Symptomatic Diagnosis and Prognosis of Psychiatric Disorders through Personal Gadgets

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1. Problem

Delay in identification of symptoms, diagnosis and prognosis of a mental disorder hinders quality mental healthcare.
Can we utilize the rapidly evolving, immersive ecosystem of human computer interaction to raise an early alarm on the onset of symptoms of potential psychiatric disorders ?

2. Motivation

Psychological problems are often overlooked due to

- Lack of awareness
- Social stigmas
- Inaccessibility of medical support

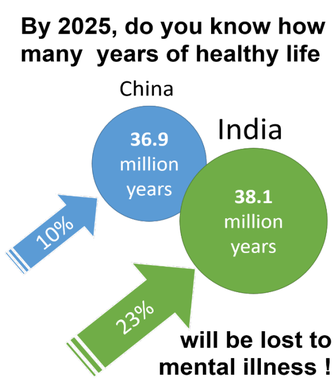


Figure 1. *By 2025, 36.9m years of healthy life will be lost to mental illness in China (10% increase), and 38.1m in India (23% increase) [1].*

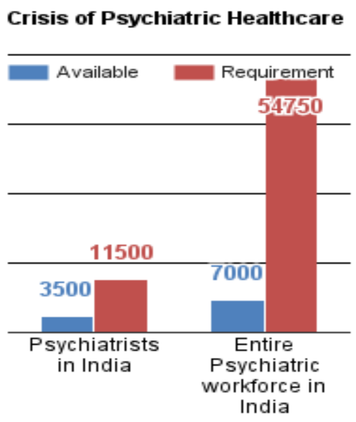


Figure 2. *As per Union Ministry of Health & Family welfare in India, there are just **3500** psychiatrists for **1.3 billion people** [2].*

Even after consultation and treatment, a large number of disorders worsen due to [3]

- Lack of regular monitoring
- Less time spent with doctor
- Side-effects due to heavy medication not reported

3. Our Approach

We first identify these sources of personal data and then leverage the patterns to recognize potential symptoms of any disorders.

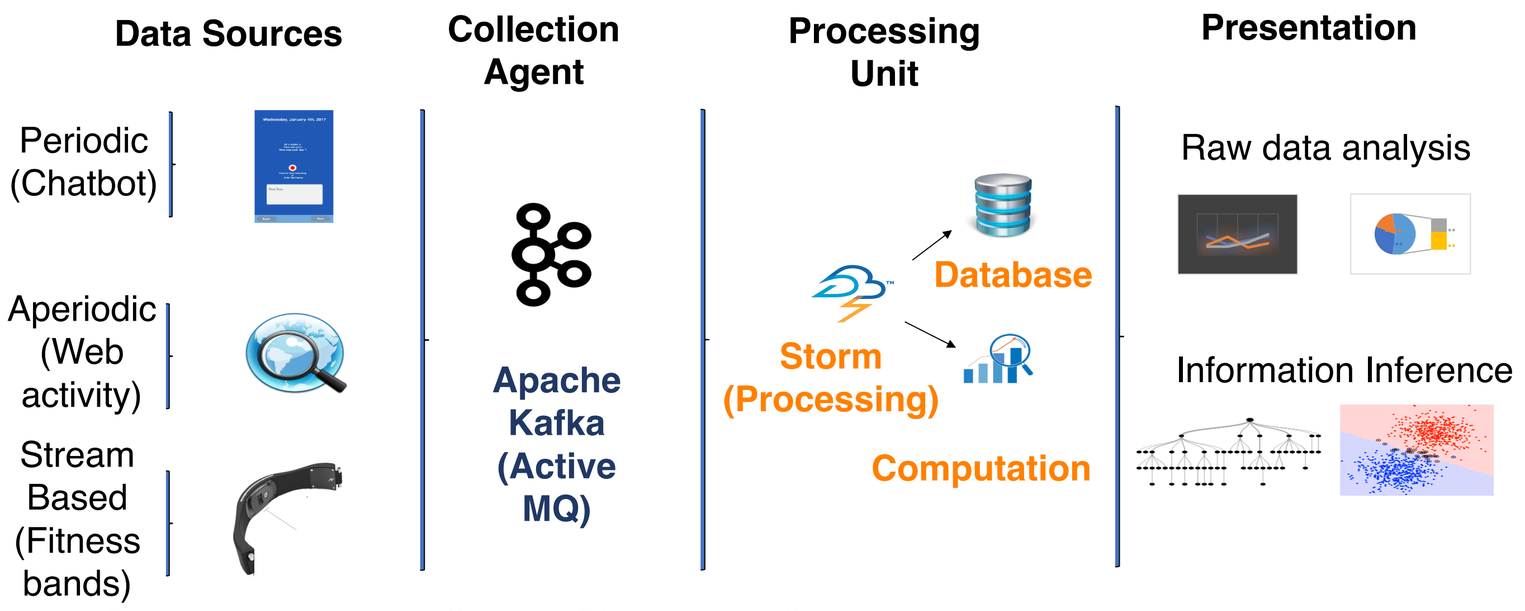
Figure 3. *Word Clouds revealing symptoms*

Thereby, tracking an individual's mental health state offers twin benefit of raising an early alarm and tracking recovery.

Literature Cited

[1] Liu et al. (2016). Reforming mental health in China and India. *The Lancet*, *388*(10042)
[2] Nadu, T., & Health, M. (2016). Shortage of psychiatrists hits treatment - Times of India
[3] Wasan et al. (2009). Practice patterns and treatment choices among psychiatrists in New Delhi, India: A qualitative and quantitative study. *Social Psychiatry and Psychiatric Epidemiology*, *44*(2), 109–119.
[4] Bedi et al. (2015). Automated analysis of free speech predicts psychosis onset in high-risk youths. Schizophrenia, 1(May), 1–7.

4. Methodological Framework for Emotional Journal (MeEJ) Process Pipeline



5. Discussion

HCI Concerns

- ***User Control & Freedom*** - Subscription based model to decide the data sources.
- ***Aesthetic and Minimalist Design*** - Symptoms recorded in current natural setting, through speech input and background processes in most cases.
- ***Consistency and Feedback*** - Nuanced 24x7 Multi-scale time series analysis and subtle feedback.
- ***Limited user emotion captured*** - Majority of data collected is textual, while humans express their sentiments vastly through speech and non-verbal communications such as body language, behavior and socio-cultural aspects.

Prototype

Figure 4. *Background color is a feedback of the sentiment analyzed. It is based upon **color psychology theory** to help the user with Blue hues to relax and destress the negativity and Yellow hues to stimulate the positive emotion.*

Russell's Circumplex model of Affect We have utilized this model to predict the emotional state through Chabot (emotional Journal) application.

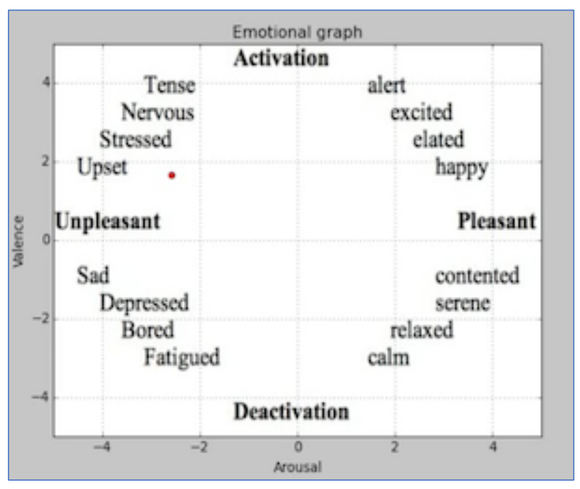


Figure 5: *Russell Circumplex model. Plot for the following data: "**I am afraid of what others will think of me. I made a horrible mistake. I should never had trusted him.**" collected using Chabot application.*

Future Work

With more smart personal devices being developed, the psychiatrists may suggest certain tracking devices, to monitor symptom indicators with more efficiency and reliability as routine process. Internet of Things (IOT) based devices may become potential data sources.

6. Use case (Schizophrenia)

Categorized Symptoms [4]

Positive (Psychotic)	Negative	Disorganization
••Delusion ••Hallucinations ••Ego Disorder	••Social Withdrawal ••Blunted Effect	••Incoherent Thoughts and Behavior

Proposed approach for symptomatic diagnosis of schizophrenia

Symptom	Identifiable Data Sources
Hear threatening voices, Delusions, Difficulty in experiencing pleasure & focus	Chatbot Application, Web and Social Media Activity
Motor immobility	Smart wearable gadgets
Depression Mania	Voice tone analysis

7. Contributions

- We have shown how data generated through our daily interaction with technology has consistent patterns to identify prodromes and symptoms of degrading mental health.
- By channeling and processing the data in MeEJ framework, we developed a fine grain health portfolio which may assist in raising an early alarm about onset of symptoms of potential disorder.
- Being a scalable architecture, the framework has the potential to evolve as a low cost accessibility for quality diagnosis.