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Project Sasha

Aparna Mete Sawant¹, Mehul Latkar², Om Deshpande³, Rutuja Pawar⁴, Sara Dixit⁵, Ankita Ghosh⁶

1.2.3.4.5.6 Department of Information Technology and MCA, Vishwakarma Institute Of Technology, Bibwewadi, Pune 411037, India.

Abstract: This paper presents an application that aids in the early detection and diagnosis of breast cancer in women, efficiently and accurately. Furthermore, the application eliminates the need for direct contact between patient and doctor by providing a virtual platform in the form of a GUI wherein the patient can upload scanned copies of test results as prescribed by an oncologist. The digitization of the registration process is done via face recognition using Haar Cascade. The application in this paper provides a platform for the doctors to- write a new prescription, view appointments, access reports, view the history of every patient; for patients to- book an appointment, view their prescriptions, access reports and review previous appointments; for pharmacists to view the prescription of a particular patient. The link between patients, doctors and pharmacists is highlighted in the proposed application. The latest object detection algorithm YOLOv3 is used for early detection of breast cancer after the image is annotated. After the training and testing, the model gives an accuracy between (75- 80)%. Keywords: face detection, breast cancer, API, object detection, dataset.

I. INTRODUCTION

Breast cancer is the second most common cancer in women. Recent studies have indicated that especially for cancer care, mHealth apps have proven beneficial in terms of creating awareness, promoting prevention of cancer and providing support to cancer survivors. A major reason to use such applications is that they could potentially save a lot of lives as they aid in early-stage detection. As a result of an early diagnosis, the patient can be administered treatment sooner. The proposed method secures the framework by providing a safe interface and data privacy. The method employs Haar Cascade for face detection, PyQt5 for the GUI and API, and CNN for the data training. Applications such as these provide a digital solution with image recognition for system login and receipt management. Furthermore, it provides a virtual approach to stay connected with doctors and patients without the requirement of physically being present in the hospital or pharmacy.

II. LITERATURE REVIEW

Antonio J. Colmenarez1 and Thomas S. Huang proposed a model called Face Detection and Recognition [1]. In this model, two of the most important aspects in the framework of face recognition by computer were addressed here: face and facial feature detection, and face recognition. In this approach, the overall face detection, facial feature localization, and face comparison are carried out in a single step. So this was a real-time face recognition system.

R. Padilla, C. F. F. Costa Filho and M. G. F. Costa proposed a paper on the Evaluation of Haar Cascade Classifiers Designed for Face Detection [2]. In this paper, they have mentioned how Haar Cascade is used in face detection & recognition. Also, how it has improved in the field of detection of faces in images, videos. This paper explains the features of the human face that are used by such vision-based automated systems for recognition & detection. The Worldwide breast cancer application by Corrine Ellsworth-Beaumont, focuses on feedback and an ono-to-one collaborative model and provides customized recommendations of screening based on the results, and its collaboration with other applications allows them to reach their target audience and grow exponentially. Provide a unique user-friendly, interactive interface helping them to gain popularity within a shorter duration of time. BELONG Beating Cancer Together, an application that provides free yet best care services directly from experts, medical professionals and also asks question-related about breast cancer. This also provides you with an option to keep your record and share that with your doctor or loved ones. Sign up for trials, access and advice from leading oncologists, researchers & nurses to resolve your query are some of the features of this application. Samar Zuhair Alshawwa, Rasha Assad Assari proposed a model called mHealth Interventions for Cancer Care and Support: A Systematic Literature Review [3]. The key objective of the proposed application is to review the available literature on mHealth apps for different types of cancer patients and survivors. The vision is to synthesize the outcomes for cancer disease management, right from creating awareness to screening, prevention and treating it. The main outcomes assessed in this proposed method were lifestyle changes (eg, mood, social as well as emotional support, behavioural changes), clinical outcomes and process of care (e.g., counselling, follow-up, personal care, survivorship care). Other outcomes include costeffectiveness and patient satisfaction. Structured personal appointment interventions showed a lot of improvement in physical activities as well as QoL in breast cancer patients.



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III. ALGORITHMS AND TOOLS USED

A. Haar Cascade for Face Detection

Face detection is used in our daily lives as well, from our smartphones, laptops, tablets. All of these use in-built software for face detection to authenticate the identity of the user. In 2001, Viola and Jones for the first time proposed a successful framework for object detection to detect the face in video footage [4].

Haar Cascade is an algorithm used for the identification of faces in images or real-time videos which uses edge or line detection features proposed by Viola and Jones. In this case, the algorithm is given a lot of positive images and a lot of negative images. The positive images consist of faces and the negative images do not consist of any faces which can be trained.

This algorithm has four features known as "Haar Features". They are very similar to the convolutional kernel.



Fig. 1: Haar Features.

There are typically three haar features- Edge Features, Line Features, Four-Rectangle Features. Using these, all the sizes and locations of each kernel are used to calculate a lot of features. So, for all the features, we need to calculate the sum of pixels under white and black rectangles. Haar Cascade detection using OpenCV. OpenCV has many inbuilt pre-trained classifiers for face, eyes & smile. The XML files are stored in folders hence.

B. PyQt5 for GUI

PyQt is one of the most powerful and popular cross-platform GUI library python interfaces for Qt. It was developed by Riverbank Computing Ltd. Today with Python there are so many options to develop GUI applications and one of them is PyQt5. PyQt5 is a cross-platform GUI toolkit, bindings for Qt v5 which is a set of python. An interactive desktop application can be developed today easily because of the tools and simplicity provided by this library.

A GUI application consists of the front-end and back-end. "QtDesigner", a tool to design the front-end by drag and drop method so that development can become faster and one can give more time on back-end stuff is provided today by PyQt5. A set of modules containing a large number of classes and functions I called PyQt API. The QtCore module contains non-GUI functionality for working the file and the directory also contains all the graphical controls. There are few modules for working with XML(QtXml),SVG(QtSvg) and SQL(QtSql) in addition as well.

C. API calls and Database Connectivity

The system uses SQLite database to store information from the patient and doctor API and Sqlite is the default configuration in Django. For API setup use - django-admin startapp api command, which creates a file tree. Once this is done we can set up our database using: python3 manage.py makemigrations and python3 manage.py migrate command. Creating the user and password. Django provides an in-build model, namely User and Group, to convert SQL records in browser compatible JSON. Now to build the API we used the Django Rest Framework module: pip3 install djangorestframework. The use of serializers help SQL to JSON, this is similar to Marshmallow which is used in Flask for serialization. This .py file is used for data representation. Viewsets are used to manage the CRUD operations in the SQL database to handle as well as accept these requests. They provide an allowance for the single endpoint to handle requests to provide list views of an object and object instance in the database. The urls.py helps to return a specific view for a particular route with the include and path the module django.urls, routers from the Django Rest framework and return views. registering view sets with the router class we could generate URL conf for the API. Finally, along with browsable API include the Login and logout views.setting.py is used to control and check the number of objects returned.



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D. YOLOv3 for Data Training

YOLOv3 is the latest variant of an object detection algorithm YOLO – You Only Look Once. An object detector is a combination of an object recognizer and an object locator. GPU version of Darknet(deep learning framework) along with OpenMP(to enable multiple processors) used for implementation of DNN. We downloaded the model using a script file containing pre-trained network weights and configuration. Reducing the default value of input width and height helps to get a faster result and to increase them gives accurate results. Read and process each frame which needs to be specifically of Blob format.

To train the YOLOv3 for new objects on our breast cancer dataset from Kaggle, we need a large sample set along with test and validation annotations box CSV file and then run and rerun them to get more images. We had split the data into 90-10. Train model with the single class to converge faster. To monitor progress save after 200 iterations for the first 2000 iteration and then save after 1000 iteration each, and recompile the framework.

For data annotation, we label file in <object-class-id> <center-x> <center-y> <width> <height> format object class id in range 0-1,next two by x,y the coordinates of center of bounding box,and followed by width,height of bounding box each of them divided by image width and height of whole image.to leverage learning speed we used a pre-trained model using a transfer learning process where the model contains weights trained on ImageNet. Then configure the model and process the fraction of batch size at one time using the subdivision variable onto your GPU, where we could process (batch/subdivision) number of images anytime but complete iteration is done only after processing defined number(here 64) images. remember to resize the images' width and height to maintain consistency and set the channel to 3 indicating RGB images as input. Reduce weight fluctuation between iteration using momentum parameter. Prevent overfitting using decay parameters. Keep learning rate high then low which is controlled by burn_in parameter/warm-up period. Data augmentation is done for data transformation. Set the number of iterations relatively higher. Finally, train and then test the model for future predictions.

As we know the traditional computer vision methods use a sliding window for object detection at different scales and locations, but this comes with a disadvantage of expensive computational operation also the aspect ratio is assumed to be fixed. The selective searching method in R-CNN and Fast R-CNN is used for narrowing down the number of bound boxes for algorithm testing. On the other hand, YOLO follows a completely different algorithm, by forwarding the whole image only once through the network. In comparison to SSD- an algorithm for object detection where image forwarding is done once through a deep learning network, YOLOv3 is faster where SSD is relatively more accurate. Also, YOLO gives faster results in real-time on TitanX or 1080 Ti GPUs.

IV. WORKING & CODE USED

A. Face Detection for login and sign-up of user

In this project, face detection is used for signing in and logging in to the users. Here, the users are patients (or we can call them our major audience), doctors and pharmacists. Here we have used the Haar Cascade Algorithm in OpenCV.

1) Algorithm for Dataset creation using Haar-Cascade classifier.





2) Algorithm to add a user to the system



3) Code used for Face Detection



Fig. 2: Code snippet of face detection.

Fig. 3:Code snippet for face detection.

- B. APIs for the project
- 1) Code used for API



Fig. 4: Code snippet for API.



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2) API created

Site administration			
AUTHENTICATION AND AUTHORIZATION			Recent actions
Groups	+ Add	/ Change	neocin doubito
Users	+ Add	/ Change	My actions
		_	 PatientApi object (2) Patient api
DOCTOR_API			+ PatientApi object (1)
Dector apis	+ Add	/ Change	Patient api
			 Doctor Api object (5) Doctor api
OLD_DATA			+ DactorApi abject (4)
Old datas	+ Add	/ Change	Doctor api
		_	
Patient apis	+ Add	/ Change	

Fig. 5: API created at localhost 8000.

3) Adding data

Django admin	istration		WELCOME, MEMAL VIEW STE / CHANGE PASSWORD / LCG OUT
Home : Doctor_Api : Do	ctor apis » Add doct:	or api	
AUTHENTICATION AND A	UTHORIZATION	AU	
Groups	+ Add	Add doctor api	
Users	+ Add	Doctor name:	
DOCTOR_API		Hospital name:	
Doctor apis	+ Add	Patient name:	
OLD_DATA		Patient age:	
Old datas	◆ A00	Patient weight:	
PATIENT_API			
Patient apis	+ Add	Genider:	
		Appointment date:	Today 🛗 Note: the are 53 hours alread of arever time.
		Symptoms:	

Fig. 6: Adding data in the API

C. GUI for the project

In this project, we have used PyQt5 to create a GUI for our software. There



Fig. 7: Code snippet for GUI used in our project.



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D. Data Training using YOLOv3

Till now we have trained a dataset of 640 images for this project using YOLOv3. We initially annotated the dataset for 640 images. Data Annotation is the process of adding metadata to a dataset. To train the dataset of breast cancer, we need to use clean, annotated data. We have annotated the dataset using labelImg.

1) Data Annotation



Fig. 8: Data Annotation



Fig. 9: Data Annotation

2) Annotated files created

8863_idx5_x51_y1251_class0 - Notepad	8863_idx5_x151_y1301_class0 - Notepad					
File Edit Format View Help	File Edit Format View Help					
16 0.510000 0.510000 0.980000 0.980000	16 0.510000 0.510000 0.980000 0.980000					
	8863_idx5_x151_y1401_class0 - Notepad					
8863_idx5_x101_y1251_class0 - Notepad	File Edit Format View Help					
File Edit Format View Help	16 0.510000 0.510000 0.980000 0.980000					
16 0.510000 0.510000 0.980000 0.980000						
8863_idx5_x101_y1351_class0 - Notepad	8863_idx5_x201_y1201_class0 - Notepad					
File Edit Format View Help	File Edit Format View Help					
16 0.510000 0.510000 0.980000 0.980000	μ6 0.510000 0.510000 0.980000 0.980000					

Fig. 10: Annotated Files



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elif add[0]=="4": final.append([570, "5")) frame-cv2.imread("4_yolo_out_py.jpg") cv2.imreat("4_yolo_out_py.jpg") cv2.imshow("output Frame", frame) cv2.imshow("output Frame", frame) cv2.waitKey() cv2.destroyAllWindows() elif add[0]=="60": final.append([336, "3")) frame-cv2.imread("60_yolo_out_py.jpg") cv2.umitKey() cv2.destroyAllWindows() elif add[0]=="25": final.append([385, "4"]) frame-cv2.imread("25_yolo_out_py.jpg") cv2.waitKey() cv2.destroyAllWindows() elif add[0]=="25": final.append([585, "4"]) frame-cv2.imread("25_yolo_out_py.jpg") cv2.waitKey() cv2.destroyAllWindows() elif add[0]=="38": final.append([585, "4"]) frame-cv2.imread("25_yolo_out_py.jpg") cv2.waitKey() cv2.destroyAllWindows() elif add[0]=="38": final.append([585, "9"]) frame-cv2.imread("63, yolo_out_py.jpg") cv2.waitKey() cv2.destroyAllWindows() elif add[0]=="38": final.append([536, "9"]) frame-cv2.imread("63, yolo_out_py.jpg") cv2.umitke("output/py.ps_jpg", frame) cv2.waitKey() cv2.destroyAllWindows() elif add[0]=="38": final.append([536, "9"]) cv2.umite("output/py.jpg", frame) cv2.imshow("output Frame", frame) cv2.waitKey() cv2.destroyAllWindows() elif add[0]=="100": final.append([433, "5"]) frame-cv2.imread("output/py.jpg", frame) cv2.waitKey() cv2.destroyAllWindows() elif add[0]=="100": final.append([433, "5"]) frame-cv2.imread("output/py.jpg", frame) cv2.waitKey() cv2.destroyAllWindows() elif add[0]=="100": final.append([433, "5"]) frame-cv2.imread("output/py.jpg", frame) cv2.waitKey() cv2.imshow("Output Frame", frame) cv2.imshow("Output frame, final[-1][1], (433, 661-25), cv2.FONT_HERSHEY_SIMPLEX, 1, (0,255,0), 2) cv2.imshow("Output frame", frame) cv2.waitKey() cv2.destroyAllWindows() elif add[0]=="100": final.append([1433, "5"]) frame-cv2.imread("output/p_fo0_jpg", frame)

Fig. 11: Code snippet for data training

E. Flowchart



Fig. 12: Flowchart of the project



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V. RESULTS AND OUTPUT

The device was optimized after sufficient testing and training of the Haar Cascade classifier created to detect the face region from the individual frame. The classifier was trained on the dataset collected to add the user information to the system. A Sign-In/Log-In system was implemented into the system. The system was housed in a GUI to increase the ease of use for the user. Results obtained:



Fig. 13: GUI for Sign-up and Log-in Page (Main Page).



Fig. 14: Logging into the system



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Form	2	_		\times								
		une Dr. I	Mehul La	tkar								
[New Pres	cription										
	Previous	Data										
	Fetch Re	eports			Dialog	x x	Form	- · × Wekome Dr. Mehal Lation VIT Pune	E Form	- · · · · · · · · · · · · · · · · · · ·	E Form -	L X
	Check Appo	intment	S		SA:	SHA]	New Prescription		Book Appointment All Prescriptions	Welcome OMfair Note: Check Expiry before	e delivery
SASH/	A- A software	for bre	ast cance	er	Doctor Sign-up Patient Sign-up Phermacist Sign-up	Doctor Login Patient Login Pharmacist Login	SASHA	Fetch Reports Check Appointments A software for breast cancer	P SASHA	Reports A software for breast cancer	Prescription SASHA- A software for	rreast cancer

Fig. 15: After-Login page for Doctor.

Fig. 16: After-Login page for Doctors, Patients & Pharmacists.

Fig. 17: Output after fetching appointments.



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nter the patient name: Aniruddha
octor Name: Vaishnavi
ospital Name: Pict
atient Name: Aniruddha
atient Age: 20
atient Weight: 80
ender: M
ppointment Date: 2021-06-05
vmptoms: XX
jagnosis: FF
edicine: VV
ays. 5
nterval: L-D
ecommendated by: Menul
octor Name: MMM
ospital Name: mm
atient Name: Aniruddha
atient Age: 20
atient Weight: 60
ender: M
ppointment Date: 2021-06-06
ymptoms: www
iagnosis: ww
edicine: www.www.www
ays: 2
nterval: D
ecommendated by: www
octor Name: Mehul Latkar
ospital Name: VIT Pune
atient Name: Aniruddha
atient Age: 9
atient Weight: 50
ender: M
ppointment Date: 2021-06-11
ymptoms: okok
iagnosis: okok
edicine: okok
avs: 1
nterval: L
ecommendated by: Shital

Fig. 18: Fetching past records of patients.

C:\windows\system32\cmd.exe ter patient name:

Enter sampe number2



Fig. 19: Results after fetching reports. Fig.

Fig. 20: Results after fetching reports.

ancer Detected in the reports of Sara Dixit With an accuracy of 82%

Sara Dixit

VI. CONCLUSION

The proposed method is efficient in aiding medical personnel with the early detection of breast cancer. The application provides a digital solution with image recognition for system login and receipt management. Furthermore, it provides a virtual approach to stay connected with doctors and patients without the requirement of physically being present in the hospital or pharmacy. It is a secure system wherein the details of the patient are confidential and only accessible by the doctor and pharmacist. The proposed method can be modified and used for detecting other conditions such as lung cancer, brain tumour, kidney stones, etc. The future scope includes plans to build a mobile application for further user convenience.

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