Shaastra AI Challenge 2019 - Phase II Prototype Development

Team Appendly
M.Rajasekar,
S.Sai Adarsh,
P.S.Sibi Bose,
R.Balaji

Theme, Problem Statement and Github Link

> Theme : AI in Healthcare

> Problem Statement : Inaccuracy and Uncertainty in diagnosing mental health diseases like stress, depression and anxiety.

> Github Link : https://github.com/Sai-Adarsh/ThermalAI

(Contains Source Code, Instruction, Working Photos and Videos)

Our Final Solution

"Detection of Mental Health diseases with accuracy by means of generating a Thermal Facial Image with the help of a thermal camera and applying techniques of Image processing and Deep Learning image classification models to measure the magnitude of the detected disease."
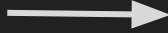
Model Used - Our Approach
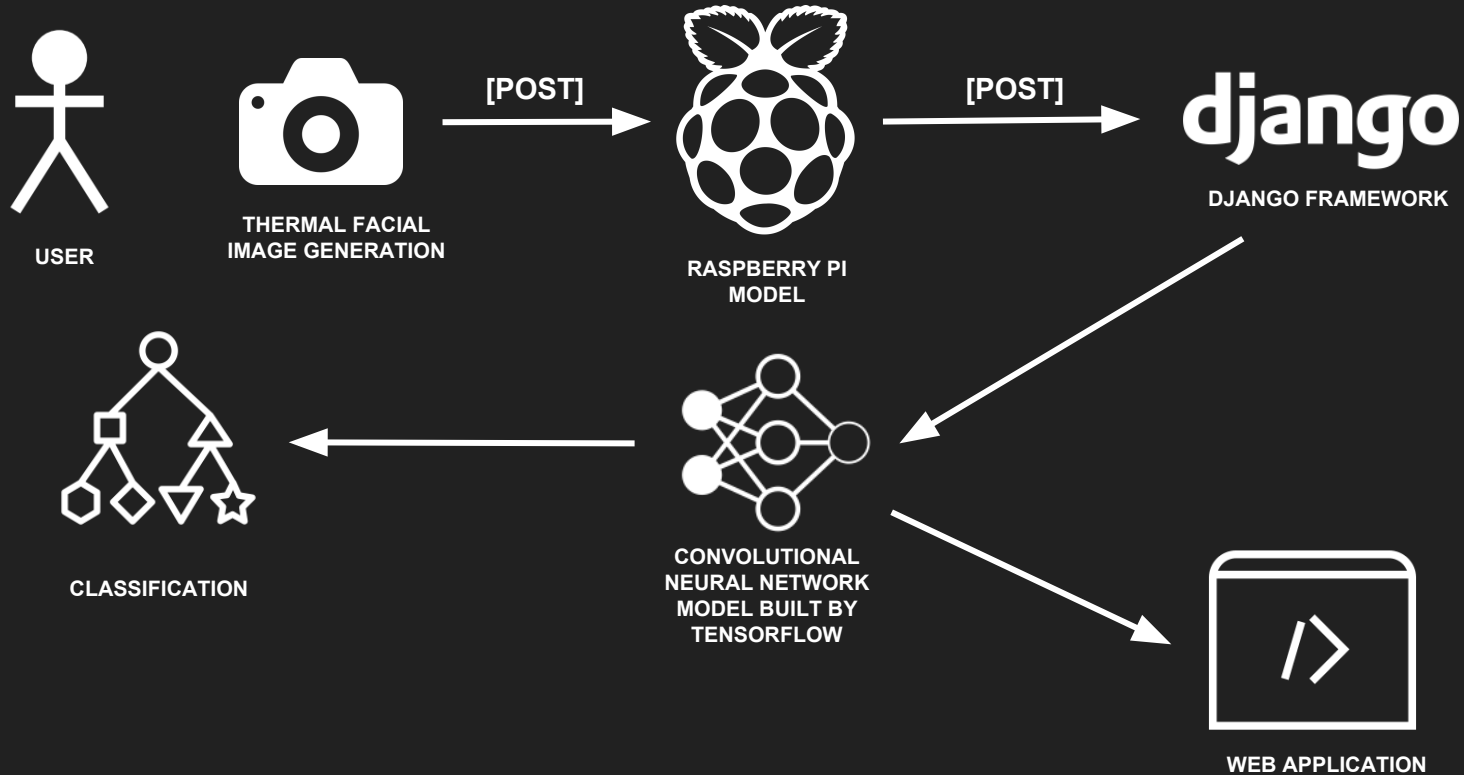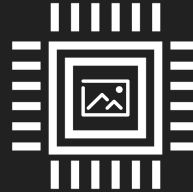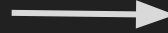
Model Used - Flow of the solution

STEP 1

**Thermal Facial Image of the subject is captured by an IR Thermal Camera**

STEP 2

The Captured Image is sent into a Convolutional Neural Network for the mapping of the given heat map into its corresponding mental conditions
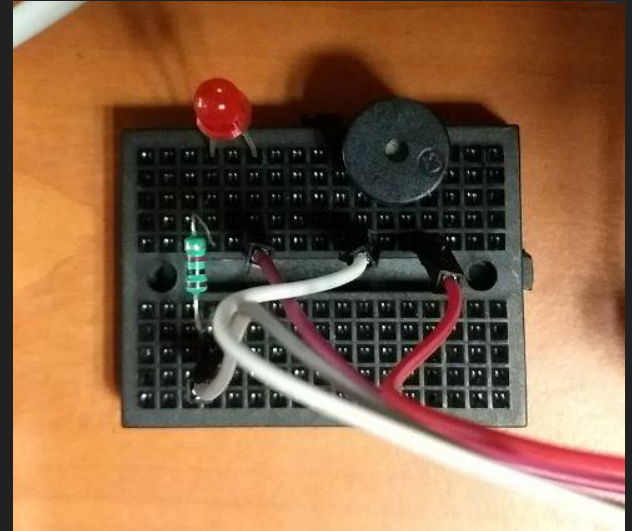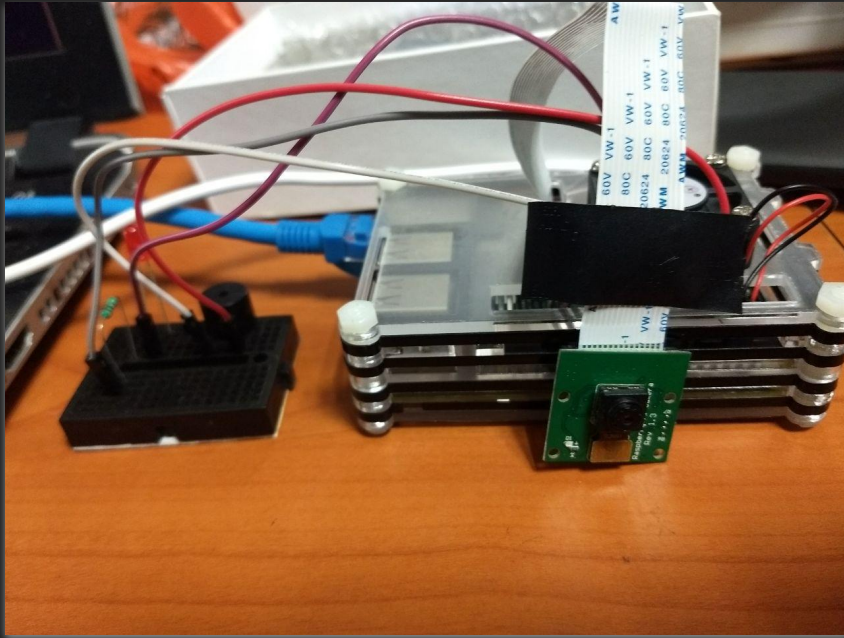
STEP 3

The heat map is then sent into a image processing function where the pixels matching the given colour scale determine the intensity of the condition
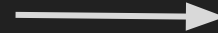
STEP 4

Accurate Results of the Diagnosis

THIS IS HOW OUR MODEL LOOKS LIKE

Algorithms Used (Stats for Nerds)

- Image Classification Algorithm Used : Convolutional Neural Network
- Architecture Used : Standard Architecture
- Activation Function used : Sigmoid Function
- Type of Classification : Binary Classification (For Now, Could also be upgraded into a Multi-way Classification Model).
- Batch Size : 16
- Number of Layers : 6
- Labelling of the Dataset : Stressed and Not Stressed.

Tech Stack Used - Our Toolkit
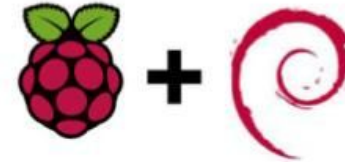
Competitive Analysis with the existing solution

Problem with the Previous Solution :

"According to Moneycontrol, the survey further revealed that **95 per cent of Indian millennials between the age group of 18-34 are stressed compared to the global average of 86 per cent.** Making matters worse, one in eight Indians have serious trouble in dealing with stress but nearly 75 per cent of the Indian respondents said they don't feel comfortable talking to a medical professional about their stress. Consultation cost was cited as one of the biggest barriers to seeking professional help."- Article Published on Business Today dated 9th of July 2018.

Competitive Analysis with the existing solution

Compared to the Conventional Methods,
- Our Model is more reliable as it is based on scientific principles.
- Our Model can become increasingly accurate as it gets processed by the Neural Networks.
- Our Model can also compute the severity of the disease with the help of image processing.

Science behind the Solution
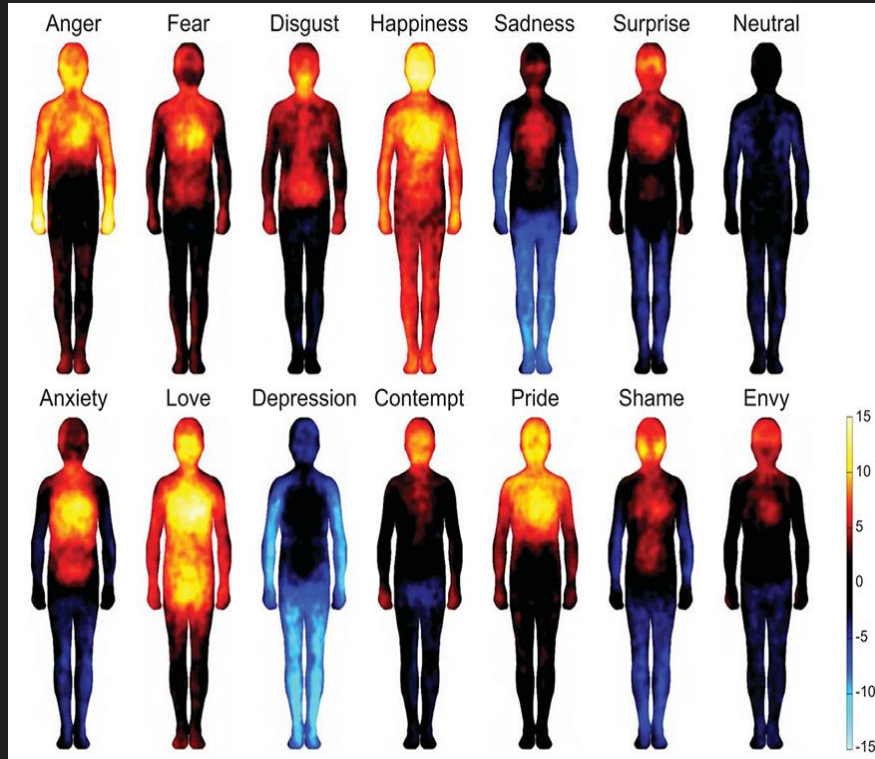
Note: warm colors indicate regions of increased sensation while blue and black areas represent decreased sensation.

A group of biomedical engineers from Aalto University researched 700 volunteers from Finland, Sweden and Taiwan in order to map human bodily sensations connected with certain emotions.

The results show that happiness and depression, as expected, are the most contrasting emotional states – love increases the bodily activation most of all, and depression – decreases it the most. The least activating emotions in the head area are sadness, neutral and depression. The most approach-related emotions, such as love, anger, happiness and pride activate the arms, while the chest area is activated experiencing most of the emotions, except for neutral emotion and the state of depression.

The complete results are published in the journal Proceedings of the National Academy of Sciences.

Business Impact - Visible Potential

Mental Health

India has only **3,827** psychiatrists and it requires **13,500** more psychiatrists.

43 Mental Hospitals in India

India has only 898 clinical psychologists and is short of 20,250 psychologists.

India has 850 psychiatric social workers and is short of 37,000 such professionals.

India has 1,500 psychiatric nurses nationwide and requires 3,000 more nurses.

Source: Union Health Ministry, 2017

Business Impact - Our Vision

"The single biggest goal with our model is that we want to see each and every healthcare unit in India ranging from small clinics to Multi-Speciality Hospitals to take into consideration their patient's mental health and check if they're a victim just like how every 35+ year old is checked for one's blood pressure level with Sphygmomanometer whether or not one's got a problem with it; for though mental health diseases are a disease by themselves, they are the root cause for many other diseases too."

"And that is also the business impact that we are aiming to create with our model."

Reference Links

1. [Supporting Information](#)
2. [Heat Maps Article](#)
3. [Stress among Indians - Survey and Stats](#)
4. [Global Mental Health Stats](#)
5. [Research on Stress among Indians](#)