

# 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 interviewing stakeholders for the initial problem statement, brainstorming, conducting a literature review, and deciding on 3 prototypes to be tested, we organized 19 interviews for stakeholders’ feedback, and we concluded by choosing one prototype as a step towards our final solution.

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).

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.

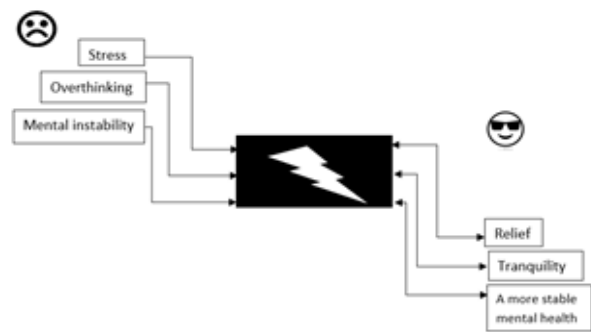
II. DEFINE PHASE

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.



• Interview 2:

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.

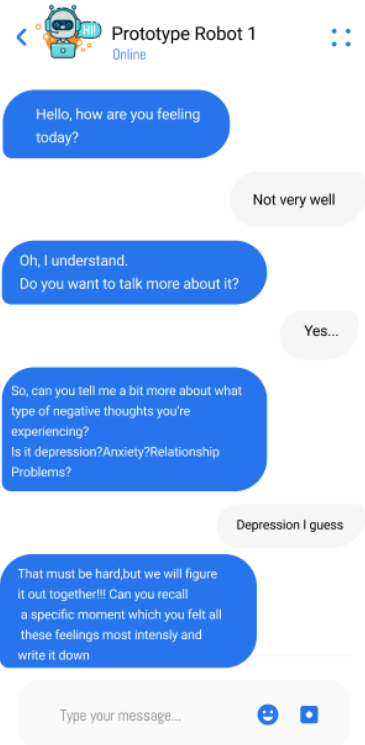
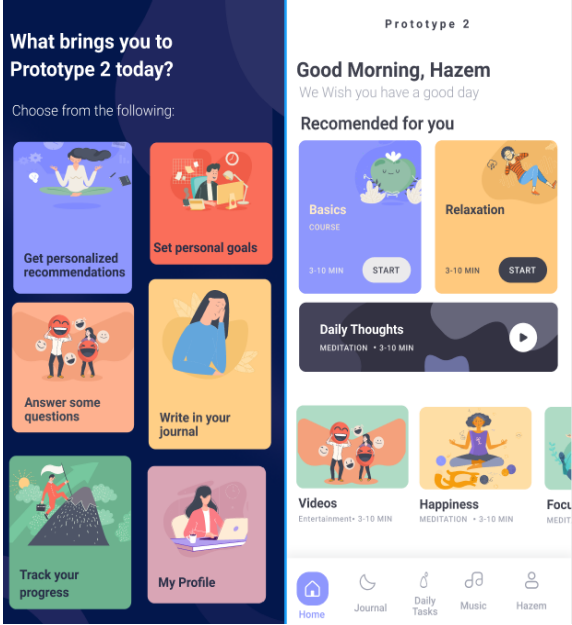


fig. 2: Prototype 1

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.

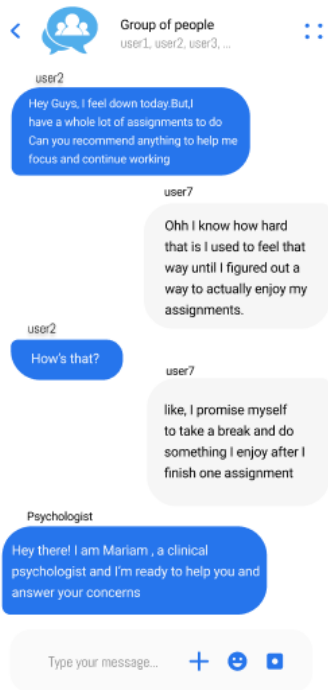


Fig. 4: Prototype 3

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	Protot ype
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

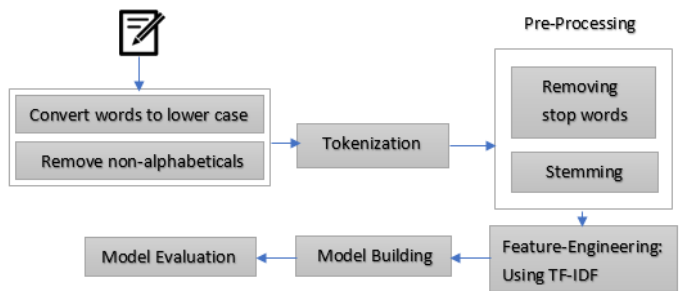
	label	text
0	joy	On days when I feel close to my partner and ot...
1	fear	Every time I imagine that someone I love or I ...
2	anger	When I had been obviously unjustly treated and...
3	sadness	When I think about the short time that we live...
4	disgust	At a gathering I found myself involuntarily si...

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							

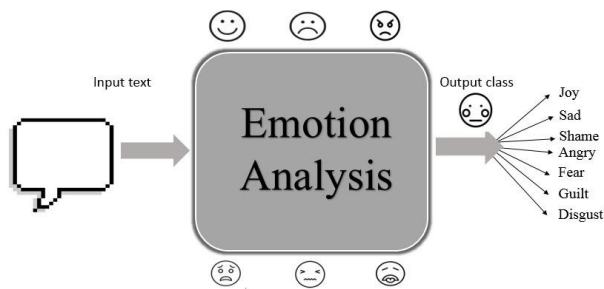
4- Testing on real-user input:

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



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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

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 you 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 w 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 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.

10) Do you think someday you’ll be able to feel better again?

I hope that all the crises our country is facing will be

solved as soon as possible. The sooner the better. It feels overwhelming actually. I hope someday the situation gets better. However I don’t think we are going to live the same as before.

We used to demand basic human needs, like electricity, water, old age security, but now look at what are our demands now: just to get out of the crisis.

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]

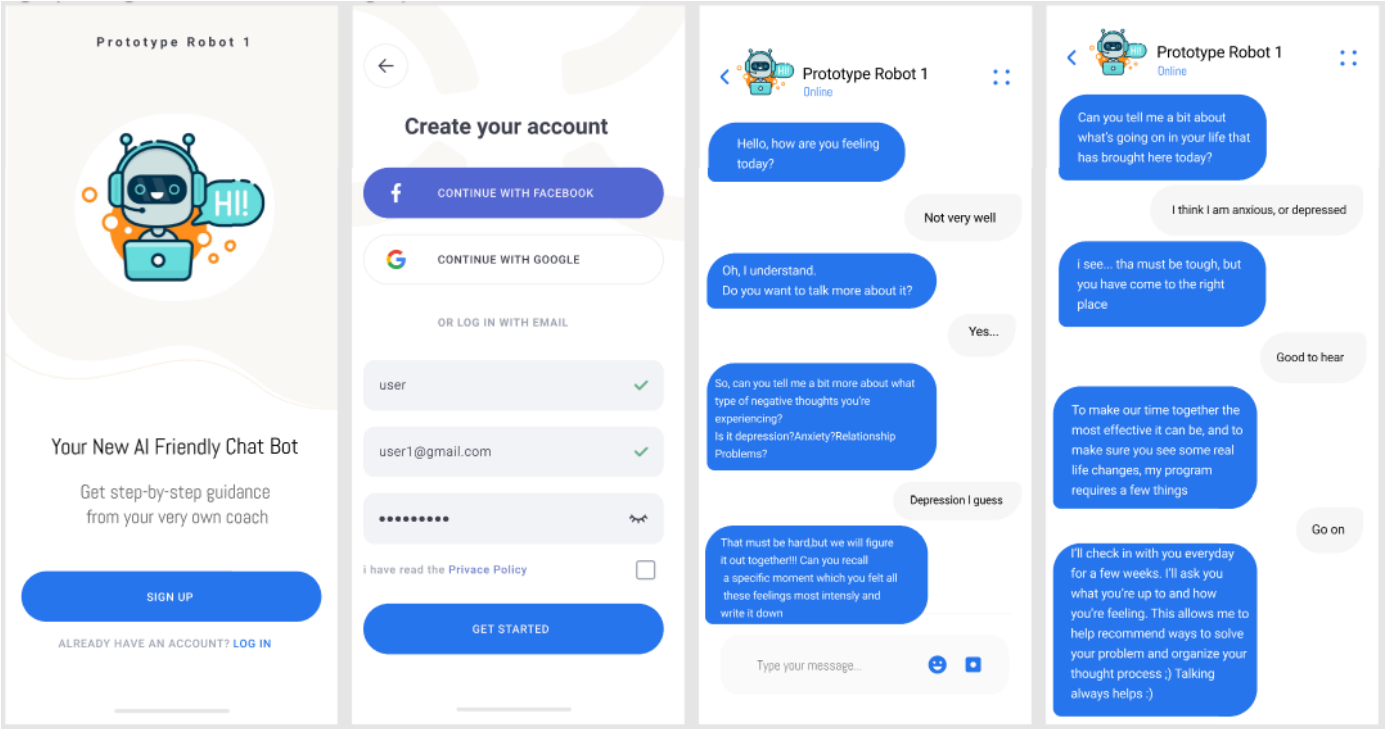
Woebot app is an artificial intelligent chatbot app that uses principles of cognitive-behavioral therapy (CBT) to help people cope with their feelings of hopelessness, anxiety, stress, and depression, through interactive chat engagement. We did not find the exact models used in Woebot, but we believe 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:

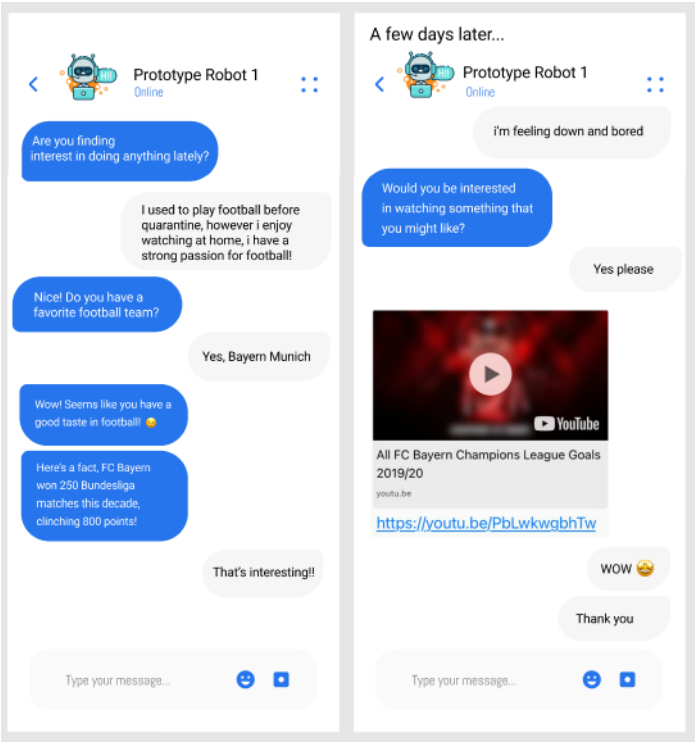
	Challenge 1	Challenge 2	Challenge 3	Challenge 4	Challenge 5	Challenge 6
Calm App	✓ interactions with other personnels is not required	✓ users are not interacting with humans	✗	✗	✗	✓ daily streaks and mindful minutes to track the user's progress.
Woebot	✓ it is an application	✓ objective and data is protected	✗	✓ 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

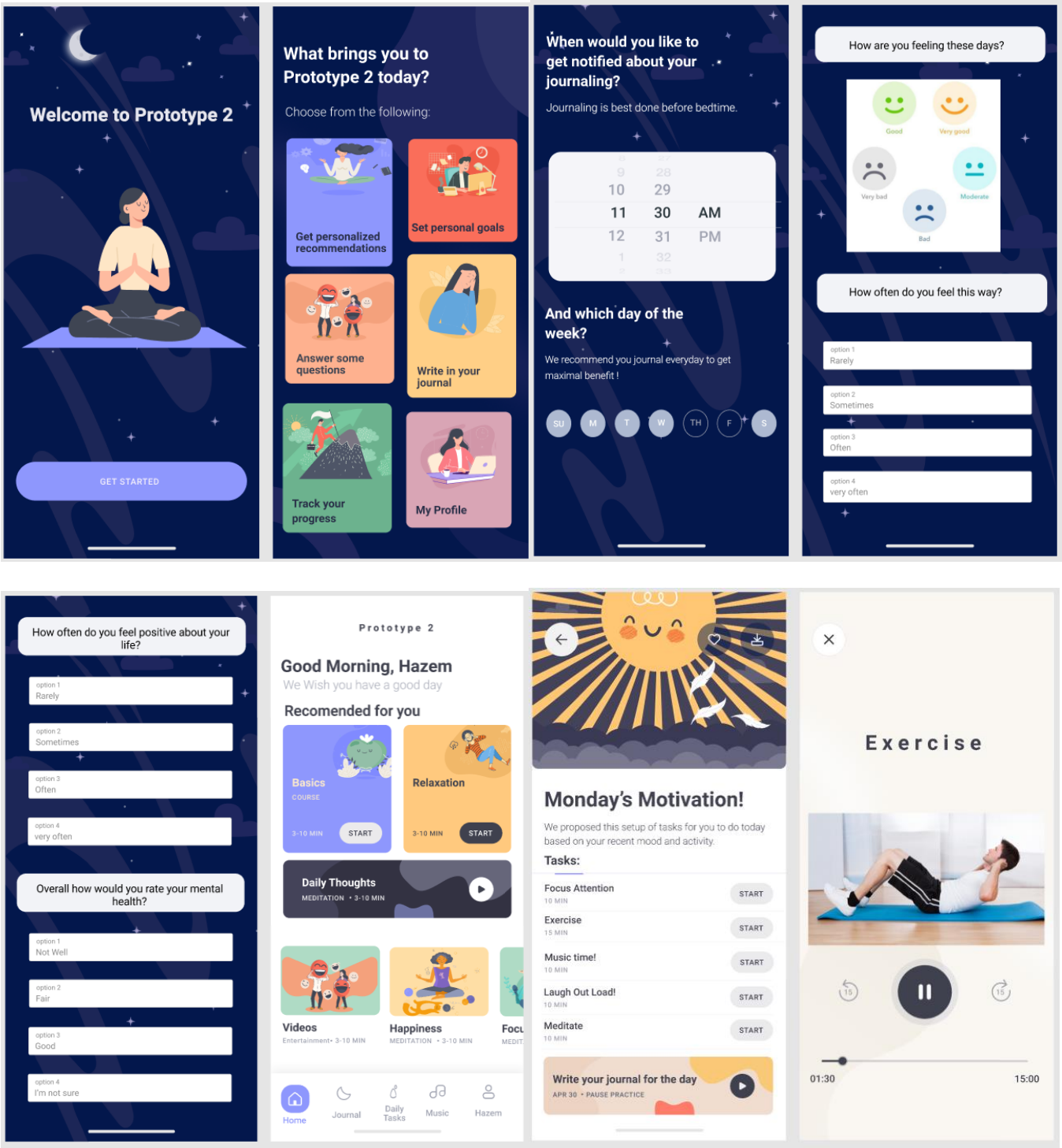
C.4.1 - Prototype 1: Screenshots



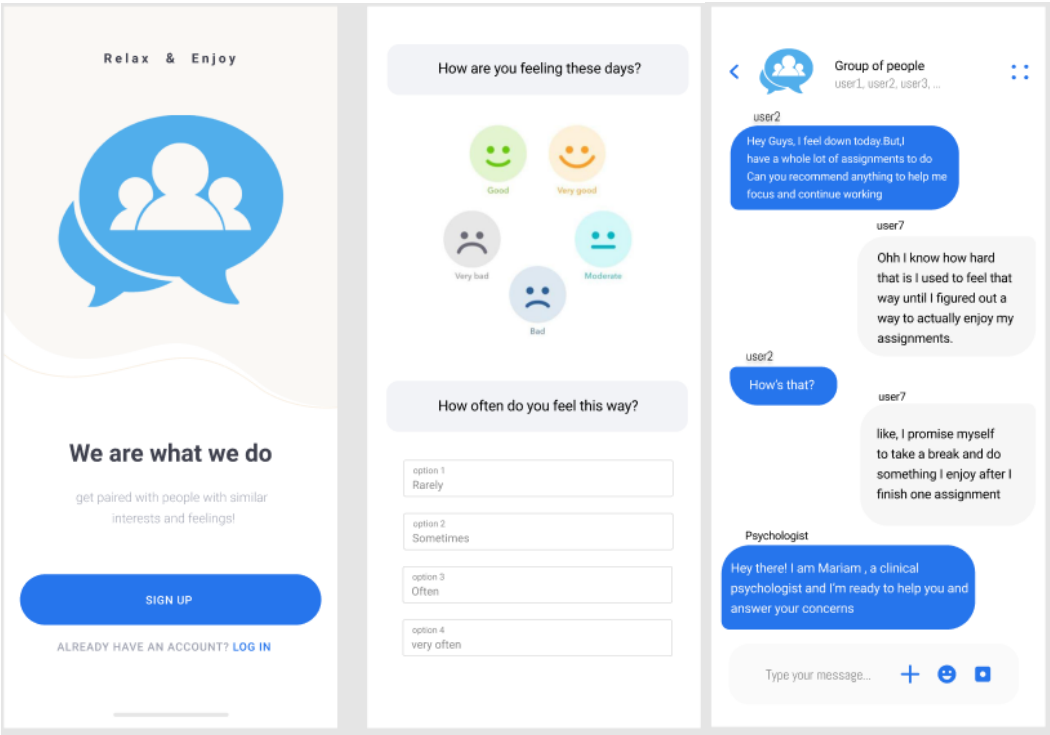




C.4.2 - Prototype 2: Screenshots:



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]