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Detection & Analysis of Wounds

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Abstract - *A react-native based mobile application with backend powered by python. The primary aim of this system will be to detect wounds and scars(external) on the human body and then return the type of scar or name of the disease. The detection and analysis of wounds have always been a problem in the medical field especially when we do not have the availability of the proper skilled medical practitioner. As per the geographical area, people roughly resides in rural, urban and suburban areas, the access to such a good medical facility varies from place to place and the rate of literacy. To automate the process with good accuracy in a systematic way is not a problem anymore. The application will have a python backend that will receive a simple image click by any standard mobile device. After receiving the image the backend will process the image and then return the results to the frontend application to let the end-user know what kind of problem do they have and then according to which they can have their basic primary first aid.*

Key Words: Open CV; Wound Detection; Analysis; Reliability;

1. INTRODUCTION

The objective of this research is to discuss a safe, reliable and easily accessible way to detect and analyze some external injury of the human body in which could be some kind of burn, infection, scar, bite of some animal or insect. The quality of the proposed data model purely relies on the efficiency of the model as well as the data set used to train those models.

Once fully trained the model would be able to recognize any external injury, scar, burn or wound and revert to the end-user giving some information regarding the same. This full-stack application is sectioned into two parts. The first one is front-end which will be implemented in react native and the backend of the application is implemented in python framework that is Django which will run the machine learning code for or detection and analysis.

The front-end and the backend will communicate with each other using an API (Application Programming Interface). The request and response will be in JSON format and requires an external package Django Rest Framework. The API is important as this can be given to any other kind of framework such as Electron Js, React Js even React Native which we are using for our current prototype implementation.

Django Rest Framework is a robust functional tool kit required for the development of web APIs. By giving us the capability to create web browsable API as well as serialization of both ORM and non-ORM model.

2. OVERALL DESCRIPTION

This section will cover up all the basic building modules of the system prototype and explain them briefly. The research is an extension application of various frameworks and libraries which are open source and freely available for everyone as a utility for both commercial and personal use under BSD License.

2.1 Open CV (Open Computer Vision Library)

At the core of this project, we will be using the Open CV a powerful utility that was originally implemented in C++ but now these days it has a wrapper of python so that it could be implemented in python as well. This is a computer vision and a machine learning software library that was built to speed up the application of computer vision products under the BSD License. As per the documentation, we can modify the code and use it for commercial purposes as well.

This library has more than 2, 500 enhanced algorithms with easy implementation. The library can detect analyze and classify various objects and patterns through a series of procedures baked in the library. The library is majorly optimized for camera- related tasks.

Since Open CV library has a python wrapper over the C++/C code, it can be easily merged with the main backend running the Django code. The main purpose of Open CV is to boost up the capabilities of the backend in a generic way. The proposed algorithms could be HoG (Histogram of Oriented Gradients) + Linear SVM i.e Linear Support Vector Machine but training an HoG filter requires a lot of training images. In case we want to speed up our system we can use Template matching, which requires a source image and a training image.

2.2 Django

A python-based open-source web framework originally designed to accelerate the development process. The Django is preferred for this project as it tries to segment out everything in the project the named sections have small app integrations in the web application.

Each app is supposed to have only one task to perform which is recommended by Django developer as per the guidelines. Django's core was built from scratch to enhance

it's performance to a good level of standards in comparison to other frameworks in the market. This framework is fast, reliable and super scalable because of which it would be a good choice to implement it in our project.

The python code for models of our machine learning algorithms can easily be imported and integrated into our Django section of backend which will give Django additional powers of machine learning and even deep learning if required. The whole backend will be in python from top to bottom.

Fig -1: Workflow Diagram

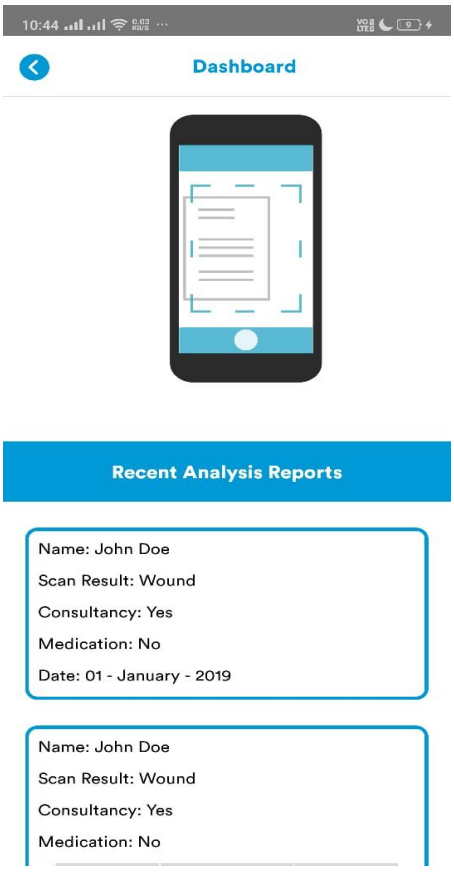

Fig -2: Application Diagram

3. LITERATURE SURVEY

Wound patterns: Detection, documentation, and analysis: Journal of Clinical Forensic Medicine Volume 3, Issue 1, March 1996, Pages 21-27.

Bruises and other injuries located in the skin can play a valuable role in the forensic investigation of a crime. This paper present details outlining how forensic odontology can be useful in detecting, documenting and analyzing such patterned injuries. Also, four illustrated case histories are included.

Viet Nam wound analysis.

A statistical study is reported of 17,726 wounded American soldiers in Viet Nam over 15 months from March 1966 to July 1967. Causes, location, treatment, and results were analyzed for various regions, organs, and tissues. Results of treatment were remarkably good, the best in the history of military surgery. Major problems of resuscitation and treatment of local tissue injury which had not before been treated on a large scale were treated with excellent results.

4. PROBLEM STATEMENT

As per the introduction we want to enhance the procedure of medical treatment by facilitating a normal user to know about their issues regarding basic injuries and problems. In the majority of the cases, people weren't aware of the general health problems which are directly proportional to the literacy rate of the particular region. Ignorance can lead to poor health or even death. If there is some wired infection or burn or any external problem then how one can know about that issue if he/ she doesn't have any doctor available.

To ensure that all people should have the knowledge the software will be there to help people the basic prototype will be able to detect the scar, wound, infection or burn on the skin and then after analyzing it will give the user back the vital information about what are the necessary step one should take.

This software can help in the reduction of such cases where the person is unaware of what problem they are suffering from. The backend of the application is implemented in the python framework that is Django which will run the machine learning code for or detection and analysis. The installation of the application is very simple as it would be just a simple Android application that can be downloaded from Play Store. the application would be able to reduce such kind of problems in which the end-user for our patient was unable to recognize what kind of external problem he has in India there is a huge number of people who got themselves into bad situations especially women in rural areas who are unaware of those infections burns scars or other injuries which later on develop serious issues for their health which affects the whole family as well.

Even if a person is educated but doesn't have proper access to the doctor he can use the application to know about such kind of issues and then can search for his first aid.

4.1 Problem Extensions

The problem and its consequences which we are targeting are not only limited to external problems with which our end-user is suffering from on further analysis we can find out that if a person suffers from a problem then proportionally its whole family suffers in return which is quite disappointing and when in an emergency our application can be a lot helpful to such people in various critical situations.

What scales here is technologies and their implementations which enables us to help a lot of people simultaneously and in a better efficent way.

Table -1: Table 3.3B: Top 10 Causes of Death in age 1- 4 year in EAG States & Assam and Other States: 2010-2013

Index	Diluent	*Male*	*Female*	*Person*
R1	Injuries	22	18	20
		3.3×10^4	0.474	100
R2	Fever of unknown origin	4.2	3	4
R3	Unknown infections	4.2	3.7	4.0
		3.2×10^6	0.324	12.1

5. PROBLEM EXTENSIONS

The paper solution is based on the fact that the people today have good access to mobile phones and knows very well how to use basic applications. the purpose of the application that is to click the picture of the scarred wound or infection and then send it back to the python backend with running open CV in its core. This would facilitate us in determining what kind of the problem our user is is suffering from and then after recognizing the problem, the backend will automatically send the results to the end-user mobile phone. Since we have a good number of population using phones this ensures us that it a good number of people will have access to our software which is easy to install and easy to use for even who isn't very much educated.

5.1 The Method

Here what we did is extended the capabilities of machine learning in the field of medical science to a small prototype level by scaling up the solution to the reach of every person, by using React Native, Django, Open CV.

The technology stack that we have used is optimized to a certain level even if it is scaled up it will perform well without disappointing us. Django latest 3.0 version ensures the async functionality integrated inside it thorough which we can do the async function calls smoothening the performance.

5.2 Technology Stack

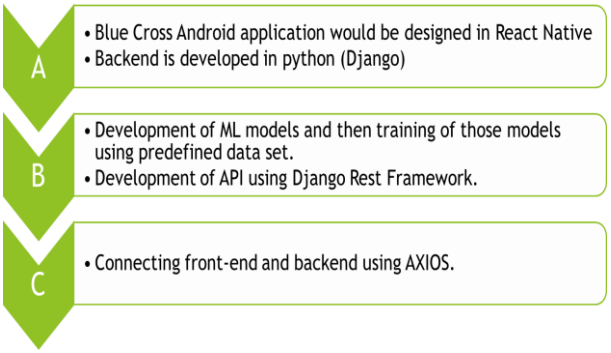

Fig -1: Technology Stack

You can apply these technologies along with the same concept to derive similar kinds of applications in almost every field with optimum performance as said computer systems only scales up the solution if used smartly.

5.3 Idea Extensions

Conventionally, in daily life, we try to use our knowledge or memory or previous experience which can help us in detecting various problems but in ––reality, what we did is just scaled and used the recorded experience of other people to save and people's life from misery. And ease their work.

6. CONCLUSIONS

As per the introduction we want to enhance the procedure of medical treatment by facilitating a normal user to know about their issues regarding basic injuries and problems. In the majority of the cases, people weren't aware of the general health problems which are directly proportional to the literacy rate of the particular region.

Ignorance can lead to poor health or even death. If there is some wired infection or burn or any external problem then how one can know about that issue if he/ she doesn't have any doctor available. To ensure that all people should have the knowledge the software will be there to help people the basic prototype will be able to detect the scar, wound, infection or burn on the skin and then after analyzing it will give the user back the vital information about what are the necessary step one should take.

This software can help in the reduction of such cases where the person is unaware of what problem they are suffering from. The backend of the application is implemented in the python framework that is Django which will run the machine learning code for or detection and analysis.

The application would be able to reduce such kind of problems in which the end-user for our patient was unable to recognize what kind of external problem he has in India there is a huge number of people who got themselves into bad situations especially women in rural areas who are unaware of those infections burns scars or other injuries which later on develop serious issues for their health which affects the whole family as well.

Even if a person is educated but doesn't have proper access to the doctor he can use the application to know about such kind of issues and then can search for his first aid.

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[7] React Native https://reactnative.dev/
[8] Scikit Learn https://scikit-learn.org/stable/
[9] Sentdex https://www.youtube.com/playlist?list=PLQVvvaa0QuDffXBfcH9ZJuvctJV3OtB8A

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