

BURN CARE



OUR TEAM



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INTRODUCTION

Burn is one of the serious public health problems . A burn occurs when heat, chemicals, sunlight, electricity or radiation damages skin tissue . There are different degrees of burns (first, second, third).

According to World Health Organization statistics (WHO), burn injuries cause 180,000 fatalities on average per year and In Egypt, burn rates are the third cause of death, as the number of burn victims reaches about 80,000 injured annually, equivalent to 300 patients every day.

PROBLEMS



01

Many people may use incorrect first aid, such as putting toothpaste on the burn, which makes matters worse because it is a non-sterile substance, or applying ice that causes irritation to the damaged skin surface and increases the feeling of pain instead of relieving it.



A close-up photograph showing a person's arm with a severe, blistered burn. A hand is applying a white, toothpaste-like substance to the injured area. The background is a teal-colored surface.

Putting
toothpaste
on the burn



02



Sometimes many people get burned late when there are not many clinics available

03



Many patients who live in very remote places may not complete their treatment due to the difficulty of reaching a doctor, which leads to their incomplete recovery.

Related Work

Some applications had the lead in providing services for burn patients, including:

Burn Ai, Burn Care ,Burn Referral, Burn Medical Education, Burn Table App

Advantages:

These Apps target doctors to help them determine the burn degree, calculate the burned body surface area and treat dehydration during the first 24 hours.

Limitations:

- These Apps don't provide any services to the patient, whether first aid or treatment.
- Some of them are available for Apple IOS only.

How can we avoid these limitations?





Solution is a **Mobile Application** integrated with **Deep Learning models**.

The main aim is to create a complete burns care tracker system between doctor and patient and solves most of the problems they face while treating burns.

Our system is consider a framework include everything related to burn whether it is :

- information about burns
- determine the degree of burn and the appropriate first aid
- connects them with doctors to treat the burn
- gives them some instructions for a full recovery.

Our system also has high security to maintain patient images and Financial transactions, as all patient data is encrypted in the database.

01

The system immediately sends **first aid** appropriate to the burn degree to contribute to reducing the risk of infection, preventing any complications that may occur to the patient and reducing the pain caused by the injury.

02

The system is **available (24/7)** and in critical situations (third and fourth-degree burns), the system allow patient to reserve an urgent appointment.

03

The system provides comprehensive **consultations** with the treating physician for follow-up according to the patient's health status. It also provides many doctors with different specialties

OTHER SERVICES

01.

contract with
pharmacies
that have a
24-hour
delivery
service

02.

alerts the
patient of the
dates of medical
consultations
and dates of the
medicines

03.

allow the
patient to make
a feedback
about the
doctor



Machine Learning

Skin burn dataset

- This dataset consists of 1440 from images of different degrees of skin burn (from Kaggle)
- Labels are in YOLO Format
- According to their severity, the images are labeled as first degree, second degree, or third degree burns.
- All the images have been resized to the shape (224×224×3) that contains information about the row, column, and channel of the image and then stored them in a 3D multichannel array.

Models

CNN Model:

- A Convolutional Neural Network (CNN) is a type of deep learning algorithm specifically designed for image processing and recognition tasks.
- The CNN architecture comprises three main layers: convolutional layers, pooling layers, and a fully connected (FC) layer .

An overview of the layers in a typical CNN:

- **Input layer:** This layer takes in the input image and passes it to the next layer.
- **Convolutional layer:** This layer applies a set of learnable filters to the input image and produces a set of feature maps.
- **Activation function:** This layer applies a non-linear function to the output of the convolutional layer to introduce non-linearity into the model.
- **Output layer:** This layer produces the final output of the model, which is a class label or a set of regression values.

VGG16 Model:

- VGG16 is a popular deep convolutional neural network architecture for image classification tasks
- The VGG16 model consists of 16 layers, including 13 convolutional layers and 3 fully connected layers.
- The first convolutional layer of the VGG16 model takes an input image of size 224x224x3, and produces 64 feature maps with a size of 224x224x64.
- The VGG16 model is pre-trained on the ImageNet dataset, which contains millions of images across 1000 different classes.
- VGG16 model has been used in a wide range of applications, including object recognition, face recognition, and medical imaging.



YOLOv5 Model:

- It is a single-stage object detection algorithm that achieves high accuracy and fast inference times on a wide range of object detection tasks
- The YOLOv5 model architecture is based on a modified version of the YOLOv3 model
- The YOLOv5 model is trained using a variant of the focal loss function, which is designed to address the problem of **class imbalance** in object detection datasets
- The YOLOv5 model is available in four different versions: YOLOv5s, YOLOv5m, YOLOv5l, and YOLOv5x

Ensemble learning

- ensemble methods use multiple learning algorithms to obtain better predictive performance, combine the decisions from multiple models to improve the overall performance.
- Voting:** is a form of ensembling (gives the prediction that has a higher vote).



models Classifications

```

CNN Classification
WARNING:tensorflow:5 out of the last 5 calls to <function Model.make_predict_function.<locals>.predict_
1/1 [=====] - 0s 103ms/step
['degree3', 'degree3', 'degree3']
VGG16 Classification
WARNING:tensorflow:6 out of the last 6 calls to <function Model.make_predict_function.<locals>.predict_
1/1 [=====] - 1s 1s/step
['degree3', 'degree2', 'degree3']
YOLOv5 detection
detect: weights=['/content/drive/MyDrive/burn/models/best.pt'], source=/content/drive/MyDrive/burn/imag
YOLOv5 🚀 v7.0-181-g3812a1a Python-3.10.12 torch-2.0.1+cu118 CPU

Fusing layers...
Model summary: 157 layers, 7018216 parameters, 0 gradients, 15.8 GFLOPs
image 1/3 /content/drive/MyDrive/burn/images/img138.jpg: 448x640 1 3rd Degree, 301.1ms
image 2/3 /content/drive/MyDrive/burn/images/img146.jpg: 640x544 (no detections), 305.6ms
image 3/3 /content/drive/MyDrive/burn/images/img349.jpg: 640x544 1 2nd Degree, 298.6ms
Speed: 2.2ms pre-process, 301.7ms inference, 0.7ms NMS per image at shape (1, 3, 640, 640)
Results saved to yolov5/runs/detect/exp3

```

YOIOv5 detection & classification

There are some images that contain more than one burn degree, yolov5 model can determine each degree separately.

```
print("YOLOv5 detection")
!python yolov5/detect.py --source /content/drive/MyDrive/burn/imgs2/ --weights /content/drive/MyDrive/burn/model2/best.pt

YOLOv5 detection
detect: weights=['/content/drive/MyDrive/burn/model2/best.pt'], source=/content/drive/MyDrive/burn/imgs2/, data=yolov5/data/coco
YOLOv5 v7.0-181-g3812a1a Python-3.10.12 torch-2.0.1+cu118 CPU

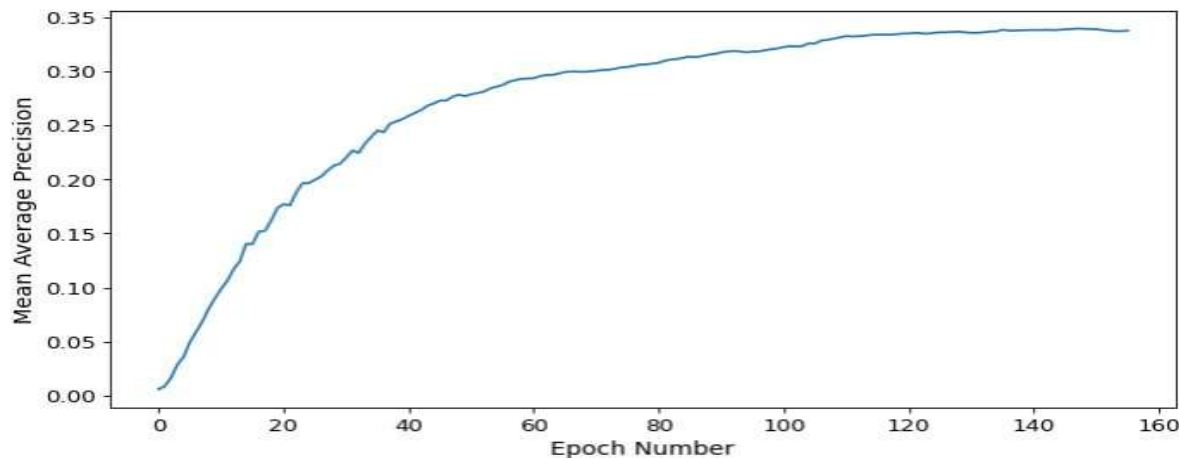
Fusing layers...
custom_YOLOv5s summary: 182 layers, 5893864 parameters, 0 gradients
image 1/1 /content/drive/MyDrive/burn/imgs2/img1364.jpg: 256x640 1 1st Degree, 1 2nd Degree, 138.4ms
Speed: 1.0ms pre-process, 138.4ms inference, 1.0ms NMS per image at shape (1, 3, 640, 640)
Results saved to yolov5/runs/detect/exp6
```



YOIOv5 Precision

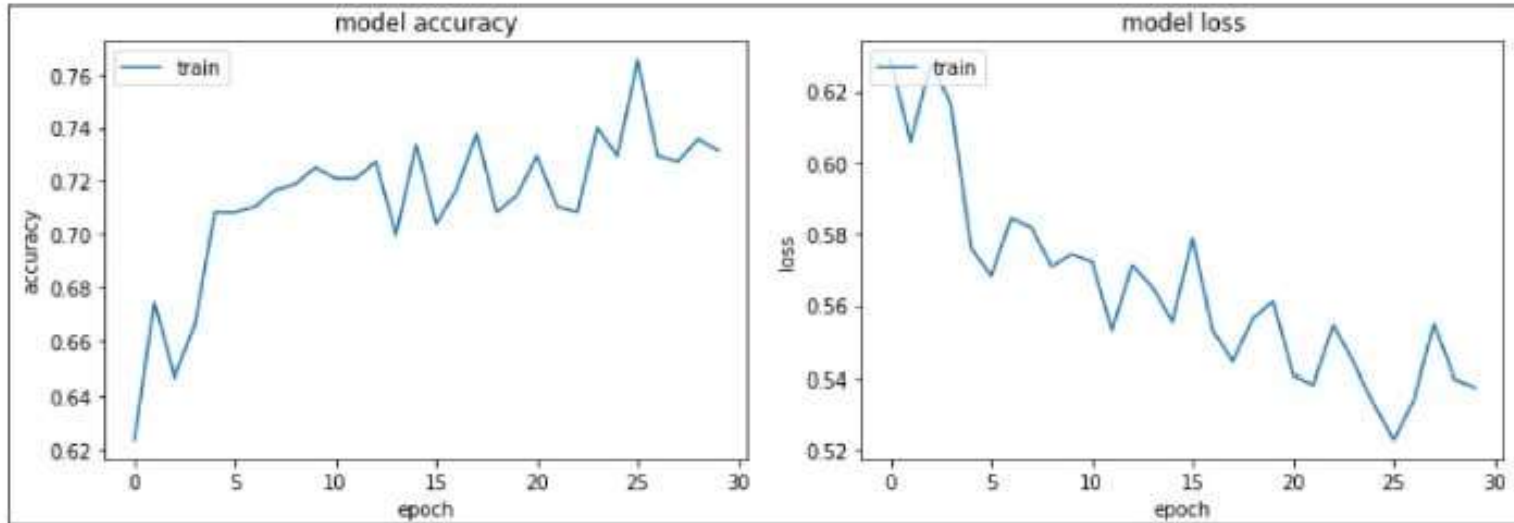
Model summary: 157 layers, 7018216 parameters, 0 gradients, 15.8 GFLOPs

Class	Images	Instances	P	R	mAP50	mAP50-95: 100% 5/5 [00:08:00:00,
all	305	538	0.344	0.289	0.229	0.0745
1st Degree	305	225	0.303	0.213	0.161	0.0522
2nd Degree	305	231	0.278	0.338	0.251	0.077
3rd Degree	305	82	0.451	0.317	0.276	0.0943

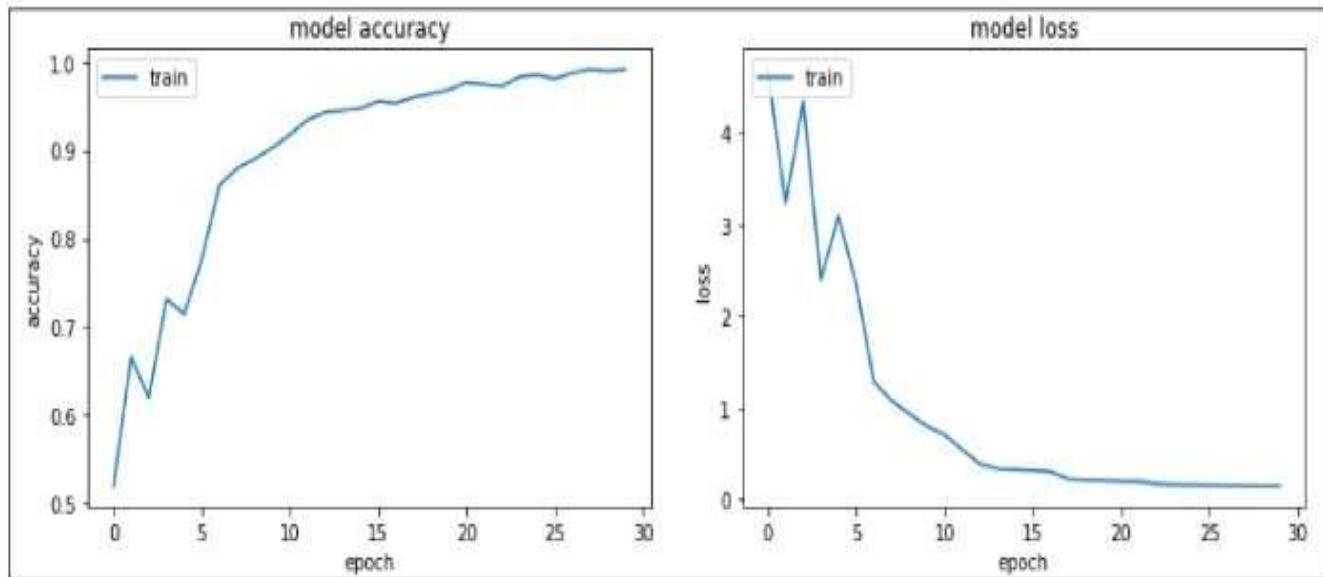


CNN & VGG16 accuracy

- CNN_ (accuracy: .7715)



- VGG16 (accuracy: .9580)



BURN CARE





Welcome page

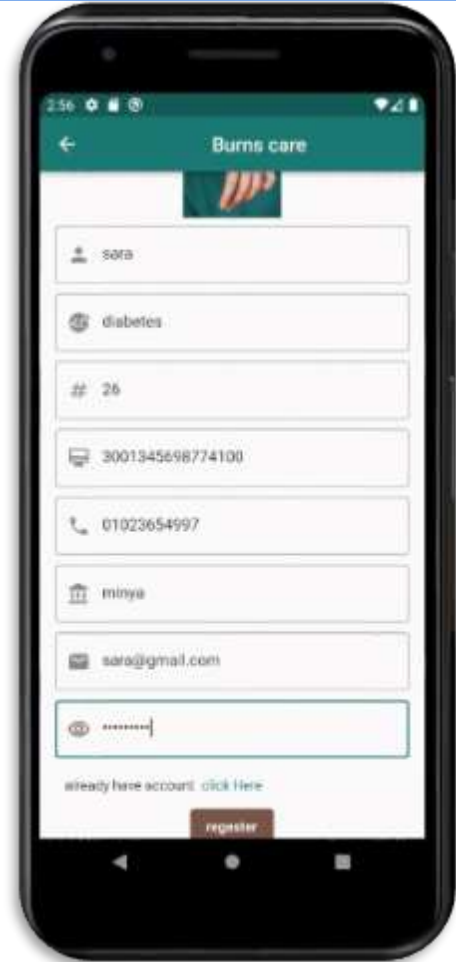


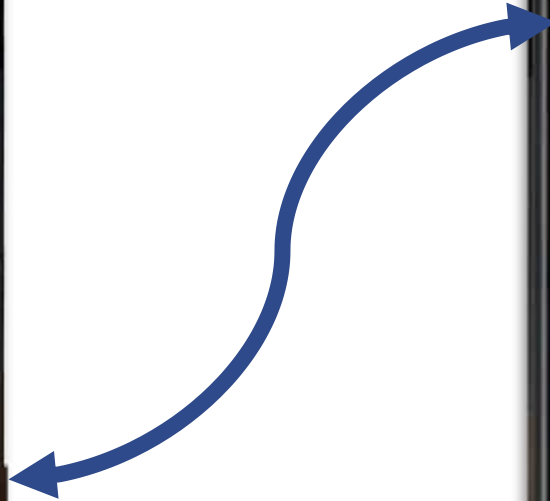
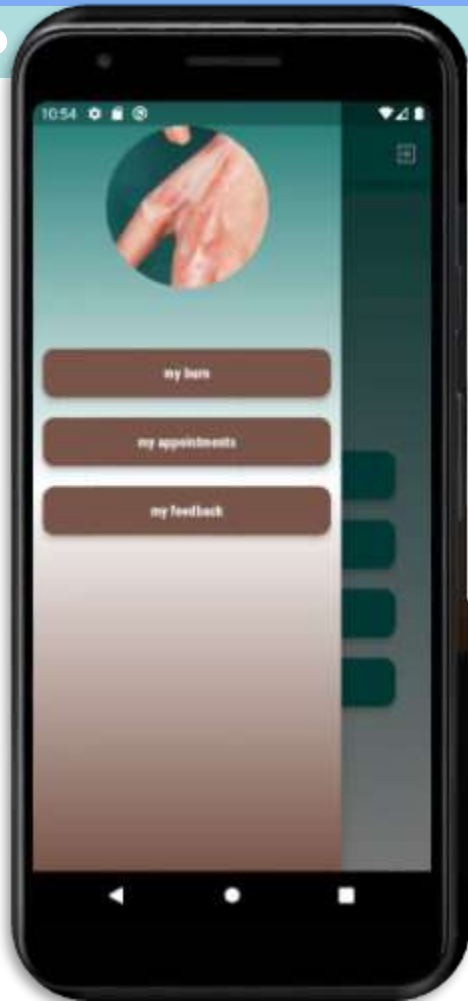
PATIENT

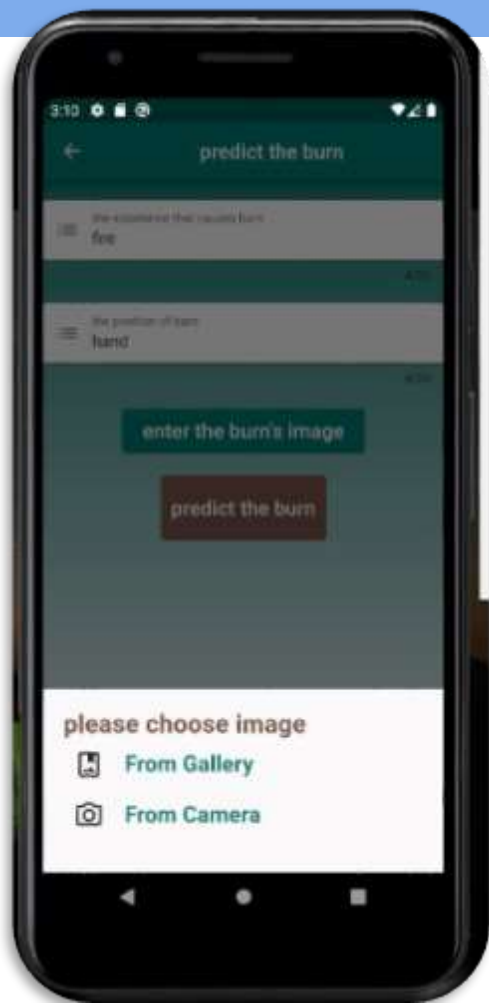


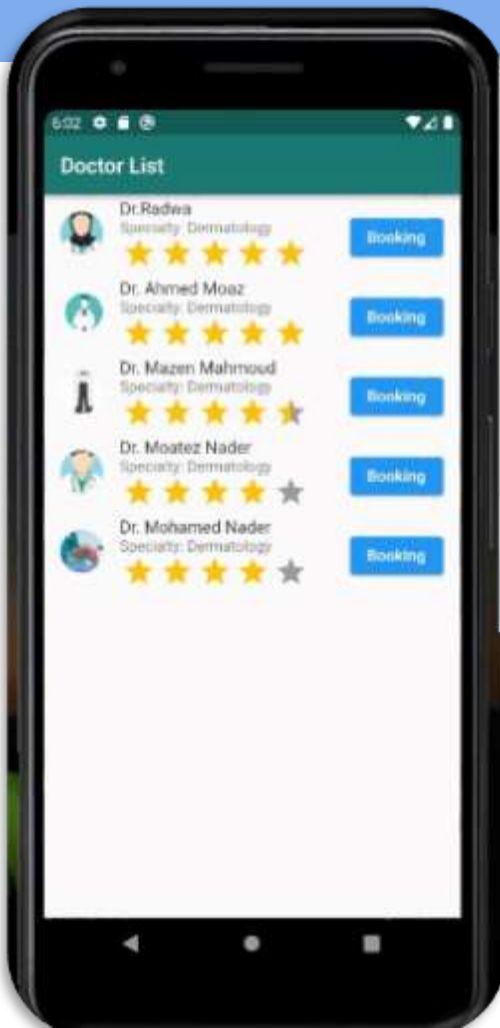
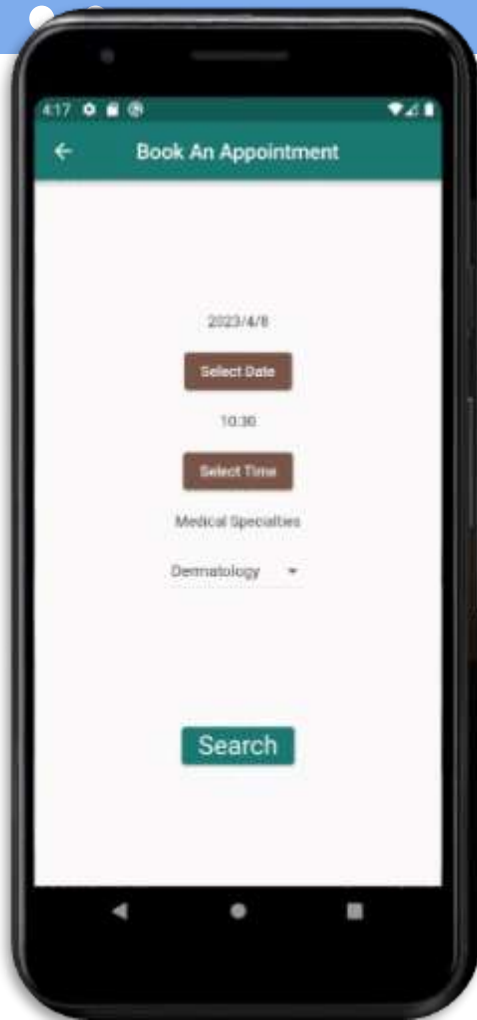
Create Account

Log In

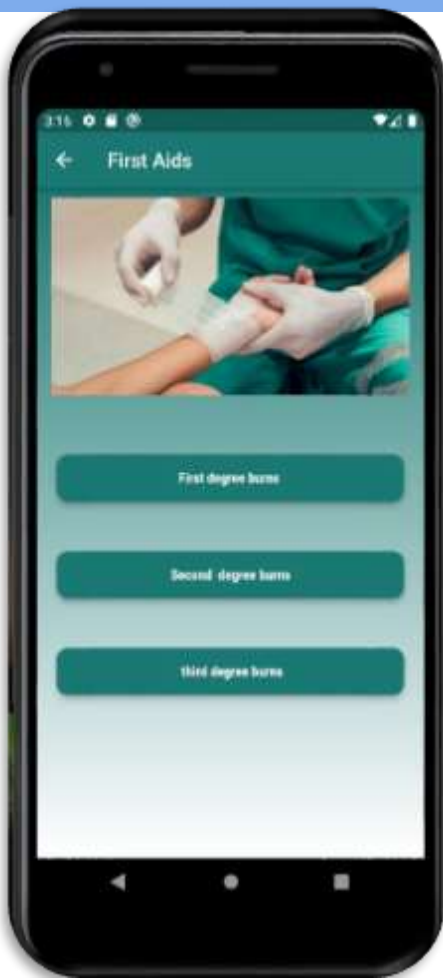


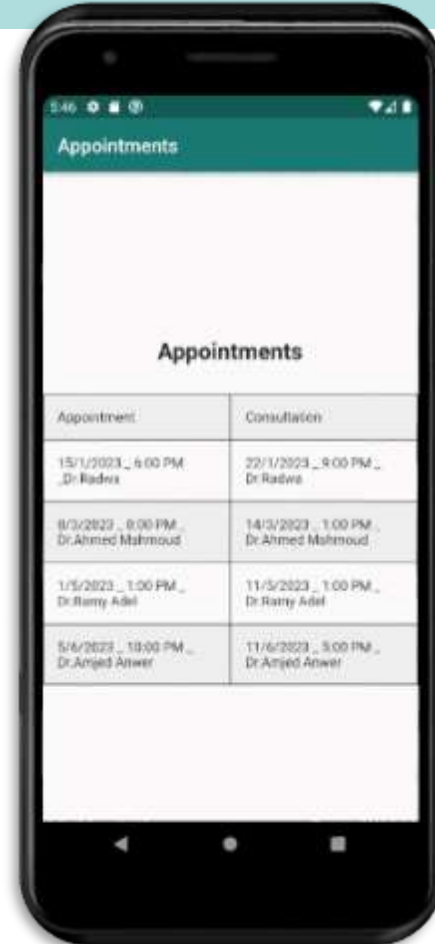


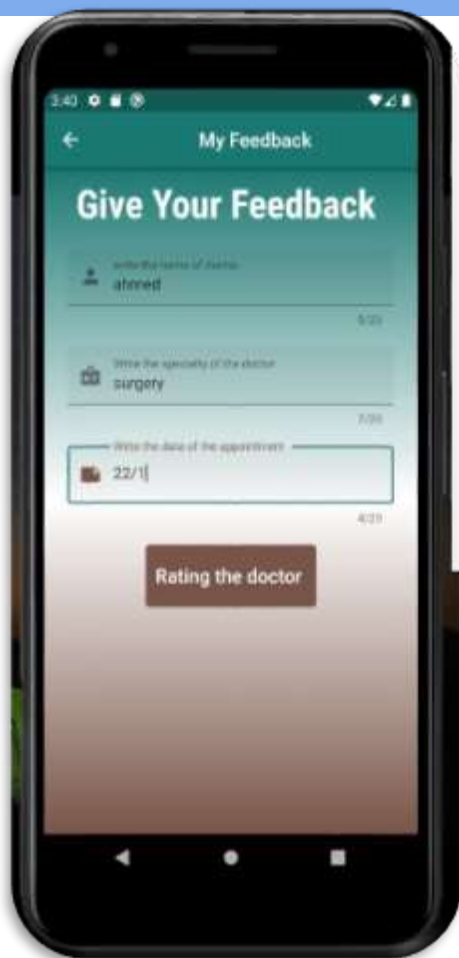






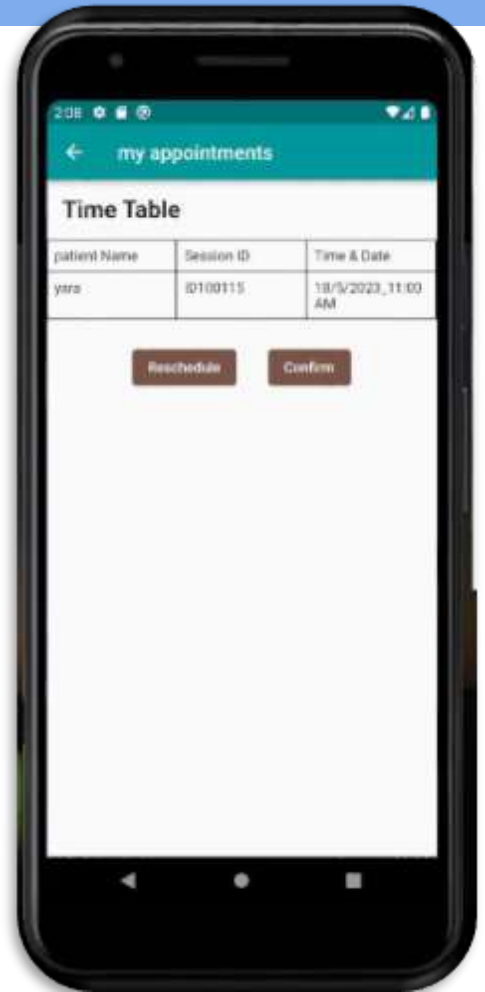








DOCTORS





Welcome

we hope you will be better soon

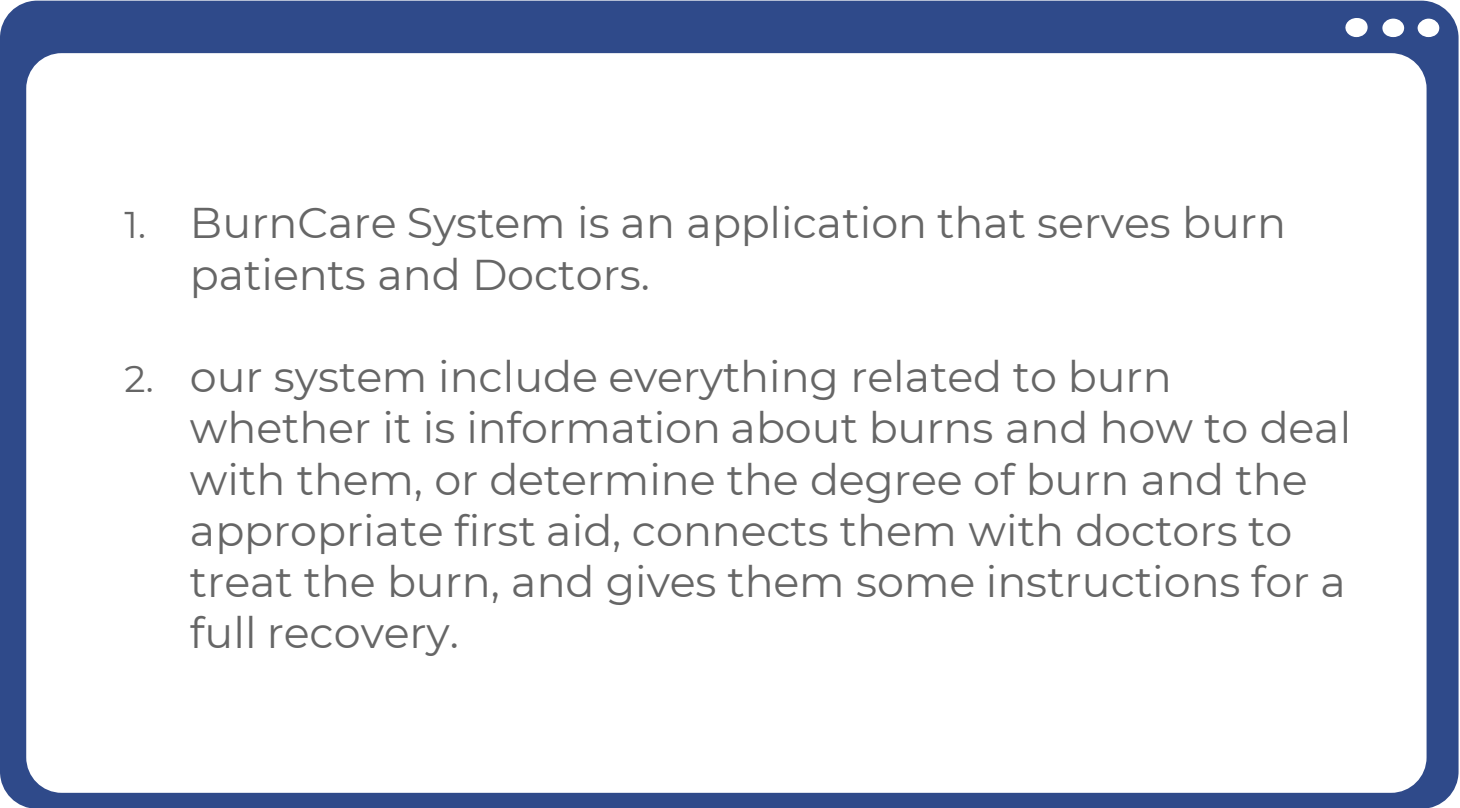
Doctor

Patient

Ui
video



Conclusion

- 
1. BurnCare System is an application that serves burn patients and Doctors.
 2. our system include everything related to burn whether it is information about burns and how to deal with them, or determine the degree of burn and the appropriate first aid, connects them with doctors to treat the burn, and gives them some instructions for a full recovery.



Future Plan



01.

Using other ML Models to predict mortality and post-burn scar contractures.

02.

Using ml models to predict drug doses

03.

Contracting with a larger number of doctors and hospitals

04.

Expansion of the marketing process for the application, especially through paid advertisements



THANKS!

Do you have any questions?