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# An Experimental Analysis using Chatbot to Detect Breast Cancer using Histopathological Images

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***Abstract :*** Cancer is the most dangerous diseases in the world and it effects mainly women. So, considering this in mind, this analysis is based on curing the cancer through scientific investigation and the secondly, the focus should be on early detection of cancer, as early detection of cancer can be helpful for its early removal. There are many deep learning algorithms which can be used for developing the experimental set up but in this paper, a Deep Learning algorithm, viz. Convolutional neural network (CNN) has been used for diagnosing breast cancer using histopathological images. Also, Deep learning technology is being utilized on Kaggle Database using python (Keras) programming and is very beneficial for the diagnosis of breast cancer with an accuracy of 98%.

***IndexTerms*** **- Convolutional neural network, Histopathological images, Cancer detection, Kaggle database**

## 1. INTRODUCTION

Among all types of cancer in women, breast cancer is most prominent. To effectively fight against cancer, requires an early detection which can only be possible with an efficient scientific detection system [1]. There are many techniques which have been developed to detect breast cancer, like medical image processing and digital pathology. Images are acquired by histopathology, which generally includes biopsy of the affected tissue. Affected tissues with the tumor are extracted by the pathologist and are in turn stained by hematoxylin and eosin (H & E), after which it is examined under a microscope for the detection of cancerous cells by finding malignant features in cellular structures such as nuclei. These microscopic images can be collected and used for developing computer-aided detection systems.

Manual detection [7, 8] is a tedious and tiring task and it can also incorporate human error, as most parts of the cell are frequently part of irregular random and arbitrary visual angles. Main goal of the detection is to identify whether a tumour is benign or of a malignant in nature, as malignant tumors are cancerous and should be treated as soon as possible to reduce and prevent further complications [2]. Deep learning is a popular subset of machine learning technology which is inspired by the working of the human brain to analyze unstructured patterns. Histopathological sample of breast tissue is shown in Fig. 1

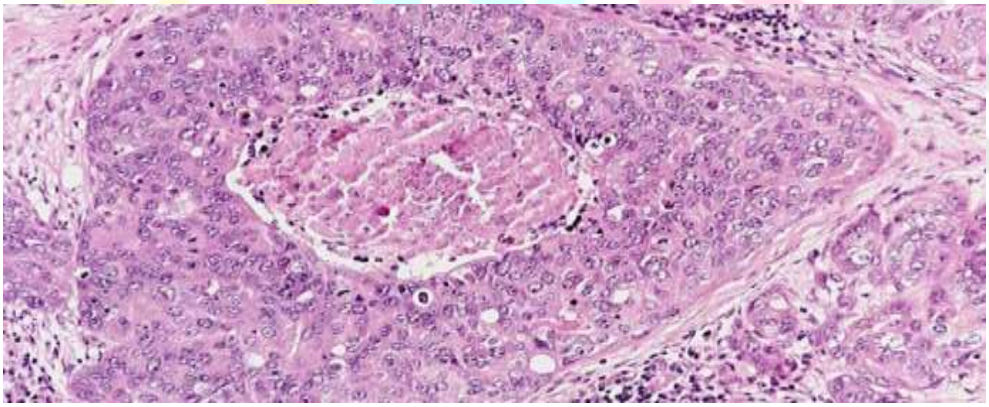

Fig. 1 Histopathological sample of breast tissue

## 2. TECHNIQUES USED

Deep learning is a branch of machine learning which is completely based on artificial neural networks, as neural network is going to mimic the human brain so deep learning is also a kind of mimic of human brain.

**2.1 Convolutional Neural Network (CNN)**

Deep Learning is a subset of Machine Learning which consists of algorithms that are inspired by the functioning of the human brain or the neural networks. These structures are called as Neural Networks [3]. It teaches the computer to do what naturally comes to humans. Based on Deep learning, there are many types of models such as the Artificial Neural Networks (ANN), Autoencoders, Recurrent Neural Networks (RNN) and Reinforcement Learning. But there has been one particular model that has contributed a lot in the field of computer vision and image analysis which is the Convolutional Neural Networks (CNN) [4] or the ConvNets and this paper is based on the usage of CNN.

The term 'Convolution" in CNN denotes the mathematical function of convolution which is a linear operation where two functions are multiplied to produce a third function. In other words, it analyzes how the shape of one function is modified by the other [5,6]. CNN is composed of many layers such as shown in Fig. 2 and are:

1. Convolutional Layer
2. Pooling Layer
3. Fully Connected Layer
4. Dropout
5. Activation Functions

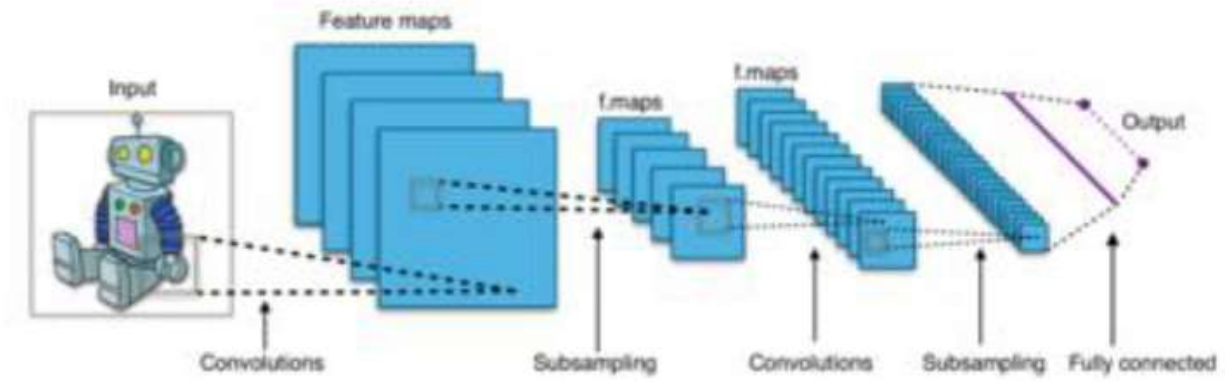


Fig. 2 CNN Layers

**2.2 Keras**

Keras is an open-source software library that provides a Python interface for artificial neural networks. Keras acts as an interface for the TensorFlow library [1] Until version 2.3 Keras supported multiple backends, including TensorFlow, Microsoft Cognitive Toolkit, Theano, and PlaidML. As of version 2.4, only Tensor Flow is supported. It is designed to enable fast experimentation with deep neural networks, it focuses on being user-friendly, modular, and extensible.

**2.3 Tkinter**

Python provides various options for developing graphical user interfaces (GUIs). Most important are listed below.

- **Tkinter** − Tkinter is the Python interface to the Tk GUI toolkit shipped with Python [2]
- **•wxPython** − This is an open-source Python interface for wxWindows.
- **JPython** − JPython is a Python port for Java which gives Python scripts seamless access to Java class libraries on the local machine.

**3. METHODOLOGY OF WORKING**

Chabot is basically a software which interacts with the patients and helps them to understand their condition without visiting any doctor. Several questions are asked to the patient firstly. Suppose for breast cancer analysis, questions are asked and then it takes your histopathological image of breast tissue and then finally tells you whether you are suffering from breast cancer or not. Here, this conversation bot is created with the help of Tkinter.

This paper introduces and assesses a deep learning architecture for automized breast cancer detection that incorporates concepts of machine learning and image classification. A labeled (benign/malignant) input image from the raw pixels is taken as input which has highlighted visual patterns, and then those patterns are utilized to distinguish between non-cancerous and cancer containing tissue, after which diagnostic decisions is made with the help of a classifier network. The CNN was trained using 2480 benign and 5429 malignant samples belonging to the RGB color model. Therefore, the proposed system provides an effective classification model for classifying breast tissue as being either benign or malignant. The working methodology is shown in Fig. 3.

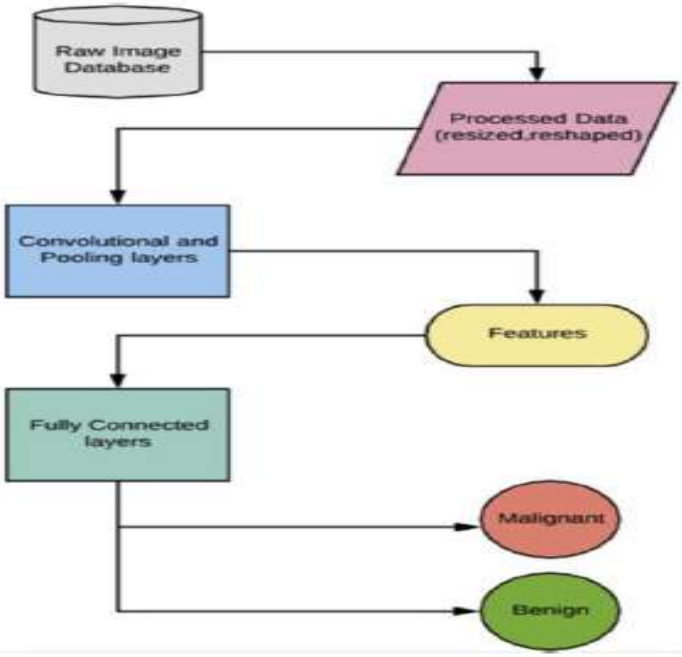


Fig. 3. Methodology of Working

## 4. ADVANTAGES AND APPLICATIONS

### 4.1 Advantages

- Quality improvement
- No noise
- No data loss
- High accuracy

### 4.2 Applications

- Bio-medical
- Medical Imaging

## 5. RESULTS OF THE SYSTEM

The system or the Chatbot developed which interacts with the patient has been created and the screenshot of the same has been shown in Fig. 4.

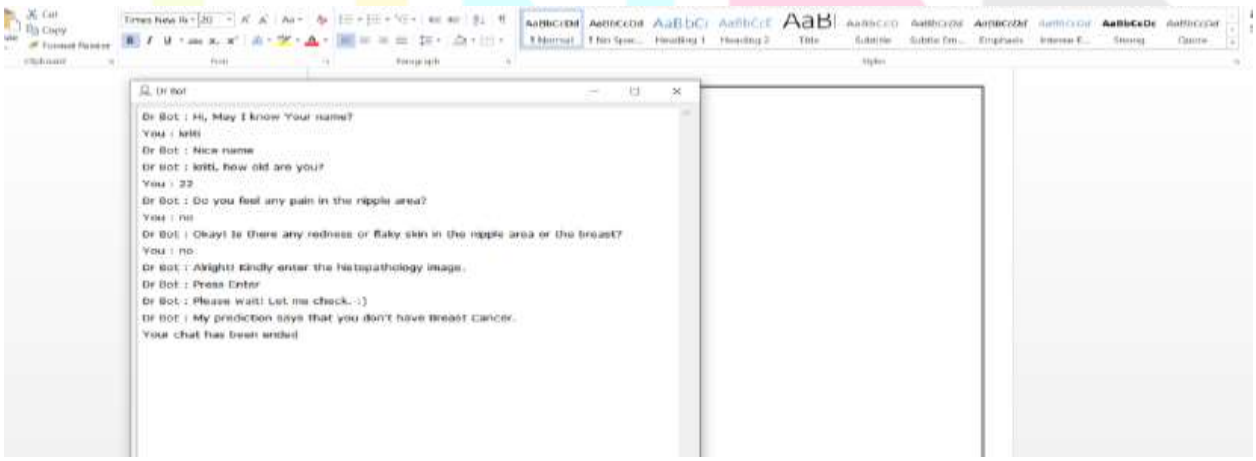


Fig. 4 Screenshot of the developed Chatbot

## 5. CONCLUSION AND FUTURE SCOPE

This paper is based on results from the early developments and future possibilities of Computer Aided Diagnosis (CAD) systems. Histopathological examination of biopsy sample which is critical in all aspects, ranging from cancer detection to treatment planning can be taken as an input image. Here, CNN is being used with the help of Python language to develop a chatbot for developing the system. As Spectral imaging is one of the most important challenge in histopathology because it can achieve images at different wavelengths instead of ordinary RGB (3-channel) input image. Therefore, in future addition of this feature can potentially provide

significant information to the doctor in the diagnosis of cancer detection. Also, the utilization of a digitized breast cancer system in histopathology images for clinical purposes will be a milestone in the medical history.

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