

AUTOMATED PSYCHIATRIST

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ii. Statement of Problem:

Indians are among the world's most depressed. According to a World Health Organization-sponsored study, while around 9% of people in India reported having an extended period of depression within their lifetime, nearly 36% suffered from what is called Major Depressive Episode (MDE).

Depression affects 9% of Indians but day-to-day anxieties are sending more Indians round the bend, say doctors ahead of World Mental Health Day. Anxiety, affecting 25% of the population, is possibly the first stage to the serious-to-handle depression if not addressed.

Moreover, people suffering from emotional problems usually don't open up easily and hesitate in visiting a psychiatrist.

This project is aimed to help them maintain their anonymity and find appropriate solutions to their problem without any hesitation.

iii. Background

There exists a culture of silence about individual problems.

Psychological problems and their expression are considered a narcissistic enterprise.

Even if people step forward to visit a psychiatrist, there are just 3500 practising psychiatrist in India where as we need about 11,500.

67% sufferers show suicidal tendency and 17% make an attempt.

45% of teens with symptoms of depression take to alcohol and drugs.

1 in every 4 women and 1 in every 10 men suffer from depression in India.

India is advancing with rapid stride. Sadly, along with this is the problem of psychological disorders especially depression that is wasting many lives and ruining them down in their most productive years. There are around 120 million such sufferers, enough to fill a state of Maharashtra.

In India, such psychological problems are under-recognised.

According to Dr. Ashit Sheth , consultant psychiatrist with Bombay Hospital & Medical Research Centre, Mumbai.

“Money, youth, success, talent, nothing safeguards against their tenacious grip. But fortunately, it is highly treatable.”

According to Dr. Rajesh Sagar, professor of psychiatry at AIIMS,

“ Just 10% people see a psychiatrist, 90% suffer without ever receiving the help they need. There are evidence-based effective medicines. Early detection plays crucial role. To ensure this, we need to come up with a solution to proper diagnosis of such disorders.”

iv. Abstract

1. Objectives

The main Idea is to eventually being able to convert our hand held device into a counsellor, a psychiatrist. The idea is motivated by the fact that what all our mobile knows about us already, like- our location(maps), our sleeping cycle(whatsapp,facebook usage), our physical health(google fit tracking app), our likings and dislikings(apps, games, fb etc), our google searches hence pretty much everything. So basically it is already tracking everything we are doing all the time. We want our mobiles to be smart enough to mine this data and can look for our emotional health.

We realize that the idea is far stretched and therefore we are working by taking small steps towards it. So currently our aim is, to develop an application which can provide psychological diagnosis by

- Taking voice input from the user in response to questionnaire
- That in turn is classified to a particular mood based on the tone of the user's voice and the answers to the set of questions asked.
- To efficiently be able to differentiate if a person is suffering from some psychological problem or is just being low normally so that appropriate measures can be taken.

2. Beneficiaries (For whom)

This is aimed to provide immediate help to the sufferers of psychological problems before they decide to consult a psychiatrist. This will ensure early detection which is crucial in treatment.

There are people of varying age and background that seek treatment. Here are some examples of the diverse range of problems faced by people:

- a wealthy young man caught in family conflict, distressed and unable to function in his business ("I try to be nice to everyone. Nobody understands me");
- an elderly man who tried to jump from the 11th floor, and saved by his son in the nick of time;
- a bright student of 10th standard, brought in for her mind-wracking fear of exams;
- a young MNC executive, who worked relentlessly hard, without a break, for three years, listless and fatigued now, unable to enjoy anything in life;
- a young divorcee, with a child, who finds it hard to drag herself out of bed and sustain any job beyond six months;
- a young law student, who has come back from her university in Canada, unable to bear the alienation and solitude of a new environment.

3. Value of results (Use)

The growth and development of the nation depends on the efficiency and productivity of the people. For this we must ensure the health of the citizens. More and more people of varying age and background are succumbing to the psychological disorders. Through this project, the primary diagnosis is aimed to reach to many people. The accessibility to the diagnosis especially who hesitate to approach the psychiatrist, in the primary objective of this project.

iv. Research

1. Present methods of tackling the problem (if any)

Currently, the problem of psychological disorder receives little concern at its initial stages . Even if people step forward to visit a psychiatrist, there are just 3500 practising psychiatrist in India where as we need about 11,500.

To bridge this gap, we need to find an efficient solution for providing the primary diagnosis.

2. Proposed Solution

We aim to make a digital diagnosis available for emotional problems. We want our hand held devices to be smart enough to differentiate our emotional tantrums from some psychological ailment. Hence we are aiming to make an rigid and scalable algorithm to diagnose psychological ailments. Though we plan to complete the first step of being able to diagnose correctly but at later stages we want our mobile to automatically detect the problem based on our searched history and other mobile activities.

3. Novelty of Approach: How is your solution better than existing products that address the same problem?

This project aims to provide an easily accessible solution to diagnose the psychological disorders. The system architecture is designed so that it is affordable. Active learning mechanism will increases available psychological data available for data mining. It will further help to study mental health of the population as whole.

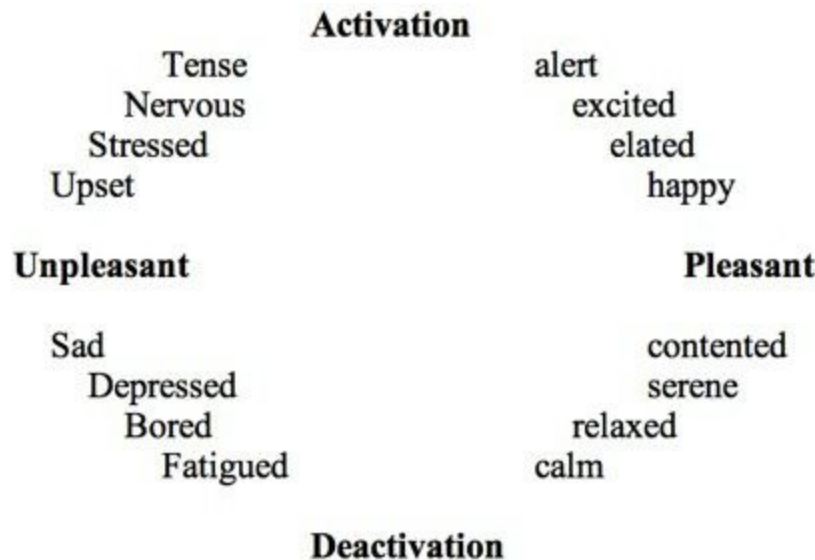
vi. Technical Report

1. Description of concepts, theories or approach involved in the proposed solution.

Proposed solution will be based upon emotional classification based upon Russels' Circumplex model according to which, all emotions that a person experience can be represented by the vector representation in 2D space with the linear space as valence(attractiveness) and arousal(activation).

This shows Russell circumplex model of emotional classification.

Our classification model is based on this scheme as it is verified to be very accurate.



Here X axis represents valence(attractiveness) and Y axis represents arousal(activation).

A cleverly designed questionnaire is fed to user whose inputs are recorded and emotionally classified.

Over the time, we plan to increase the efficiency of the system by applying Active learning(Machine learning) techniques.

Active learning is a special case of semi-supervised machine learning in which a learning algorithm is able to interactively query the user (or some other information source) to obtain the desired outputs at new data points.

This is a situation in which unlabeled data is abundant but manually labeling is expensive. In such a scenario, learning algorithms can actively query the user/teacher for labels. This type of iterative supervised learning is called active learning. Since the learner chooses the examples, the number of examples to learn a concept can often be much lower than the number required in normal supervised learning. With this approach, there is a risk that the algorithm be overwhelmed by uninformative examples.

We wish to deploy Active learning algorithms on the [[Emotional attributes] : disease] data. Once we have sufficient data cases, it will automatically increase the efficiency of our system hence making our

automated psychiatrist reliable.

2. Technical aspect of the proposed solution.

The application will take user input in form of speech. The voice input is converted into text for our application and then it is fed into emotional classifier to classify the mood of subject into 20 various kinds.

Efficiency of diagnosis is directly related to accuracy of emotion classification.

The emotional analysis is done using ANEW dictionary. Wherein it takes two inputs-gender of the subject and his answer on the question asked by application and returns the valence value and arousal value coordinates which when plotted on the emotional graph with x and y coordinates respectively, gives us the current emotional state.

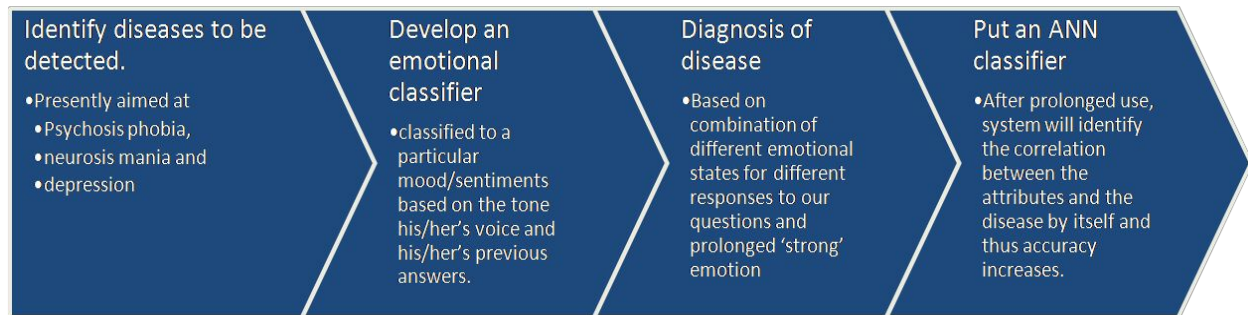
Each input is emotionally classified and also the cumulative of all the inputs and their classification are then taken into consideration to finally determine the user's emotional state.

Once we have the user's state of mind, application will ask user some more question, this time specific to his mood.

The main aim of the above procedure is to generate various emotional attributes of a person and based on the symptoms of particular diseases, diagnose the person. Major challenge is being able to ask relevant questions that can help us identify the values of major attributes. Once we have the values of various attributes then disease can be classified based on its symptoms.

Over the time the efficiency of the system should increase as we will deploy active learning on the data generated through the regular use of the application.

3. Detailed technical specifications and pictorial representations (block diagrams)



Above is our plan of action for the project.

4. Description of the flow of operations demonstrating features and functionality.

First of all, we have classified major diseases that affect the nation. These diseases are Psychosis phobia, neurosis mania and depression. We have chosen these diseases majorly because the emotional signature of all these diseases are very less overlapping and can be easily monitored with the above mentioned Russel's circumplex model. Once we can determine the emotional state of the person from the speech input he gives to the questionnaire in our app, we can diagnose the disease based on its emotional signature.

Over the time data collected can help us improve the efficiency of our system by applying Machine learning concepts i.e Active learning.

Based on the diagnosis, application can suggest the user various remedies of the disease with a query made to google regarding that disease. Even nearby psychiatrist can be suggested based on his diagnosis. If the person wants to share his emotional state with close people/family etc then a functionality to share his diagnosis result with his family/guardians can also be implemented that can help in better connectivity with other people and in response help him overcome the situation.

5. Performance estimate of the solution.

This system aims to provide an easily accessible solution to tackle psychological problems. The performance will be set to improve due to the active learning mechanism. Over the time, the analysis of the accumulated datasets will not only enhance its applicability but also help the practising psychiatrists in improving their studies.

6. Experimentation done to establish the workability of the above.

We are modelling the emotional analyser and have tested it for various keywords. So far, we are able to compute a mixed bag of keywords and extract the most appropriate emotion to describe the state of the mind of the user. Next is mapping the emotion to the disease and we are working on that part currently.

Link to the Video showing the prototype.

Currently, we have developed the most important part of the project i.e. the emotional classifier that works on text input. The next part of the project will only be possible if this part is flawless. In this video we show how well our project demonstrates the emotion of a person based on the text he enters. Currently it is text input but input will be taken by speech in the completed project using google APIs.

[Click me!](#)

vii. Cost factor analysis

Here we want to present all the major costs involved in this process.

The main areas of expenditure are:

1. Development work - College chapters can help with development work with meagre charges but other incentives such as work experience on their resumes.
2. Deployment work - This will be the main charges that will be required to be borne. Total charge for a scalable network for tens of lakhs of users is to be accounted. According to current rates, around Rs 1000-2000 p.m. is there for hosting the server for processing the large amount of data.
3. Play store one time fees and such small expenditures. These are one time charges as meagre as 25\$ (approx Rs 1500).

So the initial charges will be as low as Rs. 3500 that is incomparable with the benefits this system is giving us.

Revenue generation:

1. If the application is launched and well received, then we can aim to generate some revenue through selling anonymous data for surveys and emotional research. The data can be guaranteed to maintain anonymity and privacy of individuals.

We need to weigh the condition it will resolve and also the research avenues it will open versus the one time costs of the above setup. The masses it will directly and indirectly uplift by tackling the major concern of today's life is a benefit that will overshadow any one time expenses it can cause.

viii. Results

We have researched upon the problems that we can tackle initially.

Currently aiming at

- Psychosis phobia,
- neurosis mania and
- depression

because of varied emotional signature of these diseases

We have designed and developed an emotional classifier that learns the emotion of the person based upon few questions asked.

We are currently working upon:

- Diagnosis of certain diseases based upon their symptoms.
- Putting an Artificial Neural Network active learning mechanism in place

We hope that this prototype is effectively implemented as such a solution can help millions of sufferers who don't get the required psychological help in time. This will not only help them recognise first signs of their trauma but also be boon for the nation at large.