Deep learning Techniques for Breast Cancer Prediction using IBM Cloud

1. INTRODUCTION

1.1 Overview

Breast cancer is one of the main causes of cancer death worldwide. Computer-aided diagnosis systems showed the potential for improving diagnostic accuracy. But early detection and prevention can significantly reduce the chances of death. It is important to detect breast cancer as early as possible.
The goal is to classify images into two classifications of malignant and benign. As early diagnostics significantly increases the chances of correct treatment and survival. In this application, we are helping the doctors and patients to classify the Type of Tumour for the specific image given with the help of Neural Networks.
We will be using deep learning algorithm CNN, NumPy, TensorFlow, Keras, OpenCV and some other deep learning techniques. We will do Flask Integration and IBM Watson Deployment also.

1.2 Purpose

Since early detection and prevention can significantly reduce the chances of death the earlier, the better. The purpose here is to build a model in Watson Studio and deploy the model in IBM Watson Machine Learning.

2. LITERATURE SURVEY

2.1 Existing problem

Doctors use many tests to find, or diagnose, breast cancer. They may also do tests to learn if the cancer has spread to a part of the body other than the breast and the lymph nodes under the arm. If this happens, it is called a metastasis. Doctors may also do tests to learn which treatments could work best. For most types of cancer, a biopsy is the only sure way for the doctor to know if an area of the body has cancer. In a biopsy,

the doctor takes a small sample of tissue for testing in a laboratory. This section describes options for diagnosing breast cancer. Not all tests listed below will be used for every person. Doctors may consider these factors when choosing a diagnostic test:

- The type of cancer suspected
- Your signs and symptoms
- Your age and general health
- The results of earlier medical tests The series of tests needed to evaluate a possible breast cancer usually begins when a woman or their doctor discover a mass or abnormal calcifications on a screening mammogram, or a lump or nodule in the breast during a clinical or self-examination. Less commonly, a woman might notice a red or swollen breast or a mass or nodule under the arm. The following tests may be used to diagnose breast cancer or for follow-up testing after a breast cancer diagnosis. Imaging tests:Imaging tests show pictures of the inside of the body. The following imaging tests of the breast may be done to learn more about a suspicious area found in the breast during screening. In addition to these, there are other new types of tests that are being studied.
- Diagnostic mammography. Diagnostic mammography is similar to screening mammography except that more pictures of the breast are taken. It is often used when a woman is experiencing signs, such as a new lump or nipple discharge. Diagnostic mammography may also be used if something suspicious is found on a screening mammogram.
- Ultrasound. An ultrasound uses sound waves to create a picture of the breast tissue. An ultrasound can distinguish between a solid mass, which may be cancer, and a fluid-filled cyst, which is usually not cancer.
- MRI. An MRI uses magnetic fields, not x-rays, to produce detailed images of the body. A special dye called a contrast medium is given before the scan to help create a clear picture of the possible cancer. This dye is injected into the patient's vein. A breast MRI may be used after a woman has been diagnosed with cancer to find out how much the disease has grown throughout the breast or to check the other breast for cancer. Breast MRI is also a screening option, along with mammography, for some women with a very high risk of developing breast cancer and for some women who have a history of breast .MRI may also be used if locally advanced breast cancer is diagnosed or if chemotherapy or endocrine therapy is being given first, followed by a repeated MRI for surgical planning. Finally, MRI may be used as a surveillance method following a breast cancer diagnosis and treatment. Biopsy:A biopsy is the removal of a small amount of tissue for examination under a micro scope. Other tests can suggest that cancer is present, but only a biopsy can make a definite diagnosis. A pathologist then analyzes

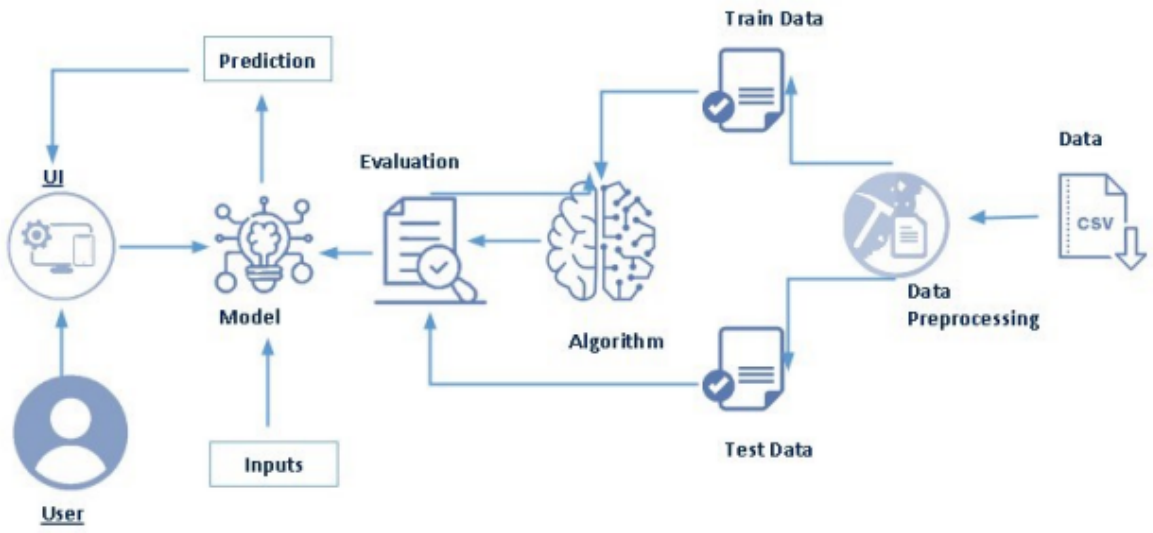
the sample(s).

2.2 Proposed solution

As can be seen, there is a series of tests and diagnosis to be carried out. A lot of processing and documentation and manual analysis is involved. Instead if all this data is retrieved into a model , early detection and prevention will significantly reduce the chances of death. The purpose here is to build a machine learning and deploy it in Watson Studio by creating an endpoint. To interact with the model, Node-Red and scoring Endpoint will be used

3. THEORITICAL ANALYSIS

3.1 Block diagram



3.2 Hardware / Software designing

To complete this project, you must required following software's, concepts and packages

1. Anaconda navigator and pycharm:
    a. Refer the link below to download anaconda navigator
    b. Link : https://youtu.be/1ra4zH2G4o0
2. Python packages:
    - Open anaconda prompt as administrator
    - Type“pipinstallnumpy”andclick enter.
    - Type“pipinstallpandas”andclickenter.
    - Type“pipinstallscikit-learn”andclickenter.
    - Type”pipinstall matplotlib”andclickenter.
    - Type”pipinstallscipy”andclickenter.
    - Type”pipinstallpickle-mixin”andclickenter.
    - Type”pipinstallseaborn”andclickenter.
    - Type“pipinstallFlask”andclickenter.

4. EXPERIMENTAL INVESTIGATIONS

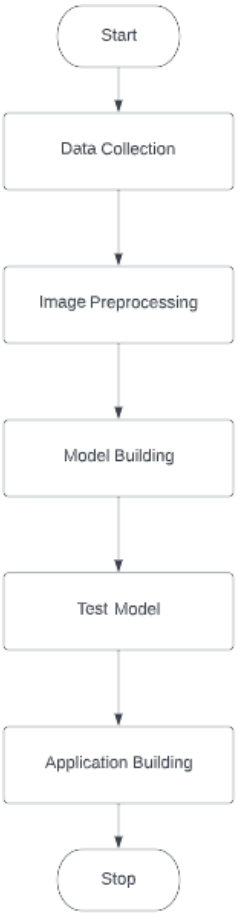
You must have prior knowledge of following topics to complete this project.

- ML Concepts
    - Supervised learning: https://www.javatpoint.com/supervised-machine-learning
    - Unsupervised learning: https://www.javatpoint.com/unsupervised-machine-learning
    - Regression and classification
    - Decision tree: https://www.javatpoint.com/machine-learning-decision-tree-classification-algorithm

- Random forest: https://www.javatpoint.com/machine-learning-random-forest-algorithm
- KNN: https://www.javatpoint.com/k-nearest-neighbor-algorithm-for-machine-learning
- Xgboost: https://www.analyticsvidhya.com/blog/2018/09/an-end-to-end-guide-to-understand-the-math-behind-xgboost/
- Evaluation metrics: https://www.analyticsvidhya.com/blog/2019/08/11-important-model-evaluation-error-metrics/

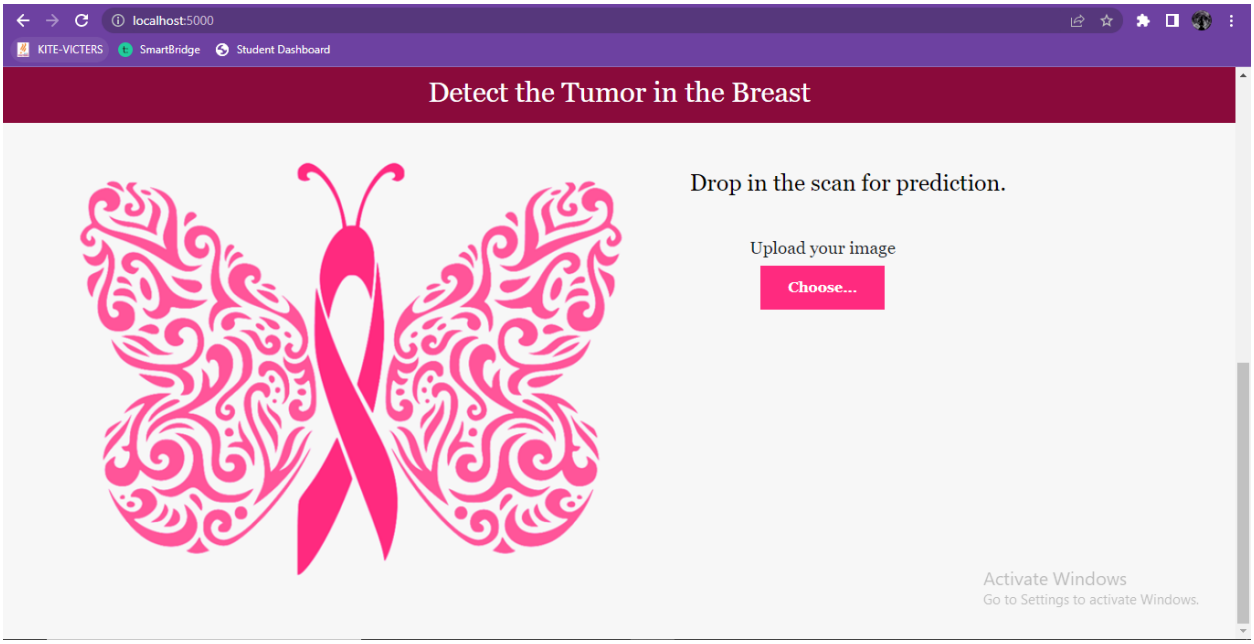
- Flask Basics : https://www.youtube.com/watch?v=lj4I_CvBnt0

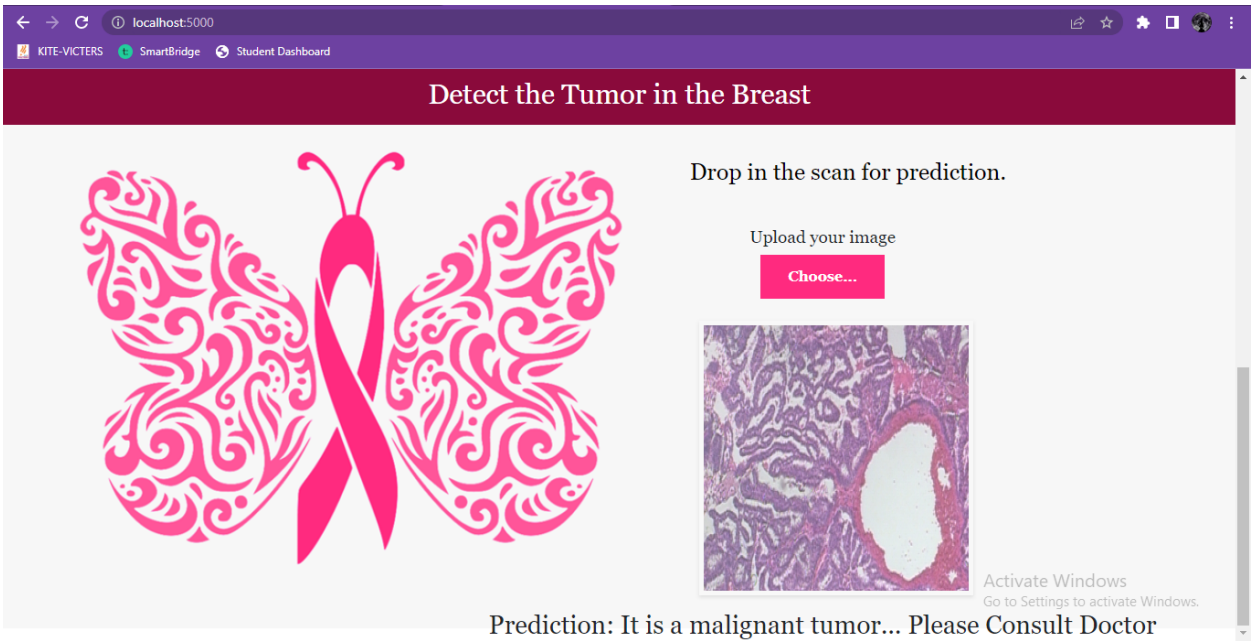
5. FLOWCHART



5. RESULT


localhost:5000
KITE-VICTERS
SmartBridge
Student Dashboard
Detect the Tumor in the Breast
Breast cancer is one of the main causes of cancer deaths worldwide. Early diagnostics significantly increases the chances of correct treatment and survival, but this process is tedious and often leads to a disagreement between pathologists. Computer-aided diagnosis systems showed potential for improving the diagnostic accuracy. But early detection and prevention can significantly reduce the chances of death. It is important to detect breast cancer as early as possible. This application is based on Convolution Neural Networks which classifies the scan as either benign or malignant tumor.
Activate Windows
Go to Settings to activate Windows.


localhost:5000
KITE-VICTERS
SmartBridge
Student Dashboard
Detect the Tumor in the Breast
Drop in the scan for prediction.
Upload your image
Choose...
Activate Windows
Go to Settings to activate Windows.



7. ADVANTAGES & DISADVANTAGES

Advantages:

- Increased accuracy for insurance prediction.
- Reduce the time complexity.

Disadvantages:

- Data mining techniques does not help to provide effective decision making.

8. APPLICATIONS

- Deep Learning technology can be used for early detection of Breast cancer.
- It presents the results obtained by processing input from uploading image.

9. CONCLUSION

In this project, we have established the application to predict from uploaded image based on the IBM cloud application. Breast cancer prediction can be used as a web app to predict the cancers cell in breast.

10. FUTURE SCOPE

The project can be further enhanced by deploying the deep learning model obtained using a web application and larger dataset cloud be used for prediction to give higher accuracy and produce better result.

11. BIBILOGRAPHY

- ◊ Supervised Learning: https://www.javatpoint.com/supervised-machine-learning https://youtu.be/kE5QZ8G_78c

- Unsupervised Learning: https://www.javatpoint.com/unsupervised-machine-learning https://www.youtube.com/watch?v=kE5QZ8G_78c ◊ Regression, Classification and Clustering: https://www.youtube.com/watch?v=6za9_mh3uTE https://www.geeksforgeeks.org/ml-classification-vs-clustering/

- Artificial Neural Netrwoks: https://www.youtube.com/watch?v=DKSZHN7jftI https://www.javatpoint.com/artificial-neural-network

- Convolution Neural Networks (CNN) : https://www.youtube.com/watch?v=umGJ30-15_A https://www.geeksforgeeks.org/introduction-convolution-neural-network

- ● Flask Basics: https://www.youtube.com/watch?v=lj4I_CvBnt0

APPENDIX

Source code

main project.ipynb

```
import tensorflow as tf
```

```
[2] from google.colab import drive
    drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

```
[3] from keras.preprocessing.image import ImageDataGenerator
    train_datagen = ImageDataGenerator(rescale = 1./255,shear_range =0.2,zoom_range = 0.2,horizontal_flip = True)
    test_datagen = ImageDataGenerator(rescale = 1./255)
```

```
[4] x_train = train_datagen.flow_from_directory(r"/content/drive/MyDrive/Breast-Cancer-Risk-Prediction-main/breastcancerdataset/test", target_size=(64,64),batch_size
    x_test = test_datagen.flow_from_directory(r"/content/drive/MyDrive/Breast-Cancer-Risk-Prediction-main/breastcancerdataset/train",target_size=(64,64),batch_size=
```

```
Found 22 images belonging to 2 classes.
Found 103 images belonging to 2 classes.
```

```
[5] from keras.preprocessing.image import ImageDataGenerator
    from keras.models import Sequential
    from keras.layers import Conv2D, MaxPooling2D, Dense, Dropout, Flatten
    from keras.layers import MaxPooling2D
```

```
[6] model=Sequential()
```

```
[7] model.add(Conv2D(64,(3, 3),activation='relu', input_shape=(75, 75, 3)))
```

```
[8] model.add(MaxPooling2D(pool_size = (2,2)))
```

```
[9] model.add(Flatten())
```

```
[10] model.add(Dense(units= 40 ,kernel_initializer='random_uniform',activation = 'relu'))
```

```
[11] model.add(Dense(units= 1,activation = 'softmax',kernel_initializer= 'uniform'))
```

```
[12] model.compile(loss='binary_crossentropy',optimizer='adam',metrics=['accuracy'])
```

```
[14] from keras.models import load_model
     from keras.preprocessing import image
     import numpy as np
     from tensorflow.keras.models import load_model
```

```
[15] model = load_model("breastcancer.h5")
```

app.py

```
from __future__ import division, print_function
# coding=utf-8
import sys
import os
import glob
import numpy as np
from keras.preprocessing import image


from keras.applications.imagenet_utils import preprocess_input, decode_predictions

from keras.models import load_model
from keras import backend
from tensorflow.keras import backend

import tensorflow as tf

 # global graph
# graph=tf.get_default_graph()


from skimage.transform import resize

# Flask utils
from flask import Flask, redirect, url_for, request, render_template
from werkzeug.utils import secure_filename
from gevent.pywsgi import WSGIServer

# Define a flask app
app = Flask(__name__)

# Load your trained model
model = load_model("ibmbreastcancer.h5")
print('Model loaded. Check http://127.0.0.1:5000/')



@app.route('/', methods=['GET'])
def index():
    # Main page
    return render_template('bcancer.html')
```

```python
@app.route('/predict', methods=['GET', 'POST'])
def upload():
    if request.method == 'POST':
        # Get the file from post request
        f = request.files['image']

        # Save the file to ./uploads
        basepath = os.path.dirname(__file__)
        file_path = os.path.join(
            basepath, 'uploads', secure_filename(f.filename))
        f.save(file_path)
        img = image.load_img(file_path, target_size=(64, 64))

        x = image.img_to_array(img)
        x = np.expand_dims(x, axis=0)
       #  with graph.as_default():
        preds = model.predict(x)
        if preds[0][0]==0:
            text = "The tumor is benign.. Need not worry!"
        else:
            text = "It is a malignant tumor... Please Consult Doctor"
```