outputs for the three prototypes/provided interview questions/Researched previously implemented solutions/Literature review on Calm app/Summarized previous literature reviews/Summarized key feedbacks of the interviews on Prototype 2 along with Shaza .
 - **Shaza:** -participated in the brainstorming session
 - participated in designing of prototype 1, 2, and 3 on Figma.
 - worked on the BetterHelp literature review.
 - interview questions
 - conducted 5 interviews: 3 for prototype 1 and 2 for prototype 2.
 - participated in summarizing the keys ideas of prototype 2 interviews.
 - **Ali:** -Provided several ideas in the brainstorming session
 - Worked on Design of Prototype 1 on Figma
 - Worked on Design of Prototype 2 on Figma
 - Worked on Woebot literature review, research & provided solved/unsolved challenges
 - Provided interview questions
 - Provided challenges ideas of pre-existing solutions
 - Conducted 4 interviews: 3 on prototype 2 and 1 on prototype 3
 - Summarized the feedback from interviews on prototype 3
 - **Reeda:** Abstract updating / Literature review on Happify (definition + in table) / Challenges' formal definitions / Part of prototype 2 design / 3 interviews on Prototype 2 / summary of key feedback from stakeholders / conclusion on the chosen prototype and future goals
 - **Youssef:**
 - conducted 3 interviews
 - participated in defining the prototypes
 - summary of prototype 1 feedback
 - worked on prototypes 1 and 3 on Figma with the team
 - **Everyone:**Brainstorming/ Challenges definitions / Concepts of the 3 prototypes
- *Contributions Milestone 3:*

Everyone:

- Brainstorming on possible ML aspects and choosing final one

- Writing the actual main code (meeting via Zoom)

- **Dina:**
 - Worked 2 Literature Reviews and the dataset description.
 - Worked on designing a flow chart showing the architecture of the solution with shaza.
- **Shaza:**
 - Designed the architecture sketch with Dina
 - Worked on the summary of the brainstorming and the results of evaluating the ML possible solutions. (with Youssef)
- **Ali:**
 - Worked on the design of the final ML solution (Architecture and design choices)
 - Worked on the implementation of the initial version (Coding and testing)
 - Designed a flow chart showing the steps taken in implementing the initial version.
- **Reeda:**
 - Concept Product YouTube Video
 - Code and text explanation of the Design and Implementation
- **Youssef:**
 - Summary of Brainstorming (collaborated with Shaza & Reeda)
 - Worked on a part of the literature review
 - Choice of the dataset
- *Contributions Milestone 4:*
 - **Dina:** -Three interviews
 - Future plans and Conclusion
 - Initial coding
 - **Shaza:** - Three interviews
 - Neural Network model implementation (with TF-IDF)
 - **Ali:** -Worked on SVM model + Bag of words and SVM + TF-IDF implementation
 - Two interviews
 - Designed a table of accuracies and processing approaches used for the models
 - Comparisons of results section
 - **Reeda:** -The abstract
 - Introductory paragraph to present for interviews & some questions
 - Two interviews
 - Real-world testing & Summary of feedback section
 - Initial coding
 - **Youssef:** - LSTM and GloVe ML implementation
 - Final ML solution section
 - Three interviews

APPENDIX B

Milestone 1:

- *Interview 1:*

Name: **Dalal Younes**
Age: **54**
Profession: **Professor at the Lebanese University**
Interesting facts about the person: **She is a journalist aside from being a professor, she likes writing in her free time about life circumstances in general and Lebanon in specific. She is the project team leader at Information Management Ltd. She spent a big portion of her life in France.**

Questions:

- 1) From one year till now, to what extent do you feel that your life has changed? Was it to the better or worse?

My life changed dramatically to the worst during this time period. I knew that all these circumstances through which Lebanon is passing are going to get worse, and I knew that all this corruption will lead to high risks and disasters maybe. But I didn't expect all that to happen this year and suddenly, an explosion was not expected.

2) Could you please specify some of the problems that you as a Lebanese person are facing?

I am suffering from many problems like psychological and mental instability, loss of social security and a decrease in the areas of professional academic development. I don't want to talk about our basic needs like water and electricity because I feel fed up with these problems and we've suffered from them and mentioned them a lot.

3) Regarding the explosion of Beirut:

a) Could you please describe your feelings when the explosion occurred? Where were you? If you were not near how did you receive this bad news?

My family and I were in our home. At the moment of the explosion, everything in our house broke, the sound was very strong and the smoke filled all the rooms. We ran to the hallway and we hid in it for a while, then we went to the ground floor thinking that it was safer.

In that moment, and while watching the fire and the devastation everywhere, I didn't feel afraid from what was happening, I was just worrying about my children, I was nervous that they were living these moments, the moments that are similar to the past war that I lived in.

b) Do you still think about the explosion? Do you still get flashbacks of the event?

The moments of the explosion are unforgettable, they are very painful and affect my daily life in a negative way. For sure, now I feel a bit better than a few months back, but the first two weeks after the explosion, I just can describe them as a nightmare.

c) Does this flashback affect you? How?

The only feeling that is affecting me now is the nervousness. What happened is not a normal disaster, what happened is injustice and disregard of people's lives. If it was a volcano or an earthquake, maybe we can accept it more than an explosion that was the result of more than ten years of corruption.

d) Do you think that the explosion left in you fear and anxiety till now (do you still feel anxious /sick every time you pass next to the port or you see a smoke or you hear a strong noise?)

For sure the explosion left impacted us a lot. It caused a lot of fear and inquietude, however the fear on our kids or the fear related to the economic situation that we live is a more important source of fear and inquietude.

4) With respect to corona:

a) Do you feel that staying at home and being socially and physically isolated affected your daily performance in your work/university?

Staying at home affected me positively and negatively. Although I lost a lot of my social relations, activities, and events, I gained more time to spend with my family. In addition, I left some Habits that I thought were impossible to leave.

b) Can you describe a situation you passed through and in which you think that you didn't behave normally and that you are tired of everything around you?

Before the beginning of corona, I was working on a project related to my work. I tried to continue it however in front of all the difficult circumstances like the explosion and the economic situation that happened, I lost my willingness to complete it, and now I just feel like I can't proceed working on it at all, I just can't.

5) Regarding the economic and political situation:

a) Do you feel that you are bound/useless in your society and unable to achieve any change and if yes why?

True, failure to help your country is the accurate description of what is leading us to despair.

b) Do you worry about your future and why?

Financial stability is very important in a country that doesn't give you basic human rights; especially after 25 years of working in this country, you realize that the end of service compensation doesn't have value anymore in the light of the increasing inflation. After all this, of course you will feel constant worries.

6) In general:

a) What do you think are your dominant emotions these days? (For example are you feeling depressed, hopeless, tired or happy, energetic and stable now that it has been a while since the explosion)? Can you rate these feelings?

I feel so many complex and mixed feelings that coexist together. The most important feeling I can describe is rage.

b) Do you suffer while concentrating on things like your work, your university or anything else? Do you think it is normal? Have you had this problem before (persistently)? Or is it recent?

Being unable to focus is a dominant feeling I am suffering from now. I believe that the reason behind this feeling is instability. Being unable to focus, a started long time ago and it increased much now. We are already living in a disastrous situation and we wake up everyday on the news of a new one. I can't even continue working on a previous project I was working on. I try to shift my focus, but honestly I can't continue working on it at all.

• Interview 2:

Name: Ahmad Abdullah Alayan

Age: 19

Profession: University Student

Interesting facts about him/her: Obsessed about music starting from listening, writing to singing and everything in between.

Questions:

1) From one year till now, to what extent do you feel that your life has changed? Was it for the better or worse?

One year ago, I was starting to recover from a very mentally unstable period that led me into a very dark place where I suffered from extreme apathy, depression and anxiety due to a lot of family issues and personal problems. One year ago I started visiting my therapist and began taking medication, from that point onwards everything has become better. I learned so much about myself starting from how to control my reactions to things and also how to deal with stuff through absorbing the pain instead of running away from it.

2) Regarding the explosion of Beirut:

a) Could you please describe your feelings when the explosion occurred? Where were you? If you were not near how did you receive this bad news?

I was extremely shocked when the explosion happened, I mean who would have expected us to rank among top 5 strongest explosions in the world. It all happened suddenly although I was not near the explosion as I was at my Home in Tyre. But most of my friends live in Beirut, so the first thought was what if something bad happened to any of them and I went crazy texting them to make sure all is good. I received the news via Whatsapp and facebook as the internet was going crazy about it.

b) Do you still think about the explosion? Do you still get flashbacks of the event?

Yes I still think about it as I went down to volunteer the day after it and I witnessed the huge destruction that it caused, as I heard from people about their pain and complaints and these things are hard to forget as you remember them every once in a while.

c) Does this flashback affect you? How?

These flashbacks make me sad and angry at the same time, sad because of the innocent people who died and those who lost them in addition to those who suffered from the destruction or injuries especially within this pandemic and the economic crisis in Lebanon. Also, mad because of our

upsetting and disapproving corrupt government.

d) Do you think that the explosion left in you fear and anxiety till now (do you still feel anxious /sick every time you pass next to the port or you see a smoke or you hear a strong noise?)

As silly as it sounds and for someone who is usually afraid of death my anxiety went way up after the explosion because it happened suddenly and unexpectedly so I started relating it to every weird event that happens.

3) Let's talk about COVID19:

a) Do you feel that staying at home and being socially and physically isolated affected your daily performance in your work/university?

Yes to be honest, I got used to sitting at home without doing any significant activity which led to growing my procrastination habit. For example if I feel super tired I don't get up to class as I prefer to re-watch it at my own pace later and I keep postponing until the exam time where I stress myself to the max.

b) Do you think that corona changed the way you behave or communicate with other people? (Example make you nervous)

No, I still love to be socially present and I cannot wait until life goes back to normal.

4) Do you worry about your future and why?

Yes, I worry so much about my future as it seems non-existent in our country due to the political corruption in addition to the unprecedented economic crisis that is becoming worse and worse each day. As my target for now is to travel and find a good job outside Lebanon where I can live independently without being affected or pressured on by any corrupt side as it is the case here.

• *Interview 3:*

Name: **Rawad Olabi**

Age : **31**

Profession : **Electrical Engineer**

Interesting fact about him: **AUB student (Masters Program)**

Questions:

1) Where were you during the time of the explosion?

I was at my office in Electricite du Liban (EDL) facing Beirut port

2) Can you describe in detail what occurred that day? Pre-explosion, post-explosion, on your way to the hospital, inside the hospital...

Pre explosion we were at the office working on a presentation to be done for EDL's newly appointed board of directors.

Most of my colleagues left the office at 4 (normal working hours) except for me, my colleagues Claudia, Antonio and the Project manager Hayssam.

At first, we heard a sound that we thought it's a car accident, we looked out of the window (my office window overlooks Mar Mikhael street) and we saw people looking toward the other side which is the highway and port side, we went to Claudia's office which overlooks the port and she was still working without noticing anything. At that moment we saw the warehouse No.12 on fire but it was still small and toward the end of it, I took a small video of the fire and posted it on my status, a few moments later we saw the Beirut fire brigade cars rushing toward the port, we were calm, thinking that's it's ok the fire will be put out soon by the firefighters, we were joking a bit about the wheat storage and that we will starve if it catches fire or anything, but we didn't expect the worse.

I returned to my office, we were finished with the presentation and Claudia was making final adjustments, so I started packing my things in preparation for leaving, at that moment a big explosion which chock the building happened, we rushed me and Antonio again to Claudia's office to see what happened, she was standing and looking worried, Hayssam was also there, the moment I saw the warehouse

No.12 on fire I was shocked, the whole building was full of smoke and fire and things sparkling violently in the air, we were speculating about what was those sparkles if they were fireworks or ammunition, Antonio said it my be electricity sparkles. I took my phone again and started a live video, but was deeply uncomfortable while looking at the scene, Hayssam from the back complained about me getting in his sight while he was filming also, I turned towards him to apologize and maybe tell them that we should leave, at that moment the huge explosion happened and I was thrown away by the blast few meters, fell on the ground while trying to protect my head with my hands, the moment I was on the floor another force was dragging me on the ground and things were falling on us from the ceiling and everywhere else.

The moment it ended i was still awake, immediately stood up on my feet and sensed the blood running out of my neck, i sensed it with my fingers to make sure that no major vein was affected, thank god the vein was not affected, i heard hayssam speaking, i said we should get out immediately, i wasn't able to see clearly or think i just wanted to get out, we started walking on the rubble, supporting myself by grabbing anything that i could see hanging from the ceiling until i reached the stairs, i went down to the first floor, hayssam was behind me but i lost him, he went to his car but i noticed that the cars were destroyed, i went out to the front yard, the gates were closed and i saw Antonio, he was also severely injured, trying to talk to the guard to open the gate, the guard was not injured but in shock, he said he doesn't have the keys, i checked upon antonio to see if he is fine and asked him to check my neck too, then i noticed that my right hand is severely cut open from many places and i am loosing a lot of blood. At the moment I asked the guards to support me to walk so that I don't fall, but they were in shock and didn't help. Antonio noticed that the fence is collapsed in one side and told me to let's go there and jump above it to go out to the street, I followed him and we jumped to the street in front of Hibou supermarket, then I lost Antonio also who went to the Mar Mikhael stairs, trying to get to saint Georges hospital. At that moment I saw the destruction, buildings destroyed, cars, people on the ground, and those who are still in functioning cars are trying to get their way out hopelessly, I asked several people if they can get me to hospital but all cars were full, and my injuries made people afraid, so I heard the sound of the ambulance coming from Mar Mikhael side, I started rushing towards the sound, I ran like 300 meters, the sound was for a firefighter vehicle, but other sirens sound is behind it so I continued running, I encountered an army vehicle who also couldn't help because they don't have medics after 500-700 meters running I finally encountered an ambulance, but it was struggling to get out of traffic and injured people trying to jump in it while it was so full.

I continued for a bit and found an ambulance just arriving I stopped it and the girl who is driving immediately asked me to get in, the door was locked but no one was in the ambulance to open it except the driver, I moved to the back door and it opened I got in, opened the side door for other people and finally sat down, trying to catch my breath and try not to stay awake and not faint in order to keep myself alive. The road to the hospital was full of rubble and obstacles, but the driver managed to get us to st George hospital quickly, unfortunately, the hospital was destroyed, so she tried geitawi hospital, we couldn't get there also, on the road, the ambulance crashed wit many cars who were moving slowly while trying to get them out of the way.

Finally, we reached Rizk hospital after around 30-40 mins in the ambulance, I caught my breath and got out of the ambulance, there was only a security guy at the parking entrance giving directions to people, I followed the signs to get to the ER, one I got there a nurse shouted out some codeword and pointed at me, another medic took me and sat me on his chair, and they started attending to my wounds.

The wait in the ER was exhausting, I saw many people

coming in with various cases, I also saw Antonio entering and I was relieved that he is alive, I poke him and said thank god you are here, he didn't notice me. Some nurse came and started stitching my neck and head wounds, I didn't feel anything. Then a doctor came and ordered the staff to get me to the Operation Room, I also waited for a while there while doctors were letting people in the OR based on the severity of their injuries. While waiting I was able to find someone with a phone to call my parents, they were on their way to Beirut and they were devastated, my sister, brother in law and some friends were already at EDL trying to look for me in the rubble.

After a while I was able to get to the OR and did the necessary operation to stop the bleeding, it was the sound of my sister trying to look for me who woke me up after the operation in the recovery room. Then when they took me to my room I realized that I didn't see Claudia, I started asking about her and no one was answering, later in the night I learned that she passed away, I was devastated.

Later I did 3 surgeries in my hand to reconstruct the cut tendons, broken fingers, and also to reconstruct my right ear.

3) Have you experienced any signs of PTSD (Post Traumatic Stress Disorder) and if so, which ones:

-Do you re-live the traumatic event? Do you get flashbacks of it? And if so, do you get flashbacks of images and details or just flashbacks of how you felt?

-Does talking about it make you feel uncomfortable with negative feelings? Do you avoid talking about it?

-Have you experienced any type of depression, anxiety, or stress caused by the event?

No, I didn't feel any PTSD

4) After the event has ended, did you learn anything interesting/surprising about yourself or a contradiction that you noticed?

Yes, I learned that I have very calm nature in times of crisis, I am able to handle things in a good way no matter the situation, my psychological state is strong and I am able to stay positive and grateful

5) Did you feel support from people you know, i.e. family, friends, and others?

Family & friends support was very important for my healing process, and it has the biggest effect on my physical & psychological well being

6) Did you meet up with a psychologist? If no, do you think you might in the future? If yes, did you feel any better?

No, I didn't and don't feel I need it in the future

7) What was the worst part of the event?

My colleague who I spent 8 years with and who I admire the most have died

8) What methods do you use if you want to feel better? Talking to someone about it? Getting busy doing something else? Resorting to alcohol, drugs, or any similar method?

Mostly getting busy with something else, work, study or read, also watching series and entertainment

But I also talk about how I feel when I feel not well it helps a lot

9) How would you describe your mental/emotional health situation pre-explosion versus post-explosion?

It was not much affected, except that I feel stronger and more persistent in life

• Interview 4:

Name: Mr. Jad

Age: 34

Profession : Journalist

Interesting fact about him: great attention to detail

Questions:

1) Tell me about a memorable experience you had, good or bad during this year:

I recall a few weeks ago I was in my apartment's balcony, and I was looking at the street, I saw an old man driving a classic

car and he parked near trash cans. He stepped out of the car, I saw him looking in the cans to see if he can manage to find something he can benefit from, then I found him taking a plastic bag and he laid that bag in his car's backseat, then he continued searching in those cans. After around 5 minutes, he didn't find anything more, he got in his car, and drove away slowly.

I felt so heartbroken, and I was thinking about what might that person is feeling right now, does he feel better because he found something, or does he feel worse because he had to do it and he had no other choice.

2) How did you feel at that moment when you saw that guy and why did you feel heartbroken?

I felt heartbroken and really sad. I think it is because I know it's not only him who's going through this, a big number of Lebanese people had to do it at some point because of the current degrading economic situation. What is also worse is that every day I wake up to bad news, the situation in Lebanon is getting worse day by day, I feel like I am becoming hopeless, my dreams are getting shattered.

3) Tell me about how you find your life changed within this year.

I believe it changed drastically. But I am still the same person. I worked so hard the past 10 years to be able to live a decent life, and especially to have a comfortable life after retirement, but it feels like all my savings are worthless now, I have to keep on working in this country until I die. All I want now is to survive. All I want now is to be able to go through the tons of crises our country is facing. At some point, one can feel like they cannot take it anymore, and I think you can recall that, in the past few months, I think, 3 or 4 guys took their lives because they thought that this is the best way to deal with the overwhelming obstacles they had to face. I personally would not do that, even if I have lost everything, I will keep on trying. The problem is that this sequence of economic, political crisis, and on top of that the COVID-19 pandemic, these factors combined have led us to have, as Lebanese citizens, serious mental health problems. All then after that, there is the Beirut port explosion that left many more lives in despair.

4) Tell me how did you feel during the Beirut port explosion

I was at home, and at first I felt like it was an earthquake, the building I was in was swinging left and right. I felt terrified. After a few more seconds, I heard a very loud blast. I didn't know what was going on. I felt that there was an attack somewhere in my neighborhood. I tried to guess what was going on. I went out to the balcony, and saw other people also going out to their balconies trying to see what was going on.

Luckily I didn't have any property damages, but this explosion is unforgettable. I then saw a giant red cloud and plumes of smoke, but they were a bit far. I was very shocked, and I had no idea what happened. It felt like an attack at first.

5) Do you still get some flashbacks of what happened and what do you feel when you have those flashbacks?

I still get flashbacks from time to time, I feel like I get weakened when thinking about the explosion. I feel like I've lost something inside me. I am trying not to look again at videos related to the explosion on social media, because I will recall what happened again and it will weaken me again.

You know, there are economic, political, covid-19 crises in Lebanon and on top of that there is that explosion, it felt like a knock-out for the Lebanese people. We cannot take it anymore. The following days, and the next weeks of the explosions, it was harder to focus on my everyday tasks, and on my job. My colleagues had the same issue, we were discussing everyday the problems Lebanese people are facing, and at some point I noticed that we are only talking about negative events that are going on, but unfortunately, that is the truth.

6) How are you coping with covid-19?

I am spending most of my time at home, as expected, and I feel like I am not socializing as much as before.

I go sometimes for a walk just to try to relieve stress, and that's it basically. I struggle sometimes with being productive.

7) How recent is this problem of productivity?

It has been a few months that I feel that I am not as

productive as before. Everyday feels to be more stressful. When I go to the grocery store, I see how the prices are constantly increasing, not only this, but everything, all prices are increasing. I am still able to get my basic needs, but what about people who have children to feed? Are they going to be able to satisfy their children's needs? I think it is much more harder now

8) Why aren't you socializing as much as before?

I usually, before covid-19, talk to my friends face to face, and we plan to go somewhere, but nowadays, it's not the case anymore, so it feels like we're all staying home more now, and that is normal I think.

9) How do you feel during the past few weeks?

I feel slightly better, but I still feel bad because of the explosion, and I still feel kind of depressed because of all what we are facing as Lebanese citizens. The problem is the economic crisis is going to get worse, and I am anxious about what will happen next. I am trying to be positive as much as possible, but to be realistic, I can't.

Appendix C

Milestone 2:

C.1 - Brainstorming



C.2 - Already Implemented Solutions:

Calm App: offers a variety of meditation programs and sleep stories for adults and kids to achieve lower stress levels and help with sleeping problems. It doesn’t focus on solving the root cause behind anxiety, insomnia, or stress. The types of meditations offered in this app are not personalized and might not be effective in tackling the main problem. The relief achieved may fade away after a short period of time. In order to better address the mental needs of the user, there should be an interaction or a thought sharing process to better understand the users emotions and offer him/her the programs accordingly. Moreover, this thought-sharing process will help the user better understand what he/she is going through and organize his thoughts. The program offers a \$12.994/month ,69.99\$/year and 399.99\$ lifetime subscriptions. There is no clear description if the app uses a certain type of machine learning models or not.[3]

BetterHelp is an online website that is accessible for any person who feels that he/she is suffering from mental health problems. First, a user can enter the website BetterHelp.com, and he/she will be asked to answer a set of questions (concerning personal info and psychological status). After that, the website will tell the user to register using an email account to be matched with a counselor. And once the user pays for the website, he/she can start chatting with the counselor. [4]

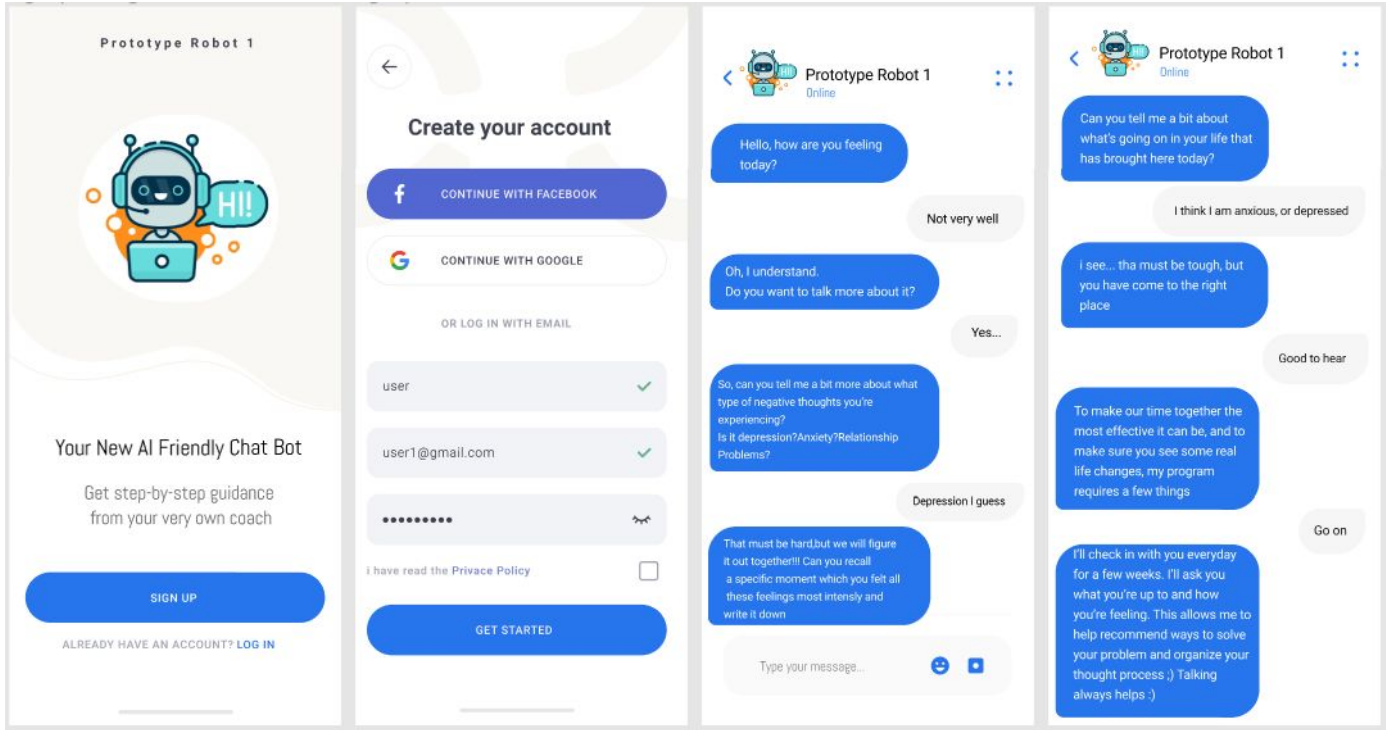
Woebot app is an artificial intelligent chatbot app that uses principles of cognitive-behavioral therapy (CBT) to help people cope with their feelings of hopelessness, anxiety, stress, and depression, through interactive chat engagement. We did not find the exact models used in Woebot, but we believe that an intelligent chatbot like Woebot would use a mix of dialogue planning models, form-filling models and FAQ models.[5]

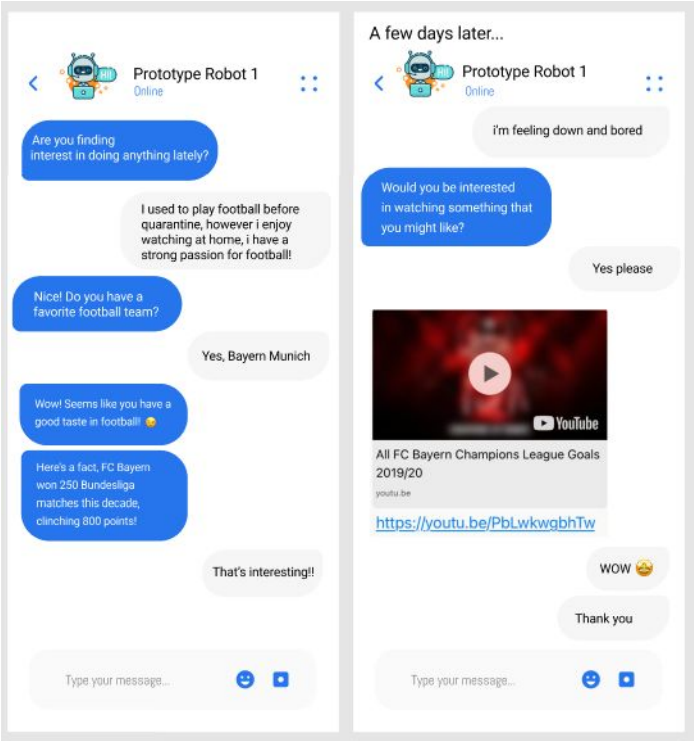
C.3 Detailed table of challenges:

| | Challenge 1 | Challenge 2 | Challenge 3 | Challenge 4 | Challenge 5 | Challenge 6 |
|------------|---|--|-----------------------------|---|--|--|
| Calm App | ✓interactions with other personnels is not required | ✓ users are not interacting with humans | ✗ | ✗ | ✗ | ✓daily streaks and mindful minutes to track the user's progress. |
| Woebot | ✓ it is an application | ✓objective and data is protected | ✗ | ✓ Free App | ✓it uses CBT(cognitive-behavioral therapy) | ✓monitors the user's mood, and keeps track of tasks,goals,.. |
| BetterHelp | ✓ it is an online website | ✗ | ✓ chatting with a counselor | ✗ very expensive around 60-80\$ per session | ✓ The counselor asks the user whatever he/she wants to evaluate his/her psychological status | ✓ The counselor keeps sending messages to the user |
| Happify | ✓ It is an application and a website | ✓ It is personalized and no user to user interaction | ✗ | ✗ | ✓ It uses scientific methods | ✓ It uses ML for a “highly customized program” |
| Our method | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

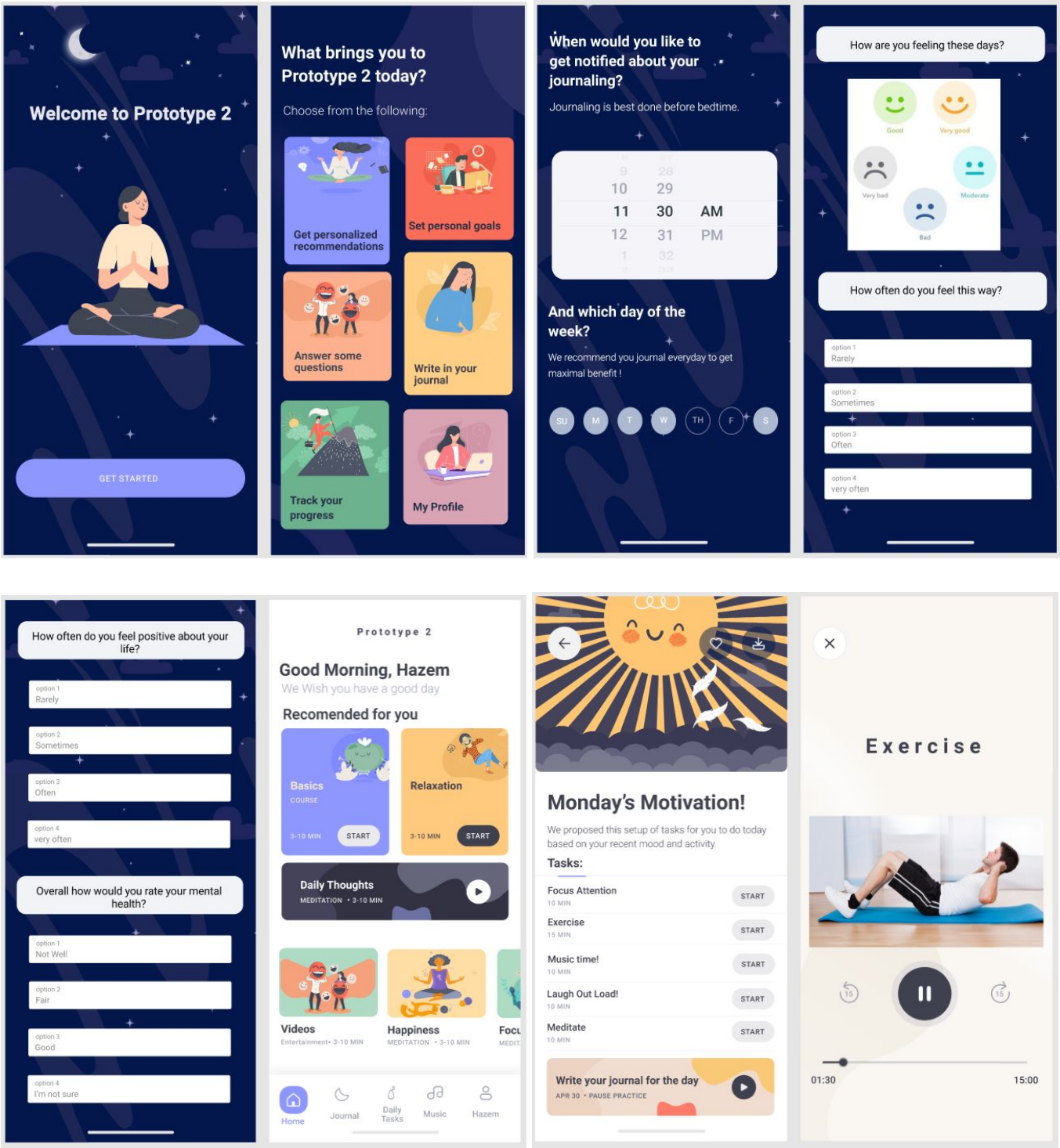
C.4: prototypes

C.4.1 - Prototype 1: Screenshots

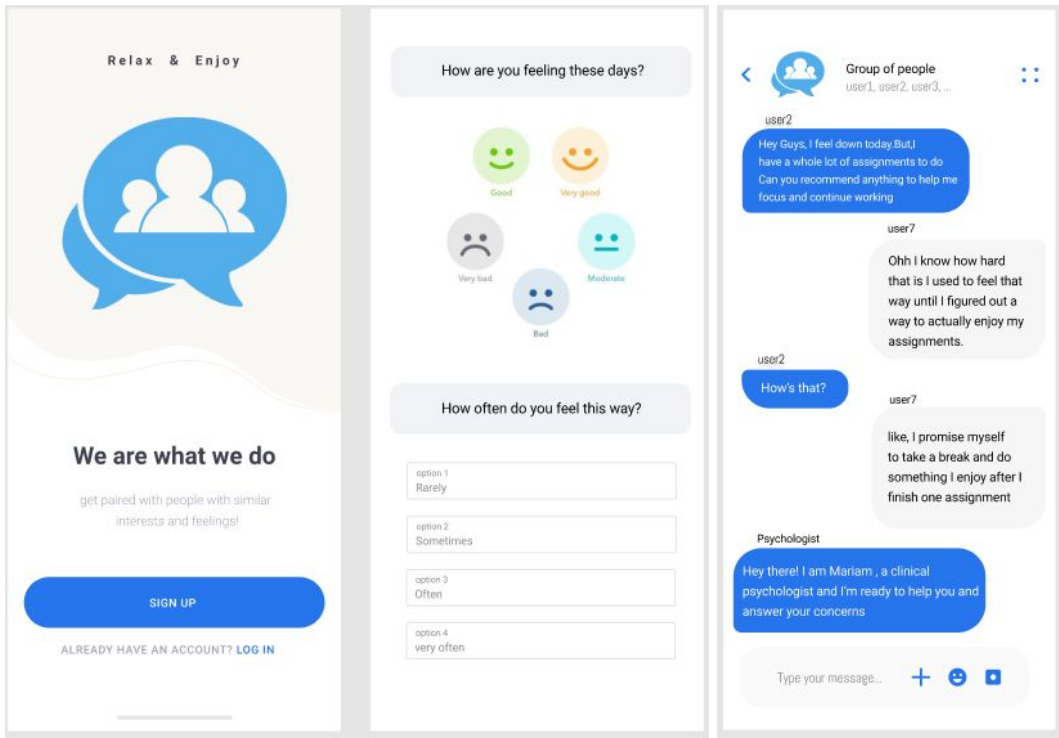




C.4.2 - Prototype 2: Screenshots:



C.4.3 - Prototype 3 - Screenshots



C.5 Feedback Interviews:

C.5.1: For Prototype 1:

interview number: 1
Interviewer: Youssef
Interviewee: Jad

1- How do you feel about using this app?

I would not mind using it tbh, I can give it a try and see how it goes.

2-Can you specify one good aspect and another one that could be better?

The good aspect is that I get recommendations from the robot, and the recommendation I saw in the prototype about watching something or random facts or suggesting something that can make me feel better are actually great recommendations. What can be better is that can I actually configure the robot to help me fight stress let's say, or help me get less anxious? Can I tell the robot help me be less anxious, and the robot can recommend something that can be applied to my case, and not to everyone?

3-Would you trust the results from such an app?

yes, up to an extent, I do not think the robot can understand everything I am saying, even the world's best chatbots like Siri and Alexa have some problems understanding what the user is saying.

4-What do you like the most about this app?

I like the way the robot talks to the user, it feels like I am talking to a friend who's trying to help me.

I like how the robot can respond and ask more questions depending on the user's response.

5-Do you think we can improve this app? How?

maybe if the robot can detect whether my situation is so bad that I need a therapist, then the robot can suggest talking to a

therapist. Sometimes one's problem is not big enough to talk to a therapist, but one needs some relaxation techniques only to practice everyday. Some problems appear greater than they actually are.

6-Do you think this might help you feel better? How?

I think yes, if the recommended tasks/activities are effective in helping me feel better

7-Would you feel comfortable texting a robot? And why?

I would feel comfortable, but I need to make sure the data collected is private.

8-Do you think robot chatbots can replace real therapists?

I don't think so, simply because a robot is not a human, it cannot empathize like humans do.

Interview number: 2
Interviewer: Shaza
Interviewee: Nabila

1) How do you feel about using this app? I will be satisfied if the robot will understand my mentality well.

2) Can you specify one good aspect and another one that could be better? A good aspect is when the robot suggests activity to do.

Maybe reducing the messages' size could be better.

3) Would you trust the results from such an app? Not really, since the accuracy will not exceed 90%, so definitely there will be cases not recognized or misunderstood by the model.

4) What do you like the most about this app? There is someone to talk to when needed.

5) Do you think this might help you feel better? Sometimes yes.

6) Would you feel comfortable texting a robot? And why? I will be comfortable talking to someone that I am sure that will not judge me or snitch on me.

7) Do you think robot chatbots can replace real therapists? Definitely no, at the end the machine has no feelings like humans.

Interview number: 3

Interviewer: Shaza

Interviewee: Jihan

1) How do you feel about using this app?

I think it is comfortable to use a platform like this to talk with an anonymous person about whatever we want.

2) Can you specify one good aspect and another one that could be better?

One good aspect is the ease to use and the clear guidance.

Another aspect that could be better is maybe include the audio aspect because usually humans prefer to talk when they are depressed rather than chatting on an app. I think psychologically it is better to talk and to be listened to by someone else so you don't feel alone.

3) Would you trust the results from such an app?

To be honest no I will not trust the results from such an app because I did not know based on what it recommends me to do something because at the end of the day it is a robot without feeling so how can I feel relaxed while talking to someone without feelings?

4) What do you like the most about this app?

I like that it is somehow similar to a real conversation because it walks with you step by step trying to let you forget what depressed you

5) Do you think this might help you feel better?

Maybe talking to someone you don't know might help you feel better and I don't like the robot. I mean it's not a part of my life (not a family member or relative) but I will still wonder about trust issues and sharing privacy.

6) Would you feel comfortable texting a robot? And why?

I did not try it before so I can't judge to be honest but I expect that I can't be comfortable 100% because texting a machine that is going to save your data and privacy might share them again with someone else.

7) Do you think robot chatbots can replace real therapists?

In my opinion, nothing could replace humans' interactions because we need these kinds of interactions to feel secure and safe. Therefore, therapists have a huge role in affecting the person's psyche.

Interview number: 4

Interviewer: Shaza

Interviewee: Abir

1) How do you feel about using this app? Very interesting

2) Can you specify one good aspect and another one that could be better? The way the guy's being approached can be better. I like the idea that it is in a chat form, it feels friendly :D

3) Would you trust the results from such an app? According to Shaza, the robots' decisions are scientifically based, so I would trust the results.

4) What do you like the most about this app? the part of recommending activities to do

5) Do you think this might help you feel better? Maybe

6) Would you feel comfortable texting a robot? And why: it is okay with me, but at the end of the day it is the warmth behind the whole spilling your feelings to a real someone that counts, so, for me, I prefer the human side of it.

7) Do you think robot chatbots can replace real therapists? Hopefully not, or else they will go bankrupt, many families would suffer :p.

I don't think that we will lose the human therapist though.

Interview number: 5

Interviewer: Dina

Interviewee: Lea Darazi

1)How do you feel about using this app? I feel that the application user friendly, and it's more practical than actually going to someone for help. It makes talking much easier

2)Can you specify one good aspect and another one that could be better?Good aspect: recommendations given.One thing that could be better: trying to understand more why the person is feeling like that (i.e. to be more specific)

3)Would you trust the results from such an app? If answers that are recommended are based on experts or people working in the field of mental health, then yes i trust it.

4)What do you like the most about this app? It's user friendly and straight forward

5)Do you think this might help you feel better?

Yes if it can offer suitable recommendation for my situation and personal interests

6)Would you feel comfortable texting a robot? Why or why not? Yes, it's easier to talk through texting

7)Do you think chatbots can replace actual talk therapies?

if the person just feels like talking, a chatbot could do the work. Otherwise, if the issue can't be solved over texting, then no it can't replace real therapists. It really depends on the person in my opinion.

Interview number: 6

Interviewer:Dina

Interviewee: Fatima El Hajj

1) How do you feel about using this app? I like the fact that using this app helps people express their feelings without fear or shame.

2) Can you specify one good aspect and another one that could be better? You can add a new property to this app such as knowing how people are feeling by hearing their voice.

3) Would you trust the results from such an app?Yes,it looks interesting and reliable.

4) What do you like the most about this app?People are busy all the time, but robots can help us anytime without boredom.

5) Do you think this might help you feel better? Personally yes I do,I always feel like I need someone to listen to my problems

and help me.

6) Would you feel comfortable texting a robot? Why or why not? Yes, because I feel like it will suggest the right things because it has no feelings. I believe that our emotions sometimes interfere in the way we think and that will prevent us from taking the right decisions.

7) Do you think chatbots can replace actual talk therapies?

Maybe in simple cases, but for bigger issues nobody can replace humans.

C.5.2 - For Prototype 2:

interview number: 1
Interviewer: Ali Wehbi
Interviewee: Ali Baydoun

1) How do you feel about using this app?
motivated and relaxed. Motivated to improve my mood and relaxed with what the results will be

2) Can you specify one good aspect and another one that could be better?
Good Aspect: the sequence inside the app, first, what brings you today which gives you a purpose. Second, the notification and remembering part. One aspect could be the recommendations of tips. The app could give you help and tell what to do depending on your case. Overall, the idea of supporting mental health is very important.

3) Would you trust the results from such an app?
I would if I can see previous results from other clients or if they show scientific research of why they are right.

4) What do you like the most about this app?
NOT ASKED

5) Do you think we can improve this app?
Yes, you can listen to feedback and see what users think

6) Do you think this might help you feel better?
Yes, I would

7) Would you use this app to track your mood?
Yes

8) Would you feel free to write a journal about your daily life, and get back some tips for you to improve your life
Yes, I think it would be very helpful

Interview number: 2
Interviewer: Youssef
Interviewee: Imad

1) How do you feel about using this app?
I do not object to using it, the GUI looks good, I think it is a good way to have a feedback loop everyday and see how I can have progress, whether it is for my mental health, or productivity.

2) Can you specify one good aspect and another one that could be better?
The good aspect I see is that it has personalized recommendations, not just general recommendations that may or may not work for everyone.

3) Would you trust the results from such an app?
I would first see if the results or tasks that I have to do make sense and see if they are actually effective or not.

4) What do you like the most about this app?
I like tracking my progress and setting personalized goals, and I like to get motivated to get things done.

5) Based on what you saw so far, do you think this might help you feel better?

I think It can help, I can see that by tracking my progress, I can see how I can get better, and I will be able to know what tasks or activities work best for me.

6) Would you feel comfortable expressing your feelings through writing in a personal journal? And why?

I think writing a journal is really beneficial. I do it from times to times, but the problem is I do not stick to doing it everyday, I mostly skip doing it. In this app, I like that I can set a reminder to journal and directly and save my data in this app. As long as my data I write is private and secure, then I do not mind expressing whatever I am thinking about.

7) Do you think that we can make the app better? If yes, what do you suggest?

I personally like it the way it is. However, I do not know how effective it is, I mean, will it recommend tasks that actually help me, and not just random tasks?
What about including something that helps with being productive?

interview number: 3
Interviewer: Ali Wehbi
Interviewee: Mark Kadamany

1) How do you feel about using this app?
Very nice concept but I think there are similar applications to it

2) Can you specify one good aspect and another one that could be better?
A good aspect would be the reminder and another one that could be added would be "like, comment, share" model to make it more interactive and this could be an added value to the application

3) Would you trust the results from such an app?
Yes, it looks credible

4) What do you like the most about this app?
Design

5) Do you think we can improve this app?
Yes it can be improved but you're on the right track

6) Do you think this might help you feel better?
Yes I think it can definitely be a daily boost

7) Would you use this app to track your mood?
maybe

8) Would you feel free to write a journal about your daily life, and get back some tips for you to improve your life
I wouldn't like that because I like to speak about it to real persons (it feels better)

interview number: 4
Interviewer: Ali Wehbi
Interviewee: Agnes Sayah

1) How do you feel about using this app?
the app seems very user friendly and comforting, I like using it.

2) Can you specify one good aspect and another one that could be better?
The color scheme and the design in general is very good. I can't think of anything to improve it.

3) Would you trust the results from such an app?
Yes, I've tried similar methods but never in the form of an app.

4) What do you like the most about this app?
it brings a sense of calamity and relieves stress.

5) Do you think we can improve this app?
I think the app can be changed over time based on user reviews.

6) Do you think this might help you feel better?

YES!

7)Would you use this app to track your mood?
possibly

8)Would you feel free to write a journal about your daily life,
and get back some tips for you to improve your life
depending on my time and my general mood and situation

interview number: 5
Interviewer: Shaza
Interviewee: Majd

1) How do you feel about using this app?

If this app is private and no one can access my journal, I would
be comfortable using this app.

2) Can you specify one good aspect and another one that could
be better?

A great aspect is one related to the various tasks the user
should do, such as meditation and listening to music. A thing
that I might find better if the questions that follow “How are
you feeling these days” are a bit more specific, not just “how
often do you feel positive about your life”.

3) Would you trust the results from such an app?

If the app developers are collaborating with a group of official
medical experts such as psychiatrists and psychologists then
yes, if not then I wouldn’t trust this much.

4) What do you like the most about this app?

It’s a user friendly app and really simple.

5) Based on what you saw so far, do you think this might help
you feel better?

Yes

6) Would you feel comfortable expressing your feelings
through writing in a personal journal? And why?

Yes I would, I can keep track of what used to irritate me and
how I handled the situation back then and compare it to how I
handle things now. It can be my own personal progress
tracker.

7) Do you think that we can make the app better? If yes, what
do you suggest?

Yes. Adding a section with many suggested psychologists who
may give help when the app does not.

interview number: 6
Interviewer: Shaza
Interviewee: Samah

1) How do you feel about using this app?

It is an organized and well-designed app that encourages users
and download and use it because of its simplicity.

2) Can you specify one good aspect and another one that could
be better?

One good aspect: The use of colors that helps to achieve the
goal of this app>

However, it is going to be better if you kind provide a section

where the user can send messages to a certified psychologist
and communicate with him/her when the app does not give the
needed help.

3) Would you trust the results from such an app?

yes probably.

4) What do you like the most about this app?

What I like most about this app is that now I am able to
express what I am feeling and get recommendations without
being in need to go to a psychologist since I do not feel
comfortable talking about my personal problems to anyone.

5) Based on what you saw so far, do you think this might help
you feel better?

Yes. It might help me to feel more relaxed and to find some
ways when facing my problems.

6) Would you feel comfortable expressing your feelings
through writing in a personal journal? And why?

Yes. since I am the only one who is reading it.

7) Do you think that we can make the app better? If yes, what
do you suggest?

It’s great as it is.

interview number: 7
Interviewer: Dina
Interviewee: Hiba Houhou

1) How do you feel about using this app?

The user interface is very relaxing and stimulates trust, the
idea of the application is intriguing and personally I would
download it. It is very interesting and I think it would push me
for self improvement.

2) Can you specify one good aspect and another one that could
be better?

The user interface is very nice, very user friendly and makes
me "trust" the app more, also the progress tracking feature
seems interesting.

What could be improved is that maybe personal goals should
be set up for each week (milestones) in portions that are
feasible and manageable to achieve.

3) Would you trust the results from such an app?

I would try it for a couple weeks and then judge, but the
interface and the detailed questions do stimulate trust.

4) What do you like the most about this app?

The user interface! And also the fact that I can set my goals in
one place and keep checking my progress.

5) Based on what you saw so far, do you think this might help
you feel better?

I think it depends on how much free time I have to go through
the recommendation, maybe the user should be asked about
their free time before setting the recommendations so that they
don't get stressed out even more.

6) Would you feel comfortable expressing your feelings through writing in a personal journal? And why?

I wouldn't, the app is analyzing every other aspect so it would feel creepy to detail my personal life and experience in such a (what feels like) exposed environment.

7) Do you think that we can make the app better? If yes, what do you suggest?

I think the app could be made better by taking into account the user's availability, and maybe suggesting the motivation recommendation based on a balance between their free time and time dedicated for their goals.Maybe the user should be able to detail the goals in a scheduled checklist.

interview number: 8
Interviewer: Dina
Interviewee: Tala Younes

1) How do you feel about using this app?

I like the design of this application, and I like the fact that it has a variety of options .At first the “write in your journal part” didn’t convince me because I can write in notes. What difference would that make? However , after you explained that this app will analyze what I wrote and give me recommendations based on my mood ,I feel like this way is a bonus because not only can I express my feelings ,but I can also get advice and solutions to help lift my mood more .

2) Can you specify one good aspect and another one that could be better?

I like the design. Honestly I couldn’t think of another aspect for the app as it contains a variety of options.

3) Would you trust the results from such an app?

I think i can because if it is based on what i wrote and how i use the app then why wouldn’t i

4) What do you like the most about this app?

I like the journal part and the personal goals part as it will remind me of my plans In a way that is motivational rather than overwhelming.

5) Based on what you saw so far, do you think this might help you feel better?

Yes

6) Would you feel comfortable expressing your feelings through writing in a personal journal? And why?

Yes, I usually do express my feelings by writing about them

Interview number: 9
Interviewer: Reeda
Interviewee: Razan Ghaith

1) How do you feel about using this app?

It is a user-friendly app with a variety of options. Users can not only opt for one of the several services provided by this app, but also get recommendations on what is best to do during a certain day based on their recent mood. It is personalized and accustomed to one’s needs. Moreover, this app tackles 2 crucial categories related to mental health, the first being the psychological aspect of this issue such as symptoms and feelings, and the second is the treatments which include recommending certain activities, verbalizing the thoughts by

writing in the journal, and most importantly tracking progress.

2) Can you specify one good aspect and another one that could be better?

-One good aspect: well-structured and simple to use

-One that could be better: questions about mental health are so general

3) Would you trust the results of such an app?

Yes, but not totally. The questions asked do not provide a complete knowledge about one’ mental health, and hence the results may not always be relevant to your case.

4) What do you like the most about this app?

It’s a judgment free, secure space which helps mentally healthy individuals as well as people struggling with mental health issues seek some customized treatments to alleviate their stress and cope with whatever struggles they face if not knowing what to do in hectic situations.

5) Do you think it might help you feel better?

Yes. All the features present provide indirect assistance to figure out what can be done to twist your mood. Even when in a good mood, it suggests useful activities which help develop a healthy lifestyle of exercising, listening to music, and even relaxing.

6) Would you feel comfortable expressing your feelings through writing in a personal journal? And why?

Definitely. Verbalizing your thoughts is a key step to relieve the stress and trace your progress.

7) Do you think we can make the app better? If yes, what do you suggest?

Despite the uniqueness of this app in terms of concept, purpose, and structure , adding more detailed questions about one’s mental health would add to its value and make the recommendations provided more relevant by matching a set of questions to a certain activity which is mostly known as being directly related to a certain mood, be it a stressful or good one. Also, it can include reminders to follow the recommended activities.

8) Do you think the app is user friendly?

Definitely

Interview number: 10
Interviewer: Reeda
Interviewee: Marwa Naime

1) How do you feel about using this app?

This app is very user-friendly and induced a feeling of positivity.

2) Can you specify one good aspect and another one that could be better?

-One good aspect: encompasses good methods relating to improving mental health.

-One that could be better: adding daily motivational/inspirational quotes.

3) Would you trust the results of such an app?

Adding facts backed by experts in the concerned field might help with oncreasing credibility.

4) What do you like the most about this app?

Very user-friendly

5) Do you think it might help you feel better?

Yes, upon regular use.

6) Would you feel comfortable expressing your feelings through writing in a personal journal? And why?

Since it's a personalized one, it is comfortable to write down thoughts and feelings as this will help in getting in touch with reality and then feeling better.

7) Do you think we can make the app better? If yes, what do you suggest?

Expert opinions and facts to improve credibility.

8) Do you think the app is user friendly?

Very.

Interview number: 11
Interviewer: Reeda
Interviewee: Nataly Dalal

1) How do you feel about using this app?

Good place to organize my thoughts, feelings, goals, and daily tasks/planning

2) Can you specify one good aspect and another one that could be better?

-One good aspect: personalization and recommendation

-One that could be better: more organized and specific, some of the features this app shows are not clear from the start and the ideas shown are a bit scattered

Maybe also the idea of how exactly you're using machine learning is a bit vague ... but that's just the technical background not an end-user concern ... what are you basing the recommender system on?

3) Would you trust the results of such an app?

Yes

4) What do you like the most about this app?

Recommending what tasks to do based on the user's feelings or specified moods

5) Do you think it might help you feel better?

To an extent ... socializing and talking to someone can help more maybe but when it comes to a tool that I can use daily alone, I think it's a great way to feel better or change my mood yes

6) Would you feel comfortable expressing your feelings through writing in a personal journal? And why?

Yes, it's very important to self-reflect and always consider what you're feeling and why (helps you deal with those feelings and understand yourself more). However, my only concern in the app's case might be the security part (I might not feel an app is a safe place to express very personal thoughts or feelings since I can't guarantee that info won't be accessed by someone else).

7) Do you think we can make the app better? If yes, what do you suggest?

-Maybe integrate the recommended tasks with the personal tasks the user sets for each day so they can have a clear balanced schedule for every day

-I think it'll also be cool if you add the "socializing" part to the app by maybe connecting users that match in moods or recommendations so they can have someone to talk to other than professionals (someone who might be able to understand since they're going through the same thing)

8) Do you think the app is user friendly?

Yes, just maybe add an info button on the second page so that the user can understand what each section includes instead of having to go into each to find out (might lose interest from the beginning)

C.5.3 - For Prototype 3:

Interview number: 1
Interviewer: Youssef
Interviewee: Jad

-How do you feel about using this app?

I feel like it's fun. Being in a group with people whom I can relate to, who may have passed through hard times like I had. I think we can talk and discuss with each other and see how each one of us is coping with stress, or hard times.

-Can you specify one good aspect and another one that could be better?

the good aspect is that I can interact with other people, and I can even communicate with a psychologist, which is great! Another aspect that can be better is that can I talk privately to the psychologist? Or can it talk to him/her only in the group. I feel like I may need to talk privately to the psychologist sometimes and not only on the group chat.

-Would you trust the results from such an app?

I would, because there is a psychologist who can help the group get better, and progress.

-What do you like the most about this app?

I like the idea about the group, I feel like I can relate to those people, and they can too, and there is also a psychologist, that is a plus.

-Do you think we can improve this app? How?

yes if I can privately talk to the psychologist, it would be a good idea

-Do you think this might help you feel better? How?

I think it does help me feel better, it helps me see that I am not alone going through hard time, or struggling, I can talk to

others and they can show support, and I can also support others, which is amazing

-Would you be comfortable being in a chat group with strangers(anonymous) and a psychologist? Do you think you can freely express your thoughts in the chat and get feedback from others who have experienced/are experiencing similar mental health issues?

I would be comfortable, but being online with strangers is not always a good experience, especially that there are a lot of creeps. I would actually do it, and I think there has to be an option to report someone or try to have some kind of an agreement among the group users to kick someone out. I think the app can have some rules and regulations that users should follow.

Interview number: 2
Interviewer: Ali Wehbi
Interviewee: Zeina Kojok

- 1)How do you feel about using this app?
I feel that it would be very helpful especially if I am feeling down and would like to talk to someone who gets how I feel without judging and without knowing me personally. This would make me feel comfortable and be able to express my feeling better
- 2)Can you specify one good aspect and another one that would be better?
good aspect that the convo is not generic -feels real and personal
- 3) Would you trust the results from such an app?
I would to some extent. Like I wouldn't base my whole life on it but would definitely take the results/convo into consideration and seriously look up and dig deeper into my results.
- 4)What do you like the most about this app?
I like the most that it's like a personal comfort zone, no pressure no expectations, just a place to chat with people that get me and to ease myself + the fact that I have my support team in my hands thus I'll be saving time and money compared to going up see a therapist
- 5) Do you think we can improve this app?
from what I've seen all is good, what you could work on maybe is the accuracy of the results and matching along with the quality of the conversation. Also maybe time the chat. Like if I'm busy I'd prefer to input this so that I can benefit more in less time compared to the days when I'm free and can chat for a longer time.
- 6)Do you think this might help you feel better?
Definitely would and especially if the matching is accurate
- 7)Would you be comfortable being in a chat group with strangers(anonymous) and a psychologist? Do you think you can freely express your thoughts in the chat and get feedback from others who have experienced/are experiencing similar mental health issues?
This is actually what makes this app better than other social media platforms and dms.
The fact that the people I am chatting with are complete strangers and are experts makes everything a lot easier. I would not have to worry about anyone judging what I do or say thus allowing me to be more comfortable and authentic in expressing my feelings and reflecting upon them. One more note: maybe having some kind of archive or file for each user according to previous chats and moods that only the experts have access to would make the results more accurate since the expert would know some background info about that person and would be able to help in the most convenient way.

Appendix C.6 - Milestone 3 :

Literature review 2:The input to SVM and naïve Bayes was a vector of 8 emotions while that of K-means was the whole dataset. The former machine learning techniques will output one emotion

label while the latter (K-means) will work on K-clusters of different frequencies and choose the most convenient label based on this. For the SVM and Naïve bayes approach two folds were used (5 and 10), and different values of K (9 and 10) were used for the K-means approach

-Literature Review 3 extra details: It consists of the following layers: one where words are embedded in a vector of low dimension, one for convolution, and one for the output after finding the largest element from the feature mapping. In this approach, the dataset was converted to a vector representation of the input(words) using a function called Word2vec that proved to improve test accuracy (0.60106) compared to using CNN with no preprocessing. A SoftMax activation function was applied on the output. However, what was deduced in this approach is that adding more CNN layers will not improve test accuracy; it will lead to overfitting. The results of this approach were then regularized (L2) to tackle overfitting.[17]

Appendix D: Milestone 4 interviews

Interviews Introduction to users before interviewing (+video +screenshots):

Hello! We are creating an application that helps people take care of their mental health and we would like your feedback on it.

Our app's features are:

- Users have their own “journal” where they can write and express their feelings in, then we, in the background and using Machine Learning, analyze the emotion and recommend to them certain activities, videos, readings...etc. (Note that we as developers don't actually “read” the journals, the ML model itself breaks it apart and analyzes words, so privacy is secured)
- Users can answer a few questions (on how they're feeling, or what they like), then we give them specific personalized recommendations
- Data about the users would be stored in their accounts for them to access and for us to track their mental health, recommend better and be as accurate and personalized as possible
- Users can set personal goals and we'll help them get reminded of achieving these goals
- Users can also recommend for us ways to improve the app
- FYI (additional): Machine Learning is used for analysis of emotion, giving personalized recommendations, and tracking mental health!

Interviews:

Interview number: 1
Interviewer: Ali Wehbi
Interviewee: Celena Mehirsi

- 1) Do you think the performance of our app (free writing space, personalized recommendations, reminding, and tracking) is sufficient for users needs?

- Yes, i think the app is great for achieving daily tasks and still be able to express freely
- 2) Any concerns on the application?

- not really.
- 3) Specifically on the journal, what do you think about it and about the emotion analysis?

- i think that the emotion analysis is a great way to identify the needs of the user, and the journal is good for the users who prefer to vent freely without worrying about being judged.

4) Do you think writing daily journals is good way to track someone’s mood? What do you think can we improve?

- i think that it surely helps but i also think that writing down daily achievements by the user also helps to identify their level of motivation.

5) What do you think of the idea of suggesting activities, tasks, movies...etc. based on the emotion/mood of a person (or based on their initial preferences), do you think it is effective in making them feel better?

- yes i do, but i’d also consider checking what the user wants to feel instead of what they’re feeling, because people’s ways of coping with negative emotions are different. some may need the ability to feel freely and some may need a mood changer like a fun movie or good music...

Interview number: 2
Interviewer: Ali Wehbi
Interviewee: Reina Osman

1) Do you think the performance of our app (free writing space, personalized recommendations, reminding, and tracking) is sufficient for users needs?

-Honestly, i think it is sufficient since alot of people couldn’t express to anyone, and i love the way the app tracks a person’s life through journals. I think it is a great reminder in order to speak our minds freely on daily basis.

2) Any concerns on the application?

-No , there isn’t any concern on this application, its great!

3) Specifically on the journal, what do you think about it and about the emotion analysis?

-I think the journal is an important part of this applications since it’s more like a secret diary that is safe in there.

4) Do you think writing daily journals is good way to track someone’s mood? What do you think can we improve?

-Of course it is! As for me, i usually speak out eveything i want on papers, on notes , or on a group of myself only, and it definitely makes me feel way better .

5) What do you think of the idea of suggesting activities, tasks, movies...etc. based on the emotion/mood of a person (or based on their initial preferences), do you think it is effective in making them feel better?

-yes it is effective in making them feel better . In my opinion, activities are important for everyone. Such activities can make us relief stress and freshens our mind. There are a lot of ways in order to escape what we’re struggling with, but some of us do not really know how to, so I think the recommendations will be effective, especially the ones that are related to initial preferences.

Interview number: 3
Interviewer: Reeda Al Saintbai
Interviewee: Paul Karim Khaled

1) Do you think the performance of our app (free writing space, personalized recommendations, reminding, and tracking) is sufficient for users needs?

-I think that this app is really sufficient to satisfies users' needs because it contains many categories or subdomains with each one of them targeting one aspect of the overall need. The user will have a lot of choice of activities to do each and every day to feel better

2) Any concerns on the application?

-My only concern is if the user will forget about doing his daily tasks on the application what will happen? Does the application send some notifications to alert him?

3) Specifically on the journal, what do you think about it and about the emotion analysis?

-For the journal, I personally love it because you can write as you like, with many errors and many consonants and it'll still analyse what have been written. Also, you can write whenever you want because it'll not be kept forever it'll disappear for you after sending it. I think this method will make the user stay in his/her comfort zone so that he/she can write whatever he/she wants to without being stressed or worried about what will happen later on.

4) Do you think writing daily journals is good way to track someone’s mood? What do you think can we improve?

-Of course writing in a journal is a good way to track someone's mood because he/she can writes whenever he/she wants and it'll be analysed. However, I think it'll be good to let users having really low mental health or a lot of mental breakdowns to write in this journal many times a day so that they can feel that they're supported by someone every time they need it. Also, writing in a daily journal will allow the user to write everything that happened the same day and he/she can keep them on journal and forget about them. The user will keep his/her worries within the journal and begin a new day with no worries.

5) What do you think of the idea of suggesting activities, tasks, movies...etc. based on the emotion/mood of a person (or based on their initial preferences), do you think it is effective in making them feel better?

-I'm sure that suggesting activities, tasks and movies to users will make them feel better because first they will know that there's an entity (here the App) worrying about them and supporting them. At the same time, knowing that some suggestions are available will let them know that others were in their shoes before so they will maybe feel better soon. Also, suggesting some movies, activities or tasks to do can help the user change his minds and idea and have a new point of view and maybe increase their mental health. For activities for example, there's nothing better than a walk on the coast or in the mountains. Same things for movies, a comedy or a comic movie will always be welcomed to have fun and laugh a lot!

6) Any additional comments?

-I love the idea of this application mainly during these tough times because I think we're all feeling alone from time to time being stuck at home. This application can help us to have a better mental health.

Interview number: 4
Interviewer: Reeda Al Saintbai
Interviewee: Razan Gaith

1) Do you think the performance of our app (free writing space, personalized recommendations, reminding, and tracking) is sufficient for users needs?

-This app is a substituent for a person’s multi-tasking routine. It is equipped enough to include all of those features in just one place. All what a person needs during their day are motives and reminders, provided through the personalized recommendation and the pop-up reminding features, respectively.

2) Any concerns on the application?

-One of my concerns include the accuracy of the mood detection and emotion prediction based on what’s written in the journal. However, knowing that mood is not only detected from the words mentioned in journal but also from specific questions asked makes it reliable.

3) Specifically on the journal, what do you think about it and about the emotion analysis?

-The journal is a great option as it provides a free space for thoughts and emotions’ expression, knowing that data is confidential and privacy is maintained which renders it a safe space for venting and saving memories as well as moments. Moreover, the emotion analysis is done meticulously, taking into consideration critical words and phrases to translate a person’s mood.

4) Do you think writing daily journals is good way to track someone’s mood? What do you think can we improve?

-It is always a good mood-tracking method to jot things down, hence it provides a beneficial option for people who like tracking their daily events and feelings. User can also track how their mood evolved during a specific month or post any event, be it traumatic or motivational. One suggestion of an additional feature to this section of the app would be including a ‘summary’ of what a user writes on a specific day. By this, he/she would refer back to the summary alone to track their mood instead of having to go through all the sentences. The summary could be a group of randomly chosen sentences and ideas to be expressed as bullet points.

5) What do you think of the idea of suggesting activities, tasks, movies...etc. based on the emotion/mood of a person (or based on their initial preferences), do you think it is effective in making them feel better?

-DEFINITELY! People are in need of suggestions to fill their day with useful and mood-changing activities and events. Suggesting a movie or an indoor/outdoor activity would leave people occupied with what is healthy for their well-being. For ex. if their detected mood was ‘sad’, the app could suggest a ‘happy’ movie; however, if the detected mood is already ‘happy’, suggestions could include movies for a cozy night or comedy ones.

6) Any additional comments?

-Overall, it is a great app with interesting features.

Interview number: 5
Interviewer: Shaza El Fakih
Interviewee: Ali Mazloun

1) Do you think the performance of our app (free writing space, personalized recommendations, reminding, and tracking) is sufficient for users needs?

- The background as well as the space provided for us to insert our emotions into is well done. Personally I would like to write on white box with rounded edges. My conclusion is based on the screenshots provided by the developers that clearly showa how this app is positivity interacting with the user throw the accurate predictions

2) Any concerns on the application?

-As long as this app secures my private data I am ok to use it

3) Specifically on the journal, what do you think about it and about the emotion analysis?

- i feel like the use of words is what decides the overall output

4) Do you think writing daily journals is good way to track someone’s mood? What do you think can we improve?

-our emotions as humans are the accumulation of our daily experience and thus keeping track of daily experiences will be a successful strategy

5) What do you think of the idea of suggesting activities, tasks, movies...etc. based on the emotion/mood of a person (or based on their initial preferences), do you think it is effective in making them feel better?

-long ago I heard that gym is the best place to maintain a good mood. so proposing set of exercise to follow depending on your mood is one of the most techniques practiced by this app

Interview number: 6
Interviewer: Shaza El Fakih
Interviewee: Khaled Hassan

1) Do you think the performance of our app (free writing space, personalized recommendations, reminding, and tracking) is sufficient for users needs?

-Yes it is.

2) Any concerns on the application?

-No concerns.

3) Specifically on the journal, what do you think about it and about the emotion analysis?

-Emotion analysis is helpful especially for people facing some mood swings or specific situations that he/she can overcome with simple help and recommendations.

4) Do you think writing daily journals is good way to track someone’s mood? What do you think can we improve?

-Writing daily journals will for sure help track someone’s mood as well as his/her personality which will make it easier to recommend a personalized solution according to

his/her preferences. I would recommend adding face recognition to identify the person's mood and suggest solutions; as well as collaborating with some phycology doctors since some cases would need some professional yet immediate help.

5) What do you think of the idea of suggesting activities, tasks, movies...etc. based on the emotion/mood of a person (or based on their initial preferences), do you think it is effective in making them feel better?

-Any activity suggestion helps the person to focus on something else than what is taking his/her concentration and might help in changing his/her mood especially when the recommendation is personalized. It should serve the person's specific needs; specifically, according to the situation he/she is facing.

Interview number: 7
Interviewer: Shaza El Fakh
Interviewee: Majd Harake

1) Do you think the performance of our app (free writing space, personalized recommendations, reminding, and tracking) is sufficient for users needs?

-Yes it is. The issue of mental health needs to be followed up in a consistent manner, so the reminders and procedures taken by this app is sufficient.

2) Any concerns on the application?

-As a user, I might be worried if the app developers did not consult any professional in the medical field (psychological specifically) if it really is beneficial or not. But, if they did, then it is an amazing app!

3) Specifically on the journal, what do you think about it and about the emotion analysis?

-It really is a good idea to write what I have been passing through on a journal, it's kind of a stress reliever. The feature of emotion analysis is also a great idea because based on my mood, the app would suggest for me certain activities to lift my spirit up.

4) Do you think writing daily journals is good way to track someone's mood? What do you think can we improve?

-It is a perfect way. If the journals could be saved, I could go back and check everything I was going through and see if I solved my issues now.

5) What do you think of the idea of suggesting activities, tasks, movies...etc. based on the emotion/mood of a person (or based on their initial preferences), do you think it is effective in making them feel better?

-It's a very good option that the app could recommend certain physical activities and movies to watch to help boost our emotions and mood swings.

Interview number: 8
Interviewer: Dina Younes
Interviewee: Maarouf Yassine

1)Do you think the performance of our app (free writing space, personalized recommendations, reminding, and tracking) is sufficient for users needs?

-Actually yes, the way this app allows the users to express their emotions freely without any bounds on word amounts will actually help users relieve some stress while typing those words. Reminders also are important to allow users to use the platform daily and analyze their inputs day by day. Recommendations also help in boosting the mood.

2)Any concerns on the application?

-Nothing about it's capabilities but mainly some privacy issues about who may be able to see my inputs and how safe the app might be(as in hacking or data leaks). But other than that all is perfect

3)Specifically on the journal, what do you think about it and about the emotion analysis?

-Actually journaling is the feature that caught my attention the most. I used to journal when feeling bad and free writing with expression of feelings not only serves to help your app, but also plays a role in relieving a person

4)Do you think writing daily journals is good way to track someone's mood? What do you think can we improve?

-Absolutely! Though I could suggest one thing for people who don't like to journal. You can add a feature for those type of people where you ask them every X hours about how they are feeling , to which they answer briefly instead of writing long journals.

5) What do you think of the idea of suggesting activities, tasks, movies...etc. based on the emotion/mood of a person (or based on their initial preferences), do you think it is effective in making them feel better?

-This is a great idea. When someone is in a desperate/abs mental state they never know what to do to make themselves feel better, therefore suggesting activities to help those people would really come in handy in a lot of situations

6)Any other comments (optional)?

-I love the idea and would personally use it! Keep it up and looking forward to seeing it available on our mobile devices 😊

Interview number: 9
Interviewer: Dina Younes
Interviewee: Jad Alaeddine

1) Do you think the performance of our app (free writing space, personalized recommendations, reminding, and tracking) is sufficient for users needs?

- I believe that the performance of the app can be very helpful to user's needs, however, I would also recommend a feature that connects users to a therapist or maybe even connect to random people who also use the app.

2) Any concerns on the application?

- If the application were to get hacked and all of the user’s private information was leaked. Also, what if the machine outcome ended up having a negative effect?

3) Specifically on the journal, what do you think about it and about the emotion analysis?

- I think it’s a very creative idea to write in a journal. As for the emotional analysis, people are getting better and better at hiding their emotions, even hiding their true emotions from their self (participate in self-deception). So it may be difficult for a machine to correctly analyze someone’s emotions if they don’t write genuine things in the journal.

4) Do you think writing daily journals is good way to track someone’s mood? What do you think can we improve?

- I personally have never written anything in a daily journal. Maybe I should start doing so to get things off my chest and finish some chapters in my life. It could definitely decrease the amount of overthinking I do.

5) What do you think of the idea of suggesting activities, tasks, movies...etc. based on the emotion/mood of a person (or based on their initial preferences), do you think it is effective in making them feel better?

- LOVE IT! Not so good for procrastinator though.

Interview number: 10
Interviewer: Dina Younes
Interviewee: Ghinwa Hammam

1)Do you think the performance of our app (free writing space, personalized recommendations, reminding, and tracking) is sufficient for users needs?

-These features are sufficient for users trying to engage in healthy mental habbits where they can express and identify their emotions and get advice. However, it is insufficient and not appropriate for people suffering from mental diagnosis that should be followed by an expert.-

2)Any concerns on the application?

- The application may not identify people who aren’t eligible for it who need medical help.

3)Specifically on the journal, what do you think about it and about the emotion analysis?

-Journaling is an essential step in the app, not only for ML emotions analysis, but also for the users to explore their emotional state more effectively and precisely after putting it into words. However, the ML model should be very strong to detect the complexities of human description, especially that journals are subjective and unique relative to a person’s style of expression, and that they may contain complex and contradicting emotions.

4)Do you think writing daily journals is good way to track someone’s mood? What do you think can we improve?

- Yes, there is no better way to understand a person’s emotional state than to analyze their own feelings from their own point of view, and that is present through journaling where users declare their emotions subjectively ans personally. It is also a good way to track the person’s mental health and possible problems over the experiences, events, and feelings

they write. What I recommend to improve is setting a daily/weekly journaling plan where the user is committed to journaling continuously

1) Do you think the performance of our app (free writing space, personalized recommendations, reminding, and tracking) is sufficient for users needs?

I think it is, because it is a unique app, and I feel like it helps people have a better mood.

2) Any concerns on the application?

At first I was wondering whether it is secure and anonymous, but since you assured me that the machine learning aspect of the application only sees my text, and not humans, I am now relieved

Interview number: 11
Interviewer: Youssef Jaafar
Interviewee: Joseph

3) Specifically on the journal, what do you think about it and about the emotion analysis?

It looks great and I am amazed how it can actually assess emotions from text.

4) Do you think writing daily journals is good way to track someone’s mood? What do you think can we improve?

Yes, I always write journals everyday, and I am super excited to use such app that tracks my mood everyday, after writing the journal.

5) What do you think of the idea of suggesting activities, tasks, movies...etc. based on the emotion/mood of a person (or based on their initial preferences), do you think it is effective in making them feel better?

I always meditate, and workout when I am not in a good mood, and it helps me a lot become resilient and face any challenge I endure.

6) Any other comments (optional)?

I would like to use such app, in case it was launched

Interview number: 12
Interviewer: Youssef Jaafar
Interviewee: Hassan

1) Do you think the performance of our app (free writing space, personalized recommendations, reminding, and tracking) is sufficient for users needs?

-Answer: yes it is, users will express their feelings and it will help them.

2) Any concerns on the application?

-Answer: no at all

3) Specifically on the journal, what do you think about it and about the emotion analysis?

-Answer: it can be more specific, but it's good.

4) Do you think writing daily journals is good way to track someone's mood? What do you think can we improve?

-Answer: writing daily journals is good, but it's better to let the app (the fictive person) listen to the person.

5) What do you think of the idea of suggesting activities, tasks, movies...etc. based on the emotion/mood of a person (or based on their initial preferences), do you think it is effective in making them feel better?

-Answer: good idea, and it will help them.

6) Any other comments (optional)?

-Answer: no, thank you.

Interview number: 13

Interviewer: Youssef Jaafar

Interviewee: Nader

1- Do you think the performance of our app (free writing space, personalized recommendations, reminding, and tracking) is sufficient for users needs?

-Answer: YES

2- Any concerns on the application?

-Answer: The machine learning that tracks emotions might not be accurate

3- Specifically on the journal, what do you think about it and about the emotion analysis?

-Answer: it is great and something innovative and could be helpful in a lot of cases.

4- Do you think writing daily journals is good way to track someone's mood? What do you think can we improve?

-Answer: it is good to some extent but not everyone usually writes when he is feeling low, it would be great if you could put a video implementation that detects the mood of the user then depending on that to do a multiple question answer then depending on that recommend him videos or quotes or stories with about great people with similar situations...

5- What do you think of the idea of suggesting activities, tasks, movies...etc. based on the emotion/mood of a person (or based on their initial preferences), do you think it is effective in making them feel better?

-Answer: it is something so subjective and could not work on all people, because not all activities or going to a movie might please or change the mood of someone.

6- Any other comments (optional)?

-Answer: Good startup idea