SAATHI

Self Assessment & Alleviation by Technology & Healthcare Interface

Ideation Report

Introduction

The 21st century introduced remarkable advancements in the field of Neurosciences which has helped researchers understand the complex Human Psyche in much detail.
Globalization, digitization, technological progress, Competition, etc. have significantly raised mental health concerns. When these concerns prevail for a longer time, and affect the mood, thinking, efficiency & behavior of a person, then they are identified as mental illnesses/disorders.

How does poor mental health affect society?

Micro-Level

- The feeling of self-alienation, helplessness, depression, sadness, social ostracization.
- Affects the productivity of the person and efficiency of work.
- Increase in the Suicide rate

Macro-level

- WHO: such disorders affect the GNP of every nation.
- Lancet Commission 2018: stated that mental disorders will cost the global economy an estimated $16 trillion by 2030.
- 12 billion working days are lost due to mental illness every year.

Major Gaps in achieving treatment- **Awareness, Affordability** & **Accessibility.**

Mental Health data in the context of India & World

According to the state of the global population with disorder 2017 report, almost 10.7% of the world population is suffering from mental health disorders. Depression & Anxiety disorders are prevalent ones. The count is expected to reach more than 1 billion in the aftermath of the COVID Pandemic.

In the context of India, the share of the population with mental disorders accounts for 13.73% with many of them being unreported & untreated. The major disorders in the context of India are Anxiety, Depression, Schizophrenia, Bipolar disorder, and ADHD. India's economic loss due to mental health complications is projected around $1.03 Trillion.

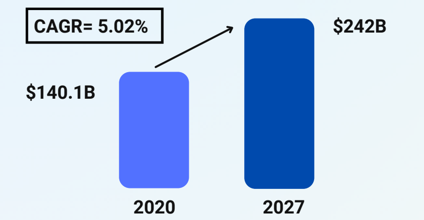
India has witnessed huge growth in neuro-psychiatry drugs and central nervous system(CNS) drugs consumption(13% YOY growth). Growth in sales of Tranquilizers, Antidepressants & Antipsychotics was observed during the pandemic.

While the data is disturbing, the global median of government health expenditure on Mental health is less than 2%.

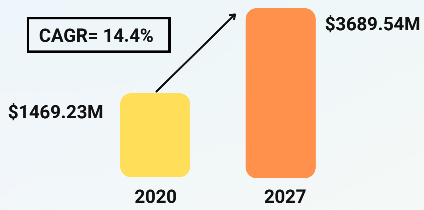
Market report of Behavioral/Mental Healthcare Industry

There is an increase in the awareness, recognition & active discourse of mental healthcare issues in recent years. The mental health sector is severely under-resourced in terms of manpower, technology & innovations. In the recent Union Budget 2022, Government has paid emphasis on the Tele-mental health program. All these factors consolidate to create huge market demand

Precedence research- The global behavioral health market size is projected to surpass around US$ 242 billion by the end of 2027 from an estimated USD 140.01 billion in 2019. The global behavioral health market is anticipated to expand at an impressive CAGR of 5.02% during the forecast period 2021 to 2027.



Global Forecast network- Behavioral/Mental Health Software Market size was valued at USD 1469.23 Million in 2019 and is projected to reach USD 3689.54 Million by 2027, growing at a CAGR of 14.4% from 2020 to 2027.



Factors responsible for Growth-

- Increasing Awareness of Mental Health
- Post pandemic demand of Mental health care infrastructure
- Increase in Startups, innovation, their funding & Investments
- Hospitals adopting Health care systems
- Deteriorating Work conditions & increase in average stress levels
- Governmental Initiatives

Evidence of growth-

- The growing interest of Investors in this domain
- Increase in the number of mobile apps targeting Mental health
- Rising numbers of NGOs dealing with this issue
- Increase in Government spendings

Indian Startups Targeting Mental Health-

Wysa

About

Helps users to self-manage their mental health using AI-based questionaries and remedies.

Flaws

- It is AI-based, with no real data tracking/monitoring.
- Usually, a Mental health victim may not answer in the true sense

InnerHour

About

Self-care therapy-based tools to overcome depression beat anxiety, tackle stress. Guides in meditation.

Flaws

- Does not monitor patient progress

MindFit

About

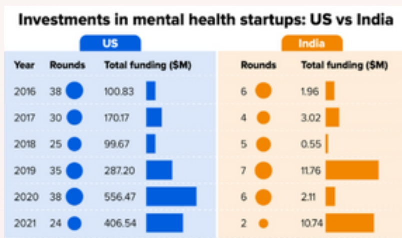
Connects professionals with patients. Provides for Medication facility

Flaws

- More into counseling services
- Accessibility issues.

Why Indian Mental Health Startups are yet to boom?

- Scalability Issue: Present startups are trying to connect professionals with patients. However limited psychiatrists put up a ceiling in scalability.
- Trust, sense of security, and breach of privacy are a few factors that contribute to people not being completely accepting of mental health startups.



Investments in mental health startups: US vs India

	US		India	
Year	Rounds	Total funding ($M)	Rounds	Total funding ($M)
2016	38	100.83	6	1.96
2017	30	170.17	4	3.02
2018	25	99.67	5	0.55
2019	35	287.20	7	11.76
2020	38	556.47	6	2.11
2021	24	406.54	2	10.74

OuraRing

About

24/7 heart rate monitoring, personalized health insights, sleep analysis.

Flaws

- Price $300
- No mitigation

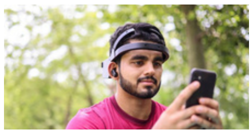
Dhyana

About

A meditation guide. Tracks heart rate variation and breathing irregularities. Biofeedback mechanism

Flaws

- Concerned to meditation only
- Price 7000 INR



Neuphony

About

Smartwatch of your brain. Helps in stress relief using Biofeedback

Flaws

- Cannot wear continuously
- Price 35000 INR

Identification of Problem Statement

Among the 5 major mental disorders that are prevalent in India, we are targeting the market segment of Anxiety spectrum disorders. Anxiety spectrum disorders are very much common in India. Around 10 million cases are reported each year. These disorders cover illnesses like Obsessive-compulsive disorders(OCD), Post-Trauma Stress Disorder(PTSD), Panic attacks, Degradation in sleep quality, etc.

Some characteristics of anxiety spectrum disorders are-

- Treatable by a medical professional
- Usually self-diagnosable & manageable
- Lab tests or imaging not required

Problem Statement:

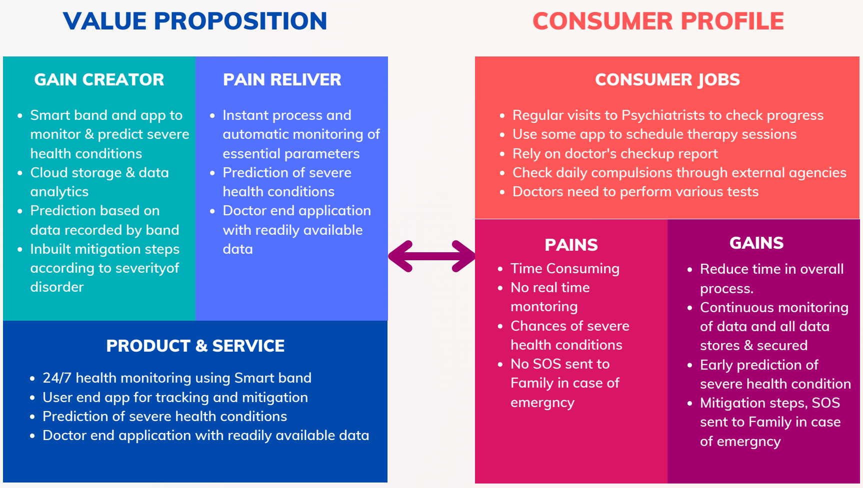
To develop an end-to-end IoT-based solution to help patients with anxiety spectrum disorders, track their mental health status, manage their cognitive behavior, and help them mitigate their issues by using a Smart wearable wristband and a mobile-based application.

Our Solution: SAATHI

SAATHI

3 Major Components of the Solution-

- Smart Wearable
- Saathi+ Mobile Application
- Saathi Patient Management System



(Diagram: Unique Value Proposition Canvas)

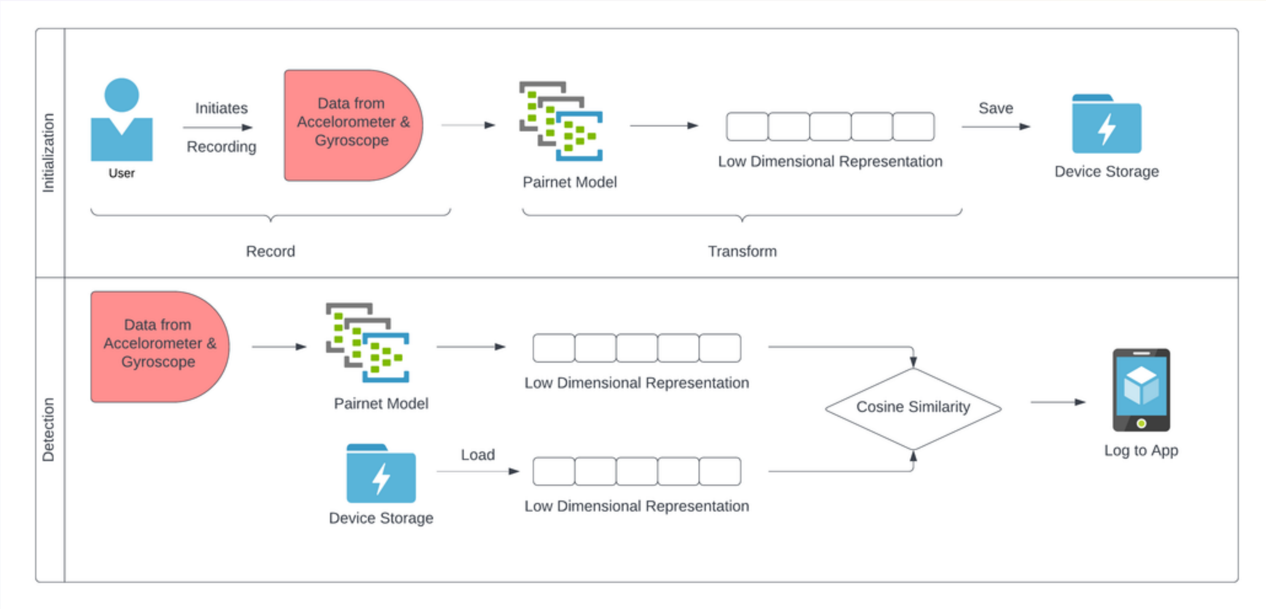
Technical Implementation

On a technical scale, our product SAATHI consists of two major components - a **wearable device** to be worn on the wrist, and a **mobile application** which provides several health related insights to the user. Our product tracks and provides several analyses across different medical conditions such as stress, anxiety, obsessive compulsive disorder(OCD) and other relevant parameters such as sleep quality and fall detection. These conditions are tracked using data from several sensors embedded in our wearable device such as accelerometer, gyroscope, temperature, etc. Using machine learning, we have developed robust algorithms which detect each of these conditions with a high degree of accuracy. All of the analyses are displayed on our mobile application which features an intuitive UI and incorporates mechanisms to alleviate the ill effects of the detected conditions, and at the same time allows the user to seek medical consultations on his recorded data directly through it.

Description of the salient analyses offered by our product

OCD Event Detection

Obsessive-Compulsive Disorder (OCD) is a mental illness that causes unwanted sensations and thoughts towards a certain inclination in a repeated fashion. Such kind of obsessive behavior is linked with several mental issues such as anxiety, stress, discomfort, and persistent thinking. Some of the well-known actions associated with OCD are - excessive hand washing, arranging things, counting, seeking reassurance, etc.



*(**Click here for Detailed diagram**)*

From the clinical perspective, it is important to generate accurate algorithms for the detection of such activities related to OCD so that the user is well aware of his illness, which will enable him to get a proper diagnosis of his illness and take corrective measures against it. Our product SAATHI introduces a novel methodology that provides its users with accurate analysis and detection of the events associated with OCD, and is the first consumer-based solution implemented via the use of IoT. It uses data feeds from two sensors - accelerometer and gyroscope - to identify such events. It comprises three main stages, namely:

- **Record:** Initially, the user records the activities which are associated with his/her OCD via our wearable device post consultation with a medical practitioner. For example, if frequent hand washing is an event associated with the OCD of a user, the said user will start the recording on his wearable at the start of the hand wash procedure, and continue it till the end of the entire event. The accelerometer and gyroscope data will be recorded during this said period.

- **Transform:** The recorded data feed from the two sensors is fed into a feed forward neural network (NN). The objective of this feed forward NN is to learn representations of a certain event from the provided sensor data, and generate low dimensional representations from the same. To develop accurate and collision-resistant representations for a given event data, the NN is pretrained on large volumes of sensor data which may be collected during the trial stages of our products. For our product, we use the PairNet architecure as the NN model, which is developed solely for use on IoT devices and features high optimization in terms of time and computational requirements. Once the representation of the recorded event is generated, it is permanently stored for the 'Match' stage.

- **Match:** Once an OCD-centric event is recorded by the user and its representations are generated by the pretrained PairNet model, our device actively sends the accelerometer and gyroscope data to PairNet model at predefined intervals. For each of the data chunk sent to the PairNet model, it generates its lower dimensional representation and compares it with the stored representations generated in the previous stage. This comparison is done via cosine similarity, and in the event where the computed similarity between the representations of the recorded and current data passes a certain threshold for a predefined number of repeated cycles, an alert is issued by our device. In a concurrent fashion, our mobile application suggests several mitigation steps to counter the complusion of performing that particular activity, and logs in the occurrence of this event for further diagnosis.

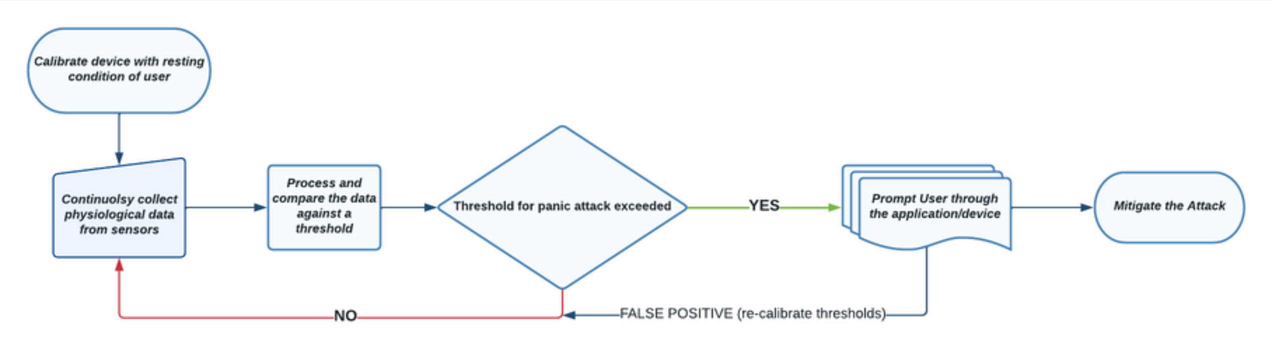
Using accelerometer and gyroscope data for detection of OCD-centric activities is a novel concept proposed under our solution. Owing to the very nature of our approach, we are able to record multiple OCD events simultaneously with ease. All of the above factors ensure that our solution is scalable and can be easily adapted uniquely to each user.

Stress & Anxiety Levels

Stress, a feeling of emotional and physical tension and anxiety, an intense felling of fear, dread and uneasiness are characteristic to multiple mental health conditions especially the ones on the anxiety spectrum. A person under stress or facing anxiety demonstrates an increased heart rate, rapid breathing, restlessness and difficulty falling asleep. These symptoms can be monitored by recording and processing physiological data using appropriate sensors on of our device.

We aim to use ECG sensors for heart rate variability, accelerometers for movement and restlessness, EDA sensors for skin conductance (perspiration), PPG sensors for blood flow and temperature sensors for body temperature in our wearable device and will be feeding the physiological data to machine learning algorithms, which will help classify the mental state of the person using the device, in real time.

Upon successfully detecting the state of stress, the accompanying application can intelligently suggest sleep schedules, help manage notifications, set meditation reminders or ask you to reach out to a loved one. It can also record stress levels over long periods which can be reviewed by medical partitioners for tracking progress and identifying triggers.



*(**Click here for Detailed diagram**)*

To provide a proof of concept for this idea, we use the WESAD data-set comprising of acceleration data, temperature data, BVP data, and EDA data collected from 12 subjects using a wrist-worn device. The data from the different sensors were sampled at different frequencies and is first made uniform. We then carry out feature engineering on the dataset and use the standard deviation, minimum, maximum, range and mean of the temperature, accelerometer, etc calculated over a window size. The prepared dataset is then fed into an LSTM model which gives an accuracy of greater than 65% in identifying states of stress and normal resting state.

We would like to mention here that a very important parameter in evaluating stress and anxiety levels, the heart rate variability, which can be calculated directly/ indirectly from an ECG sensor could not be incorporated into our current ML model due to a lack of real-world data. In practice, we shall incorporate an affordable and accurate sensor into our smart wearable device and use that data to significantly improve our accuracy.

Panic Attacks Prediction

During a panic attack, a person may experience overwhelming emotions, including helplessness and fear. Physical symptoms can include a fast heartbeat, rapid breathing, sweating, and shaking. Panic attacks can be characterized by the extreme values of these physiological functions.

Live data from ECG, temperature, EDA and PPG sensors can be mapped to a single numeric value which will depict a score. If the score exceeds a certain determined threshold limit, then a panic attack is said to have been detected. This mapping can be formulated using traditional mathematical techniques (weighted averages etc) or can even be calculated using Machine Learning techniques as is prevalent in recent research.

On successful detection, our application can provide with multiple methods to mitigate the panic attack. It can prompt users to engage in a guided meditation or mindfulness session, help them feel more aware and grounded using deep breathing exercises, muscle relaxation techniques etc. and help them navigate through this tough time.

Future development of this feature will focus around predicting panic attacks on the basis of long term and medium-term physiological indicators and sleep quality by using state of the art time series forecasting techniques.

Sleep Quality Detection

Sleep analysis is an important metric for analysing the health and well being of an individual. A good quality sleep is necessary for proper functioning and rejuvenation of the bodily systems. However, lack of proper sleep may lead to fatigue which is detrimental to the mental as well as physical capabilities of a person. Hence, it is necessary to develop a solution which is able to track the sleep cycles of an individual and is able to provide insights on the same. Advancement of IoT has brought forth various approaches to develop a stable system which can track this metric with high accuracy and resilience. A number of data sources, such as EEG, heart rate, SpO2 levels and accelerometer data may be used as strong markers for determining the different sleep states.

As a part of our proposed device, we embed sleep analysis as a part of our trackable parameters. We use the accelerometer data to track the state of sleep of an individual, and classify the different sleep cycles under three states:

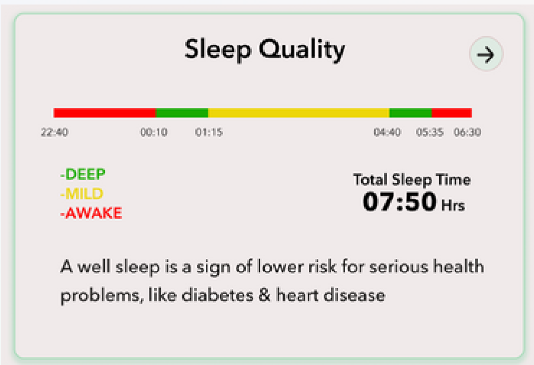
- **Mild Sleep:** It includes the non-REM (NREM) stages of the sleep. NREM itself comprises of three stages - 1, 2 and 3, which are marked by substantial decreases in mental activity along with the relaxation of body muscles. Completing the three stages of NREM sleep is essential for reinvigoration of the body.

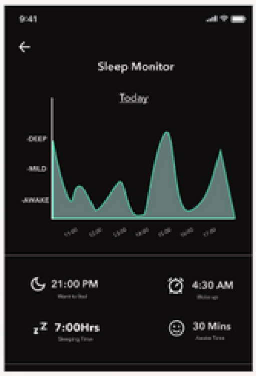
- **Deep Sleep:** It consists of the REM stage of the sleep cycle. During this stage, the brain activity is heightened to near-awake levels and is accompanied by rapid eye movement. It is an important part of the sleep cycle, as it is during this period that memories are formed and consolidated within the brain.

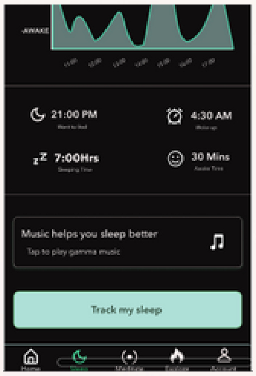
- **Awake:** This state comprises of wakefulness and movement.

We employ machine learning algorithms to identify the above mentioned stages from the accelerometer data collected by our device. For training and evaluation purposes, we use the ICHI-14 dataset which comprises of the 3-axis accelerometer data. The features used in our approach include raw accelerometer data, and the roll and the pitch angle calculated from the raw data. These features are normalized and principal component analysis (PCA) is employed to reduce the features to a lower subspace. Finally, these features are used to train an XGBoost classifier with the optimal parameter set. We obtain an accuracy of 74.12% and a weighted F1 score of 73.43% on our test data, which is consistent and at par with the performance of the existing approaches in the literature.

Our solution is highly scalable and can be applied for near-real time inference, due to our choice of the machine learning algorithm and efficient feature extraction strategy.





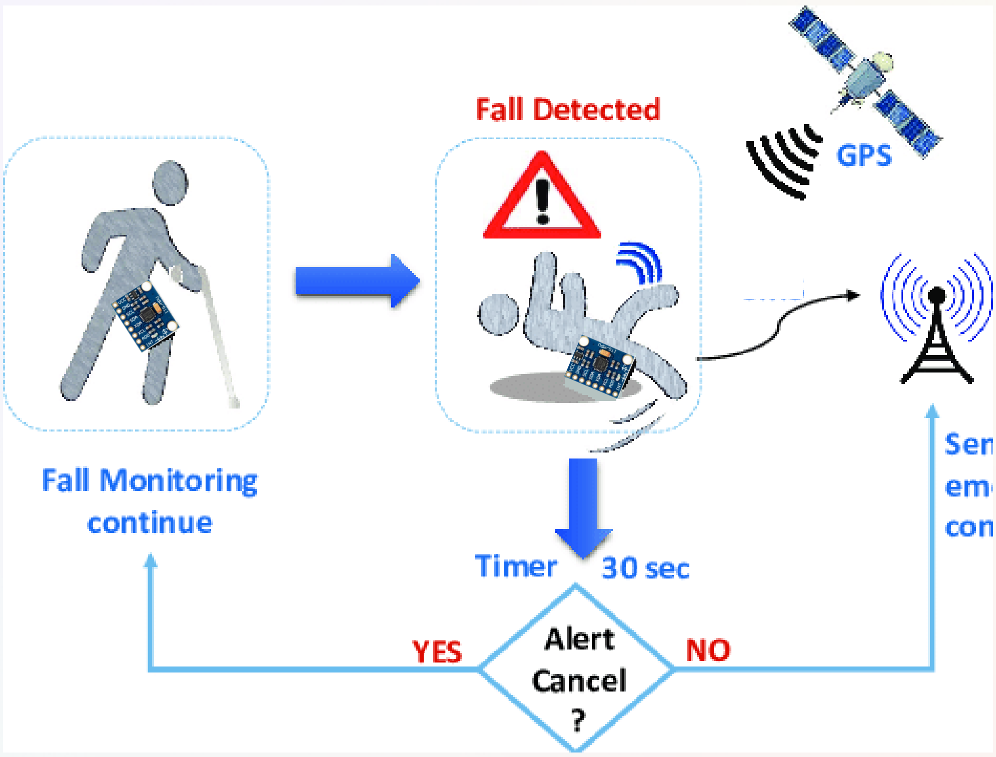


Fall Detection

Fall detection is an essential aspect of overall health tracking, especially for individuals in vulnerable groups such as the elderly and the disabled. Individuals with special needs and elderly are unable to get up again after a fall without external assistance, and hence such a system will ensure that proper aid can be administered to them as quick as possible. On a standard level, it can be determined as the sudden transition from an upright position to an almost reclining or supine position. Since fall is associated with sudden change in movement, it can be detected efficiently using IoT based solutions equipped with accelerometer and gyroscope.

SAATHI provides a revolutionary fall detection feature which detects a fall using accelerometer and gyroscope data, and immediately sends out a SOS message to the selected emergency contacts of the user. This feature will irrefutably prove to be useful for the users as it will help them gain faster access to medical services via their emergency contacts, and provide them mental assurance from the fears of being left unattended post falling. Using a machine learning based approach, we take in raw accelerometer and raw data generated by our device, and perform the necessary feature engineering. XGBoost is used for classification of fall from the transformed features, again due to its benchmark performance and high scalability.

To evaluate our algorithm, we use the SisFall dataset to train and test our model. We get a accuracy of 98.04% and a weighted F1 score of 97.95% on the test set, which even exceeds some of the existing approaches in the literature.

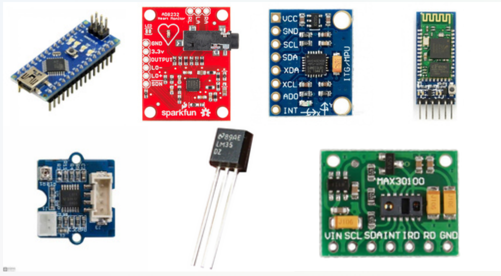


Hardware Implementation

In the above sub-section, we saw what things we want to achieve. Now we explain the whole IoT based solution and the hardware used in the prototype. We use a microcontroller board along with four different sensors to record the required metrics as mentioned above for each physiological feature. In the further subsections, we will see the different hardware components used in the prototype and the circuit layout.

Introduction to Hardware

• Arduino Nano	The Microcontroller board
• HC-05	Bluetooth Module
• MPU-6050	Motion Detection(Accelerometer & Gyro)
• MAX30102	Pulse Rate & SpO2
• LM35	Temperature Sensor
• AD8232	ECG Sensor
• GSR Sensor	Electrodermal Activity



Sensors and Devices used

Arduino Nano [Datasheet]

Arduino Nano is a small, complete, and breadboard-friendly microcontroller board based on the ATmega328. It has

- 14 Digital Pins which can be used as an input or output. We use two of them to connect the Bluetooth module
- 8 Analog input pins, each of which provides 10 bits of resolution, out of which we use four pins to communicate with the other sensors.

It powers and communicates with all the sensors and transmits the data to the user's smartphone.

HC-05 [Datasheet]

HC-05 Bluetooth Module is an easy-to-use Bluetooth SPP (Serial Port Protocol) module designed for a transparent wireless serial connection setup.

- Its communication is via serial communication, making it easy to interface with the controller.
- It can switch between master and slave modes, and hence it can transfer and receive data.

We mainly use this module to transmit the data from the sensors to the user's smartphone, where the metrics pass through our algorithms and are represented as some meaningful value to the user.

MPU-6050 [Datasheet]

The MPU-6050 is an integrated 6-axis MotionTracking device that combines a 3-axis Gyroscope, 3-axis Accelerometer, and a Digital Motion Processor™ (DMP) all in a small package.

- Its dedicated I2C sensor bus directly accepts inputs from an external 3-axis compass to provide a complete 9-axis MotionFusion™ output.
- Its 6-axis integration, on-board MotionFusion™, and run-time calibration firmware enable manufacturers to eliminate the costly and complex selection, qualification, and system-level integration of discrete devices, guaranteeing optimal motion performance for consumers.

Gyro Range (dps)	±250, ±500, ±1000, and ±2000°/sec (dps)
Acceleration range (g)	±2g, ±4g, ±8g, and ±16g

We use the MPU6050 to track the motions of a person to count the OCD compulsions and also to optimize other algorithms like sleep quality tracking, fall detection, anxiety attack prediction, etc.

MAX30100 [Datasheet]
The MAX30100 is an integrated pulse oximeter and a heart-rate monitor module. It includes internal LEDs, photodetectors, optical elements, and low-noise electronics with ambient light rejection. Salient features for use in an IoT environment include

- a Low power heart rate monitor (< 1mW),
- High SNR for robust performance and strong artefact resilience.
- The programmable sample rate for efficiency in power consumption.

We use the pulse rate and blood oxygen levels in most of our algorithms as these vitals are crucial in determining the state of mental health and health in general.

LM35 [Datasheet]
LM35 is an integrated analog sensor that measures the external temperature and generates a proportional electric current. The major advantage of this sensor is that its output is directly proportional to the Celsius scale, whereas other similar sensors use the Kelvin scale for calibration. Other benefits include:

- Has a wide operating range from -55°C to 150°C with a high resolution of 0.25°C.
- Lower power consumption and easy interfacing.

We use it to determine the body temperature, which helps us eliminate any false positives and determine if there is something wrong due to which the temperature is rising.

AD8232 [Datasheet]
Providing a single lead ECG functionality, the AD8232 is a fully integrated package designed with a high sensitivity to biopotential systems in the presence of noisy conditions. With strong denoising capabilities, this module is apt for usage in wearables and other IoT devices. Some of its salient features are

- WIde operational range from -40°C to 105°C (for W grade models)
- High efficiency with low supply power requirements.

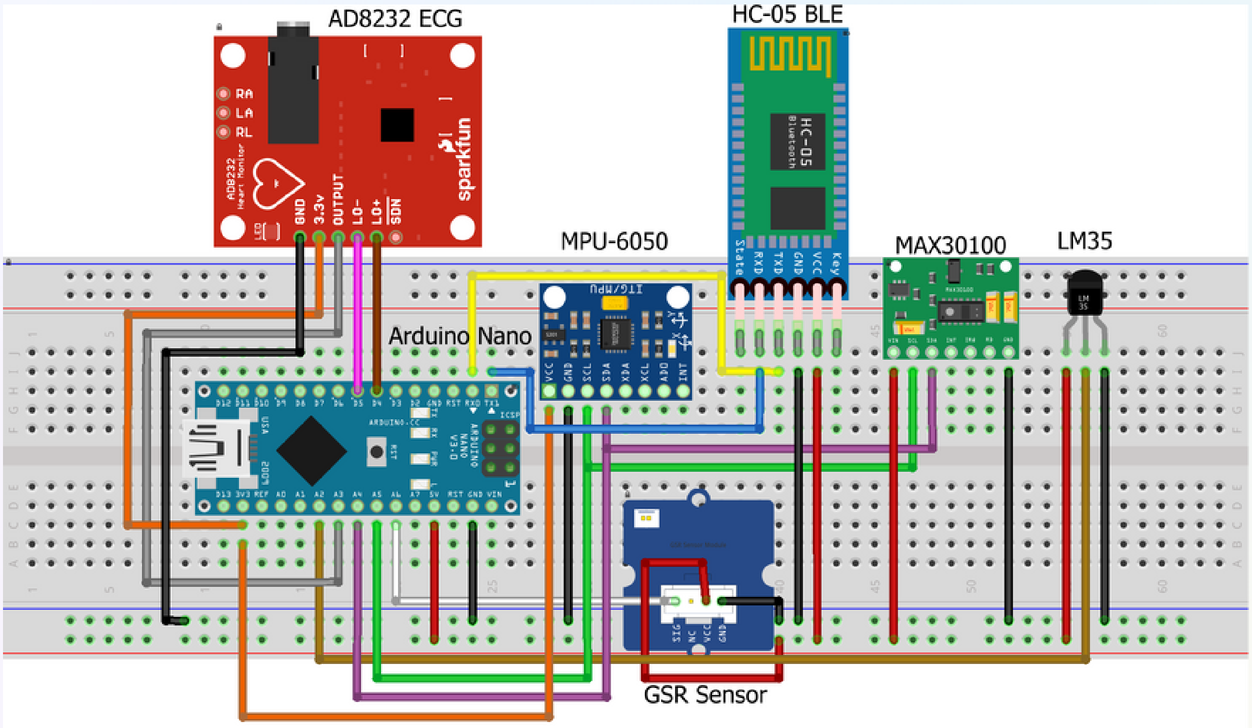
Stress and anxiety can directly affect the heart's functioning when it comes to determining mental health state. And hence, ECG plays a significant role and is a highly weighted parameter in our algorithms where we determine different states of the brain.

GSR Sensor [Datasheet]

- Galvanic Skin Response, is a method of measuring the electrical conductance of the skin.
- Strong emotion can cause stimulus to your sympathetic nervous system, resulting in more sweat being secreted by the sweat glands.
- We use it in our algorithm to determine stress levels and to optimize the Panick attack prediction performance.

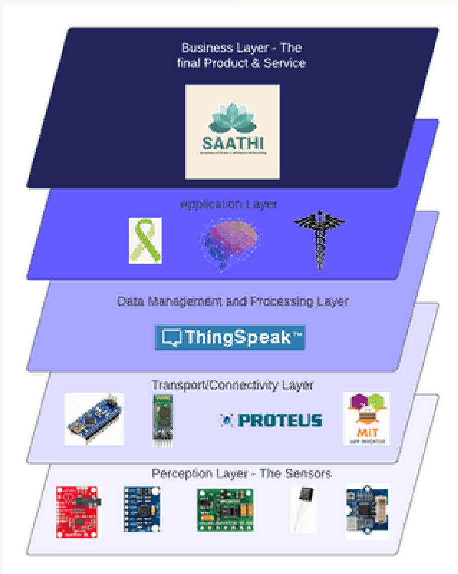
Circuit Schematic Diagram

The below image shows the hardware implementation for the basic prototype that we have designed on fritzing. The components we have used in our prototype for demonstration purposes have greater power consumption and size, which can be tackled as we envision when fabricating each component separately to ensure an optimal form factor. We have not included a battery, a battery charging mechanism, a LED display and a storage element yet. But we assume that we can achieve all these goals for fabricating a full-fledged product into a wrist-band form as the other manufacturers in the market already use a similar set of sensors to track physical health.

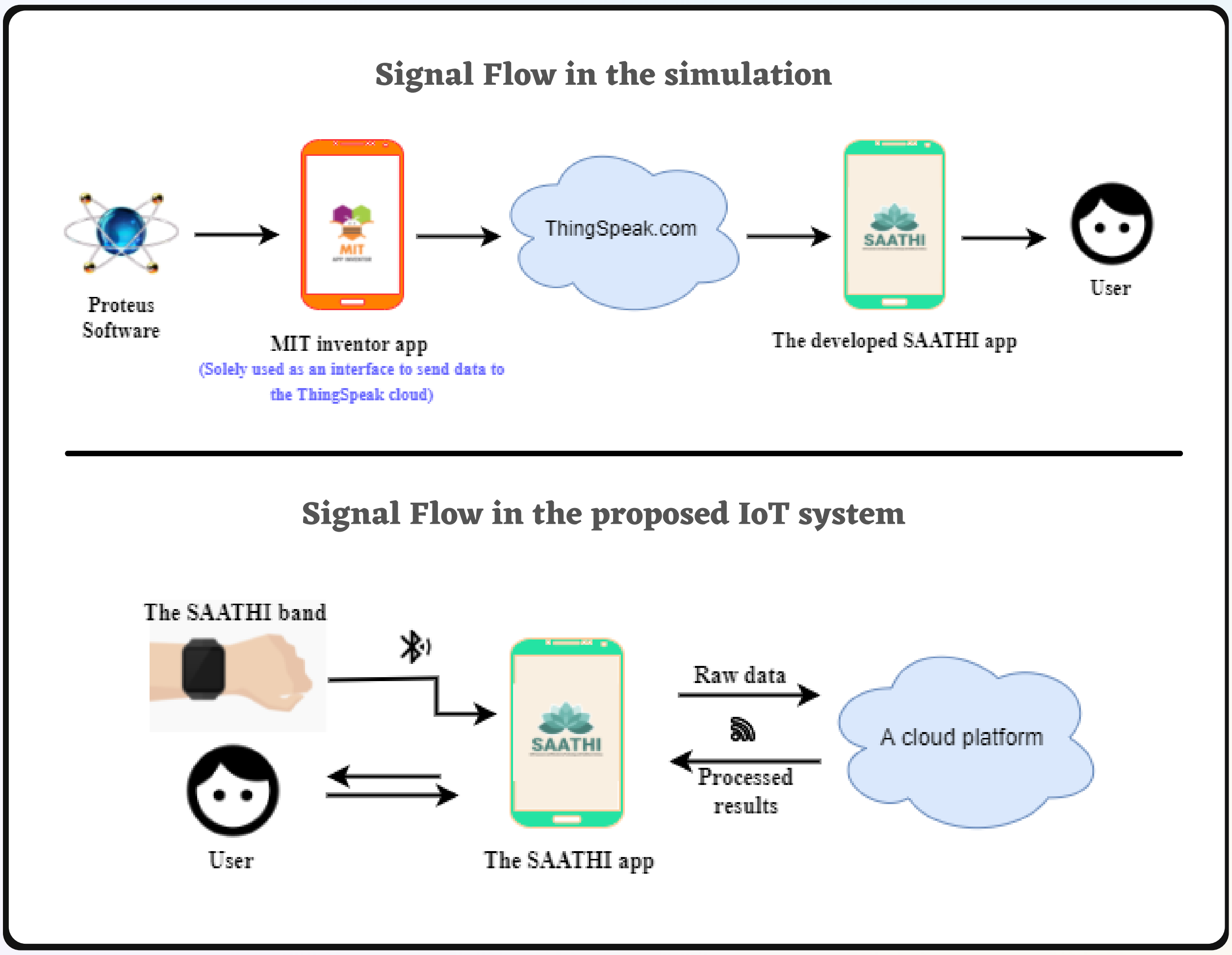


(*Click here for Detailed diagram*)

End-to-end prototype Simulation



- A Proteus model is simulated to demonstrate the dataflow in the IoT system. The model has Arduino Nano integrated with a Bluetooth module, temperature sensor, accelerometer, and a heartbeat sensor.
- The simulated Bluetooth module (in the proteus model) sends the data collected from the sensors to a test app made using the MIT App inventor platform. This test app is used as an interface to send the data to the ThingSpeak cloud platform.
- Since there is no option to send the sensor data from the proteus simulation directly to the thingSpeak cloud, the test app is merely used as a channel to achieve this.
- The data processing can be done either on the mobile app or the cloud platform. In addition to processing, a cloud is necessary to back up the data. The processed/backed up data can be retrieved and displayed via the developed app.
- The simulated data is random and does not mimic the actual human response when the device is worn. Therefore, the information is not processed. However, the submission includes the google colab files with ML models trained with the recorded sleep, fall detection, and stress detection data. The data is fetched from the ThingSpeak cloud platform and is plotted to demonstrate the functionality of the SAATHI app.
- The simulation files and a video (Click for video) describing the signal flow are included in the submission.



Smart Watch Prototype-

https://drive.google.com/drive/folders/1D_LpOUk_tOL34fhvgOBEigChp5gFKN5P?usp=sharing

This is the Saathi Smart Band that we Envision

User-End Application Features

Tracking Features - Stress & Anxiety Levels, OCD Compulsion tracker, Panic Attack Prediction, Sleep quality, ECG, HRV, Blood Oxygen Level, Pulse rate, Body Temperature, Skin Conductance, Fall Detection.

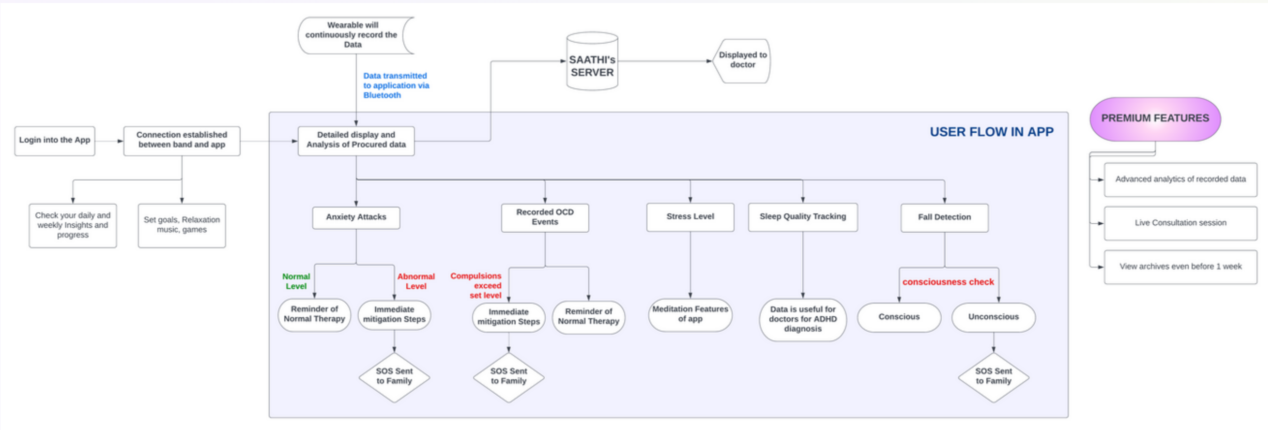
Mitigation Features - Daily Therapy Sessions, Immediate Mitigation Measures, Relaxing Games & Music, Meditation guide.

Emergency Features - SOS to Family members, Alert to a nearby ambulance

Premium Features - Advanced Analytics, Consultation Services

Alerts/Feedback - Alerts of Abnormal Behavior, Alert on Exceeding the Threshold

User Flow in Application



Click Here to View in PDF

User Flow in Application

Figma File for UI design of Mobile App and Dashboard design-
https://www.figma.com/file/8sMb7bITUuveQgM81OHiD9/Saathi%2B-App-UI?node-id=0%3A1

Demonstration Video-
https://drive.google.com/file/d/1wmy5D8c9gDiXjKYLpTB3ViDam3vSUgUe/view?usp=sharing

Success Metrics/KPIs

- **% Response rate:** Ratio of no. of successful clicks on the alerts sent to the total no. of alerts sent to the patients.
- **% Successful prediction:** Ratio of successful compulsion prediction to the total compulsions predicted.
- **% Engagement rate:** No. of mitigations done after each compulsion.
- **% Query Resolution:** No. of total queries solved to the total no. of queries received
- **% Transactions:** No of In-App transactions per 100 users

Business Model Canvas

Key Partners:

- Suppliers
- Investors
- Regulators
- Recommending Psychiatrists

Key Activities:

- Production
- Distribution
- R&D
- Maintainence

Key Resources:

- Smart Band
- User-End App
- Dashboard
- Algorithms
- Human Resource

Value Proposition:

- To help mental health patients in tracking their therapy progress.
- To help in mitigation of mental health disorders.
- To create stronger linkages between patients and network of Psychiatrists.
- To help Psychiatrists in real-time monitoring of their clients.

FUTURE-

- To create an all-round solution for mitigation of all Mental Health disorders

Customer Relationship:

- Self-Service (App)
- Regular feedback
- Ratings
- Referrals

Channels:

IoT Device-

- E-Marketplace
- Retail stores
- Website
- Medical References

App & Software-

- App store & Website

Customer Segment:

By Disorder
- Anxiety Disorders
-Bipolar disorder
-Depression
-ADHD
-Schizophrenia

By User Persona
- Individual Patient
-Family
-Psychiatrists

By Service Provided
- Clinical
-Administrative
-Financial

Cost Structure:

- Production Cost
- Operational Cost (Salaries)
- Advertising
- Transport

Revenue Streams:

- Direct Sales of Smart Bands
- In-app Purchases
- Consultation & IT services

Click Here for Detailed Report on Business Model Canvas

Finance Model

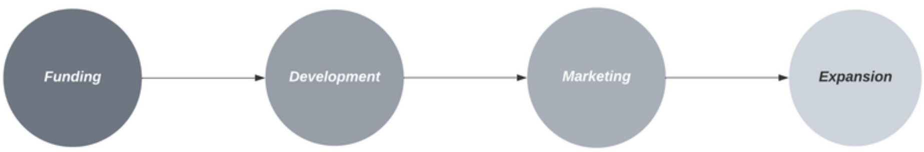
Click Here for Detailed Spreadsheet of Revenue estimates, Cost Structure & Growth Analysis

Assumptions-

- We have Initial Capital for Production
- No abnormalities in the Inflation rate
- All the channels are working at their full efficiency

In Financial Year 1, the P/E ratio is ₹9.56 i.e. for generating one rupee of profit, we have to invest ₹9.56. This P/E ratio is reduced to ₹3.5 by the end of Financial Year 5. Hence the business has potential and is scalable for the long run.

Business RoadMap



	Objective	Q1-Q2	Q3-Q6	Q6-Q18	Q18-
Hardware Team	Design and Fabricate the components to be used for the product	Design CAD models of the prototype	Optimize design and reduce costs	Design new and more advanced sensors	Introduce more aesthetic and design options
Business Team	Raise money to fund development	Develop a go-to-market strategy	Execute business strategy for the MVP	Generate new service based revenue streams	Expand to new geographies
Application and R&D Team	Develop the Saathi application	Update meditation tracks, mental health mitigation steps, zen games and calming music	Extend the product for the people who need Physical fitness along with mental.	Develop an application which can directly evaluate the parameters from any fitness band	Introduce Dark Mode and other cosmetic features
	Develop machine learning and predictive algortihms	Constant bug fixes	An automatic chatbot	Develop a voice assistant	Cloud services such that the services can be availed with smart speakers
	Organize studies and trials for prototype	Identify new disorders which can be tracked and suggest new product features	Research best mitigation practices for mental health and suggest improvements	Partner with doctors to make an end-to-end solution	Create mental health blogs, organize workshops and outreach events

Future Directions

- Implement active engagement with qualified mental health coaches and therapists.
- End-to-end management of therapy and allied services over the course of the treatment of any disorder.
- Develop a voice assistant which can provide easy accessibilty to vulnerable individuals.
- Improve synergy and cross-functionality with other IoT services and products such as smart homes to enable automatic control of mood lighting and music.
- Suggest health and nutrition plans on the basis of mental health condition.
- Monitor mobile and social media usage and suggest intelligent limitations on excessive use of any particular mobile app.
- Introduce the monitoring of more mental health diseases specifically phobias.
- Devise edge computing algorithms to offload the lighter computational tasks to the wearable.

Bibliography

Click here for all the references

---Thanks & Regards---

Self Assessment & Alleviation by Technology & Healthcare Interface (SAATHI)