SAD PROJECT DOCUMENTATION

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- **PROBLEM STATEMENT:**

To solve any real-life problem, we need to understand the depth of problem first. One such problem is the assessment of patients suffering from mental disorder, so that we can diagnose them. Often, these patients are inaccurate or reluctant in expressing themselves due to several mental and social boundaries they surround themselves in. This tends to worsen up the patients in phycological aspect. These patients are not verbal about their situation, so we need to apply sophisticated techniques for a non-verbal assessment of patient's pain.

In the healthcare setting, performing an accurate assessment of patient's pain level is an imperfect science. Certain traditional pain assessment methods rely significantly on a patient's description of his or her pain level which may be confusing or inaccurate. While non-verbal pain assessments tools are available inherent bias, reliability and sensitivity are some of the challenges encountered regardless of the tool.

Thus, there is a need to access the pain severity score of a person using non-verbal techniques and train the techiques to self-improvise upon themselves. We also need to study the dependency on environmental factors responsible for the prediction using machine learning, so as to push their sadness to happiness.

- **SYSTEM DESCRIPTION:**

The product being developed is a mobile application for android operating system. It is an emotion and pain assessment tool and can be incorporated on other platforms also, which satisfy the minimum requirements of system.

The applic

ation will allow the doctors to select or capture an image of the patient to be assessed. Then the image will be uploaded to the server and given to the Convolutional Neural Network model to process. The model is trained to generate score of each possible emotion. Then the severity algorithm will work on generated scores.

The result will be sent to app.

Future Improvements: We will be using sensors to collect information about system environments and other variables when the corresponding photos of patients are taken. As the data will eventually grow it will understand dependency of each emotion on environment variables. Also, over a period of time it will optimize itself.

- **FEASIBILITY ANALYSIS:**

  - *Technical Analysis*: A list of the major software/hardware and the programming languages used is as follows:

    - **Android Studio** Integrated Development Environment.
    - **Java** programming language.
    - Extensible Markup Language. (**XML**)
    - **Python** programming language
    - **Flask** for server establishment.
    - **Libraries** for using **Convolutional Neural Network.**

- **REQUIREMENT ANALYSIS:**

  - *Software Requirements*:
    1. Android Version 5.0+
    2. Android Studios
    3. Flask
    4. Python interpreter
    5. Spyder
    6. Anaconda
    7. Jupyter notebook

  - *User Requirements*:
    1. Camera to capture image
    2. Image to calculate results

3. Donor details

4. Show the donors to person who is seeking for the blood.

- *Functional Requirements*: 1. Interface for choosing between Capture or Import image

2. Camera interface

3. File picker interface

4. Uploading buffer

5. Convert RGB channels to grayscale

6. Resizing the image suitable for model

7. Calculate probability of each emotion

8. Classify image w.r.t best score

9. Calculate severity

10. Send response to application

11. Display response to user

- *Non-Functional Requirements:* 1. Accuracy

2.Performance

3. Sensitivity

4. Reliability.

5. Portability

- **USE CASES:**

- ***USE CASE 1***

Use Case Name: **Capture / Browse Image** Priority: **High.**

Actor: **Doctor/ Staff**

Description: **This use case describes how the image of the patient will be captured / browsed.**

Trigger: **A new assessment is to be done.**

Preconditions:

- **User must have the application running on his/her device.**
- **The patient to assessed must be present.**

Normal Course:

- **Click capture button.**
- **Adjust focus and click shutter.**
- **Give affirmation.**

Alternative Course:

- **Click Browse button.**
- **Find image path.**
- **Select picture.**

Post conditions:

- **User is guided to the next activity of app.**
- **The selected image is displayed on screen.**

- ***USE CASE 2***

Use Case Name: **Record environment variables** Priority: **Medium**

Actor: **Doctor/ Staff**

Description: **This use case describes how the doctor will record extra information related to environmental variables.**

Trigger: **Some environment variables have to be recorded**

Preconditions:

1. User must know the environment variables.
2. User must have the application installed and running on his/her device.
3. Image to be assessed.

Normal Course:

1. Click Record Info button.
2. Enter details.
3. Give confirmation.

Post conditions:

1. The doctor successfully recorded info.
2. He is guided to the previous activity.

- ***USE CASE 3***

Use Case Name: **Upload to server** Priority: **High**

Actor: **Doctor/ Staff**

Description: **This use case describes how the data will be sent to server for processing.**

Trigger: **The recorded data needs to be processed.**

Preconditions:

1. The image must be taken for sending.
2. User must have the application installed and running on his/her device.
3. The notes by doctors must be recorded.

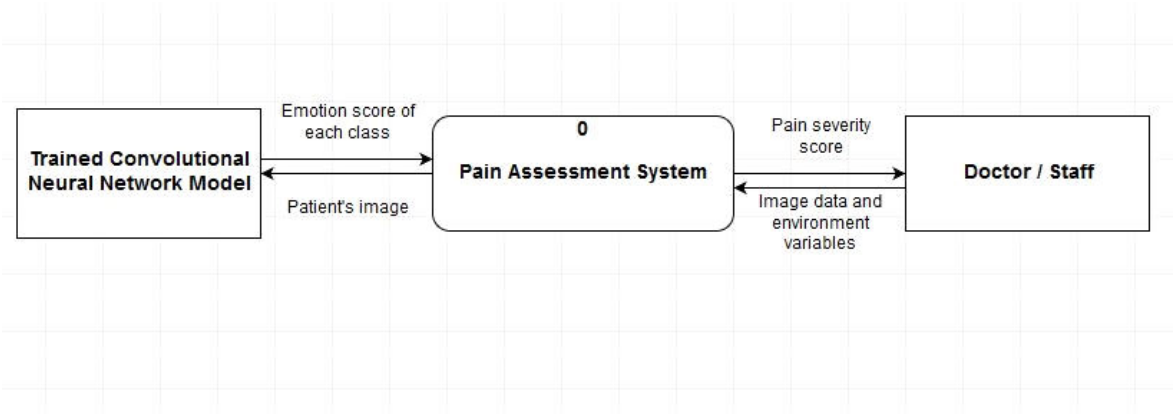
Normal Course:

1. Click on Upload to server button.
2. The data will be received by server.
3. Trained Convolutional Neutral Network will make prediction regarding emotion on the image fed to it.

Post conditions:

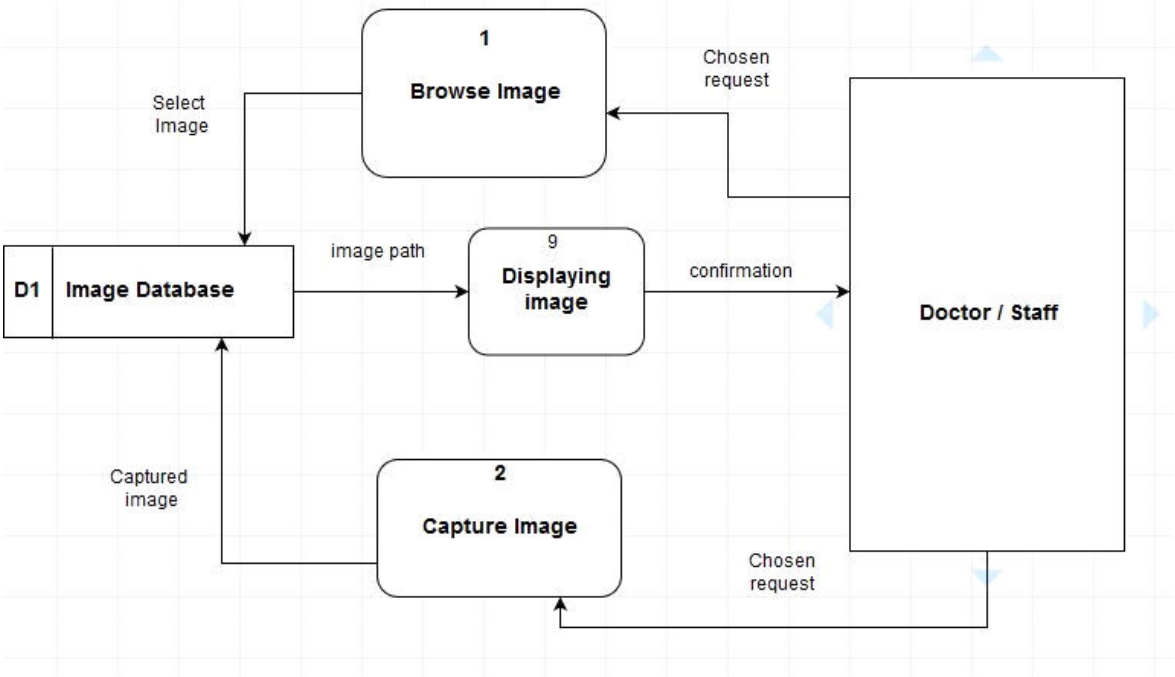
1. Data uploaded to the server.
2. Emotion has been calculated by the model operating at the server end.
3. Response from the server.

- **DATA FLOW DIAGRAMS:**
    - ***CONTEXT* DIAGRAM**

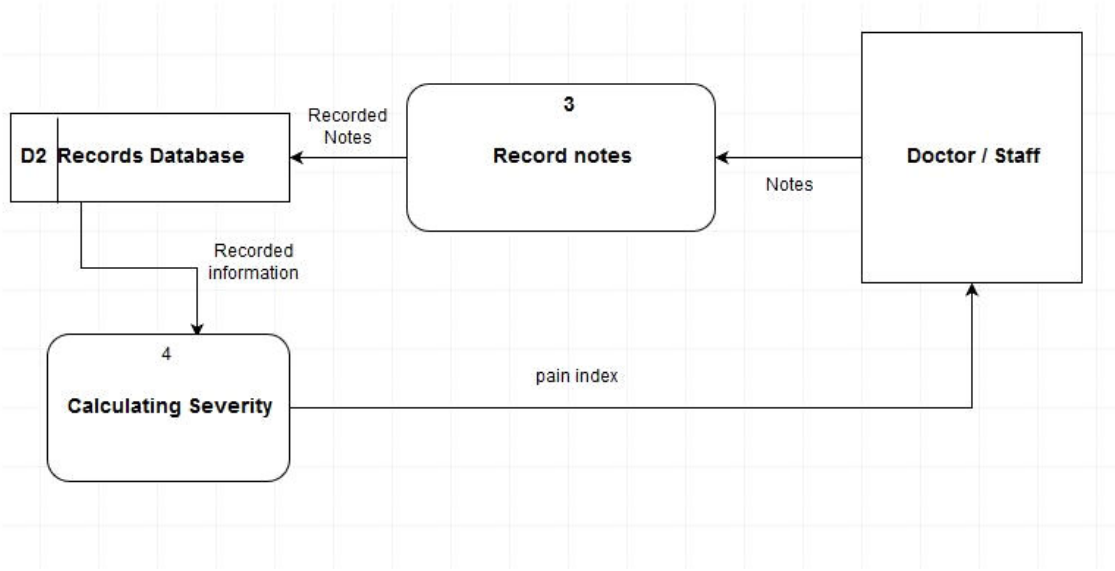


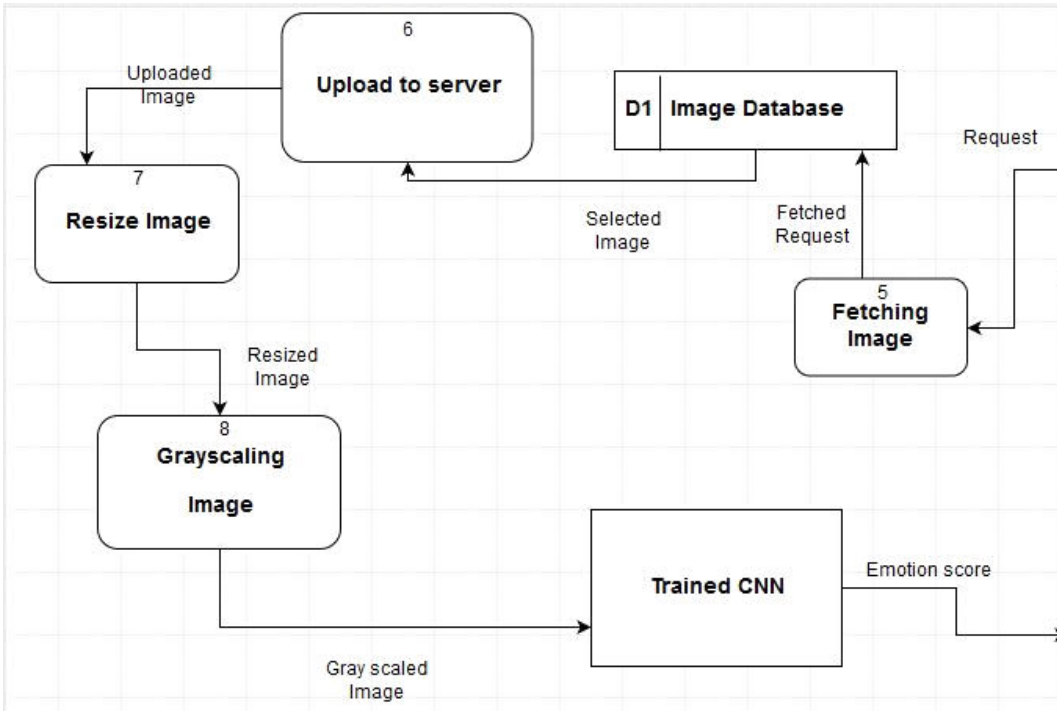
- ***DATA FLOW DIAGRAM FRAGMENTS***

  - ***DFD FRAGMENT 1***



  - ***DFD FRAGMENT 2***





- ***DFD FRAGMENT 3***

- ***LEVEL 0 DATA FLOW DIAGRAM***