

# Detection of Diabetic Gangrene using Deep Learning

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**Abstract:** This project proposes to build an application on Android OS which detects the Diabetic Gangrene. This project will give insight into the proposed Gangrene detection and knowing the status of the infected area which includes user of the system, methodology and system architecture. The expected output of the application is specified. Finally, the implementation limitations and future improvisations and future scope of the application are specified. As the old adage goes “A picture is worth a thousand words”, the main idea in implementing this project is to bring about the awareness of limb amputation due to negligence and lack of knowledge. This concept of detection is mainly based upon the images provided by the user and the symptoms verified by user. This application is user friendly and avoids the complexities that is usually found in applications.

**Keywords:** diabetic gangrene detect, Transfer learning, android studio, python

## 1. Introduction

Health is wealth, hence monitoring it and taking the precautions is very important for all the human beings. In a mean while Image Processing plays an important technique that used to take out the information which the user needs. One of its vital uses is in the fields of Biology and Health care.

Our project mainly takes a part with the detection of Gangrene due to Diabetes and providing its symptoms and preventions by using Image Processing and retraining the pictures using deep learning. Image Processing can be implemented in Detection of Gangrene due to Diabetes which takes a digital image of the Gangrene affected area in Human body and retrieves the symptoms of infection and required prevention and precaution. How this works is very simple. All the user needs to know is providing Digital image of Gangrene affected area to be analysed. Hence no prior knowledge is needed on user part. On the contrary, any person with an elementary knowledge of computing is eligible to operate.

Diabetes is a major group of diseases with a different types of causes. People with this disease have a high BP. This is a chaos of metabolism i.e. the way the body uses digested food for energy. Diabetes grow when the body doesn't make sufficient insulin. As a result, glucose builds up in the blood alternatively of being healed by cells in the body. The body cells

are then starved of energy despite high blood glucose levels.

## 2. Technologies used

### A. Client side

#### Android Architecture

By providing an open development platform, android offers developers the ability to build extremely rich and innovative applications. Developers are free to take advantage of the device hardware, access location information, run background services, set alarms, and notifications to the status bar, and much more.

Android operating system comprise of different software components arranged in stack. Different components of android operating system are

- Linux kernel
- Libraries
- Android Run time
- Application Framework
- Applications

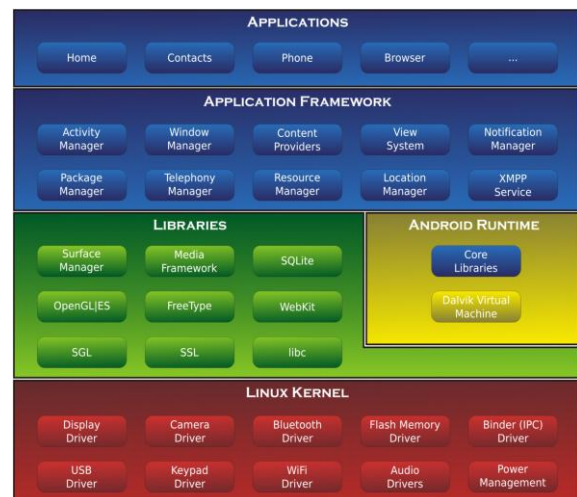


Fig. 1. Architecture of Android

### B. Server side

**Python:** Python is a computer programming language that

lets you work more quickly than other programming languages. Experienced programmers in any other language can pick up Python very quickly, and beginners find the clean syntax and indentation structure easy to learn. Python is a widely used high level, general purpose interpreted, dynamic programming language. Its design philosophy emphasizes code readability, and its syntax allows programmers to express concepts in fewer lines of code than would be possible in languages such as C++ or Java. The language provides constructs intended to enable clear programs on both a small and large scale

### 3. Transfer Learning for Deep Learning

It is a machine learning method where model developed for task 1 is reused as the starting point for model on second task. Here pre-trained models are used as the starting point on computer vision and natural language processing tasks given the vast compute and time resources required to develop neural network models on these problems and from the huge jumps in skill that they provide on related problems.

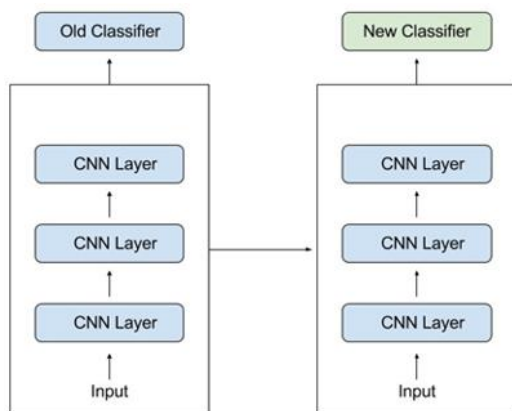


Fig. 2. Architecture transfer learning

In TL, we try to transfer as much knowledge as possible from the previous task, the model was trained on, to the new task at hand. This knowledge can be in various forms depending on the problem and the data.

#### How to Use Transfer Learning?

There are two ways to use:

- Develop Model Approach
- Pre-trained Model Approach

#### A. Develop Model Approach

*Select Source Task.* You must select a related predictive modelling problem with a large amount of data where there is some relationship in the input and output data, or concepts learned during the mapping from I/O data.

*Develop Source Model.* you must develop a skill-full model for this first task. The model must be better than a naive model to ensure that some feature learning has been performed.

*Reuse Model.* The model fit on the source task can then be used as the starting point for a model on the second task of interest. This may involve using all or parts of the model, depending on the model technique used.

*Tune Model.* Optionally, the model may need to be adapted or refined on the input-output pair data available for the task of interest.

#### B. Pre-trained Model Approach

*Select Source Model.* A pre-trained source model is chosen from available models. Many research institutions release models on large and challenging datasets that included in the pool of candidate models from which to choose from.

*Reuse Model.* The model pre-trained model can then be used as the starting point for a model on the second task of interest. This may involve using all or parts of the model, depending on the model technique used.

*Tune Model.* Optionally, the model may need to be adapted or refined on the input-output pair data available for the task of interest.

### 4. Convolutional neural network

In neural networks, Convolutional neural network is one of the important categories to do images identification, images classifications. Objects detections, faces identification etc., are few of the areas where CNNs are mostly used. CNN image classifications receives an input image, process it and classify it below certain categories Computers sees an input image as array of pixels and it lays on the image resolution. Placed on the image resolution, it will see  $h \times w \times d$  Eg., an image of  $6 \times 6 \times 3$  array of matrix of RGB and an image of  $4 \times 4 \times 1$  array of matrix of grayscale image.

A CNN architecture has three main parts

- A *convolutional layer* that extracts features from an origin image. This is the necessary feature of a CNN, which works on parts of the image every time, instead of feeding all the input to every layer of the network.
- A *pooling layer* that down samples each and every feature to decrease its dimensionality and focus on the most of important elements. There are several rounds of convolution and pooling; and in few CNN architectures, there may be hundreds or thousands.
- A *fully connected layer* that straighten the features identified in the earlier layers into a vector, and cover a traditional neural network with all neurons in each and every layer connected to all neurons in the next layer, to make this a prediction about the image

### 5. Keras Conv2d

- Keras is an API developed for human beings, not machines. Keras ensure best practices for decreasing cognitive load: it offers steady & simple APIs, it reduces the number of user actions vital for common

use cases, and it gives clear and actionable feedback upon user error.

- This makes Keras simple to learn and easy to use. As a Keras user, you are further productive, allowing you to try more ideas than your competition, much faster which in turn helps you to win machine learning competitions.
- This ease of use does not come at the cost of reduced flexibility: because Keras integrates with lower-level deep learning languages it enables you to implement anything to you could have built in the common language. In particular, as the Keras API integrates easily with your Tensor Flow workflows.

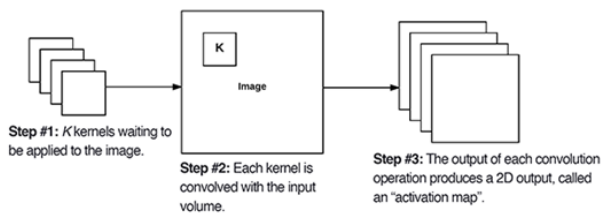


Fig. 3. Steps

2D convolution layer this layer creates a convolution kernel this is convolved with the layer input to give a tensor of outputs. If use bias is true, a bias vector is build and added to the outputs. Finally, if activation is not none, it is enforced to the outputs as well. When using this layer as the first layer in a model, give the keyword argument input shape.

## 6. Results



Fig. 4. Splash screen

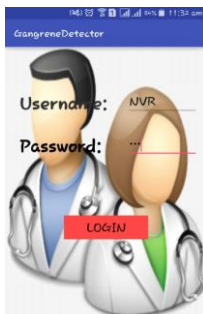


Fig. 2. Login page



Fig. 6. Symptoms checking

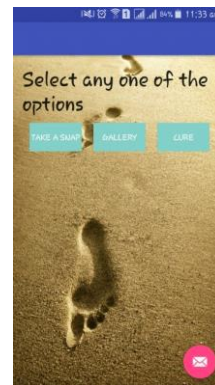


Fig. 7. Selecting option

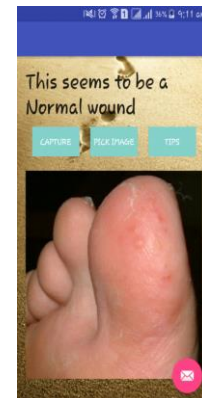


Fig. 8. Normal wound result



Fig. 9. High risk result

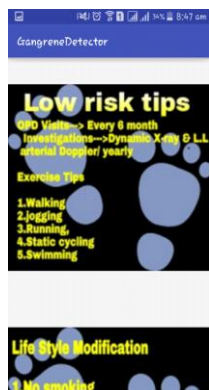


Fig. 10. Tips



Fig. 11. Tips

## 7. Conclusion

This paper presented an overview on detection of diabetic gangrene using deep learning.

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