Melanoma Semantic Segmentation and Skin Cancer Detection Web Application

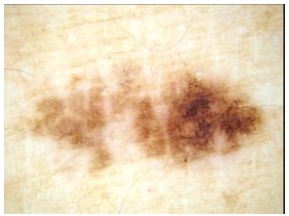
Table of contents

Introduction

- Skin cancer is one of the most common types of cancer.
- The main cause is UV light .
- Skin lesions can be benign, pre-cancerous or malignant .

Benign Cell Keratosis

Actinic Keratosis



Melanoma

Melanoma

- Melanoma cancer is less common than other skin cancer types, but it is the most dangerous one as it spreads fastly.
- Clinical accuracy for melanoma detection ranges from 65% to 80% due to interclass similarities in lesions.

Proposed Solution

- If skin cancer detected early, it can be treated effectively .
- When detected early, the 5-year survival rate for melanoma is 99%.
- We prepared a web application that assets doctors and helps patients in early diagnosis. The web application performs two main tasks:

Skin lesions classification task

Melanoma semantic segmentation task

Semantic Segmentation

Input

Segmentation [14]

Assigning a class to each pixel

Impact

Improved Public Health

Reduced Treatment Costs

Reduced Psychological Burden

Related Work

Ref NO.	Problem Type	Authors	Dataset	Model	Accuracy and Jaccard Index
1	Classification	Gessert et al	ISIC	Efficient-Net	63%
2		Samia et al	ISIC	DenseNet201and ResNet50	79.43% and 77.69%.
3	Semantic Segmentation	Hassan et al	ISIC	Res-U-Net++	85.96%
4		Hong et al	ISIC	UNET	87.41%
5		Zabir Al Nazi1 and Tasnim Azad	ISIC and PH2	UNET	80% and 87%

Requirements

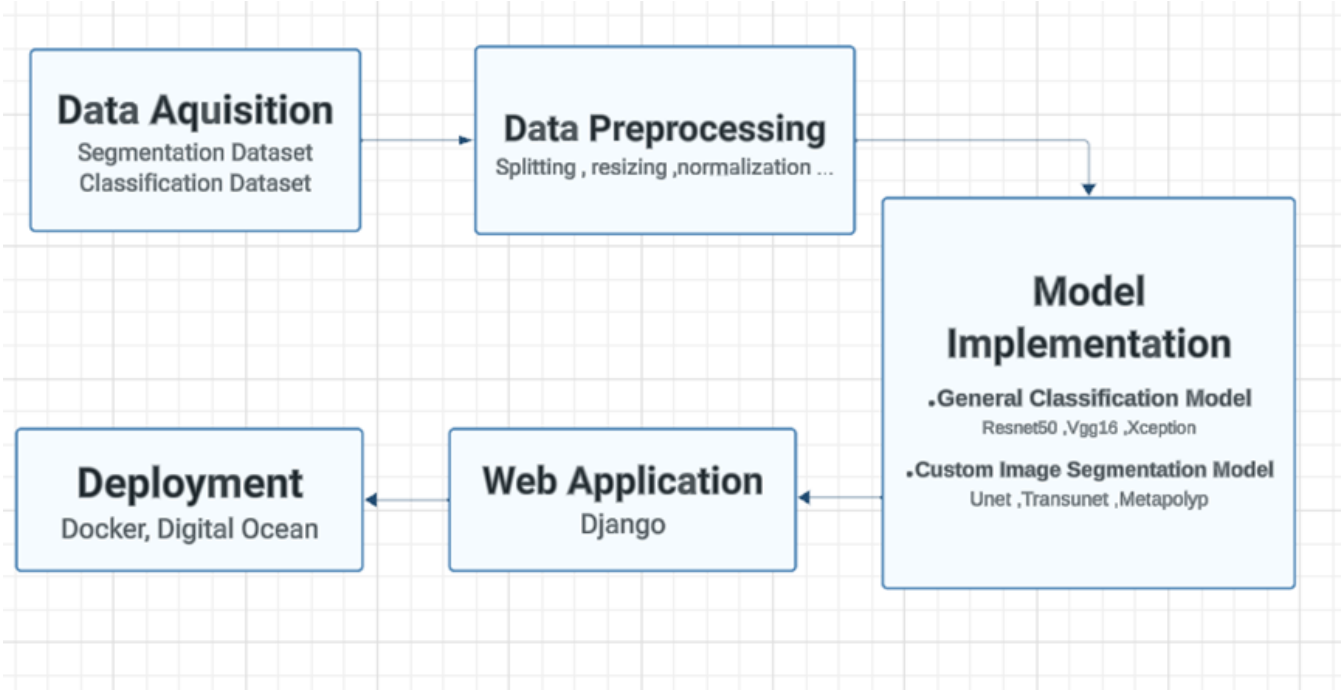
Functional Requirements

- Lesion Classification
- Melanoma Segmentation
- Image Upload

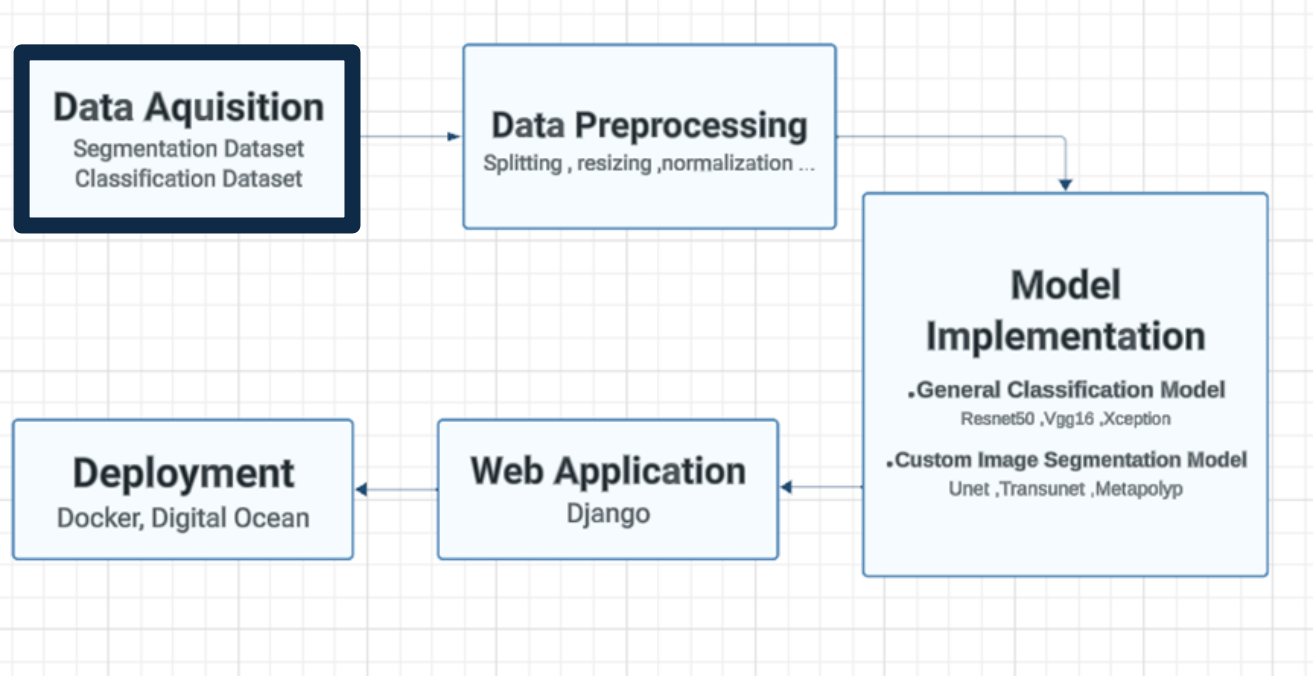
Non-Functional Requirements

- Performance
- Usability
- Reliability
- Scalability
- Maintainability
- User Friendly

Methodology

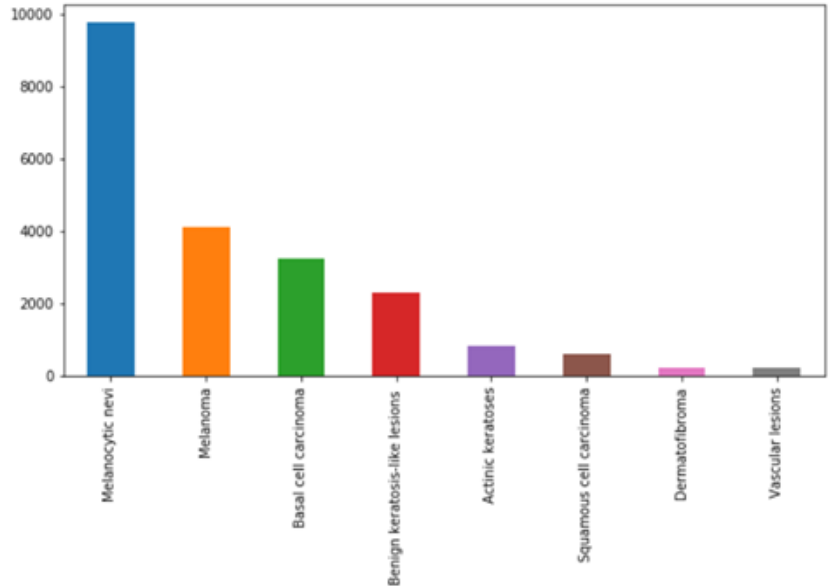


Data Acquisition



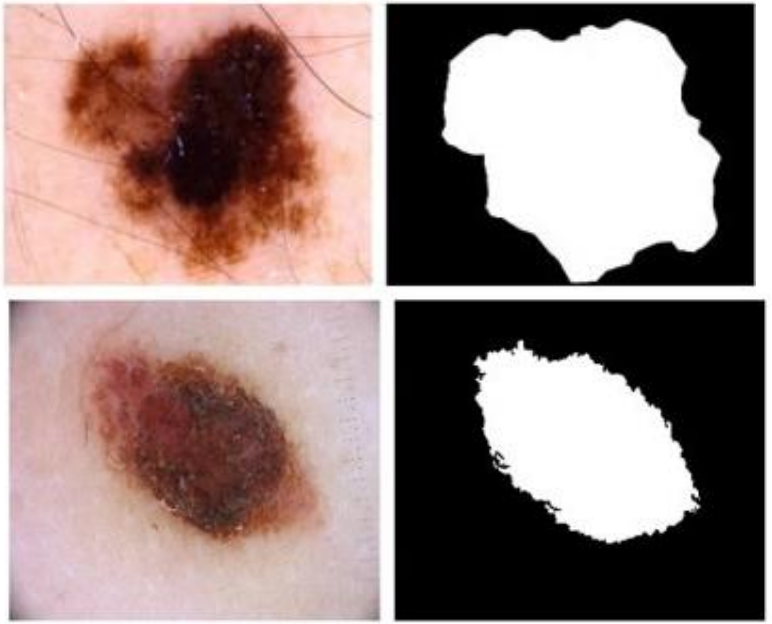
Skin Cancer Classification Dataset

The classification dataset is ISIC 2019 dataset that contains 25.331k images.
The dataset contains 8 types of Skin cancer

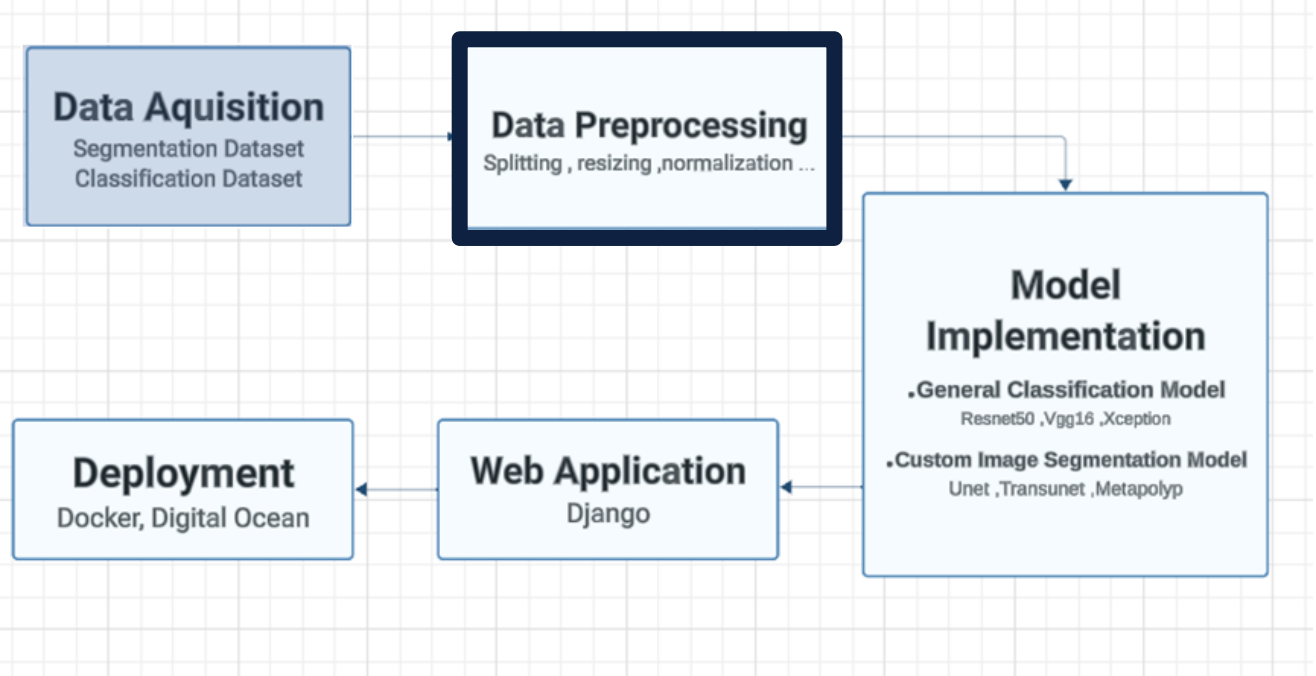


Melanoma Segmentation Dataset

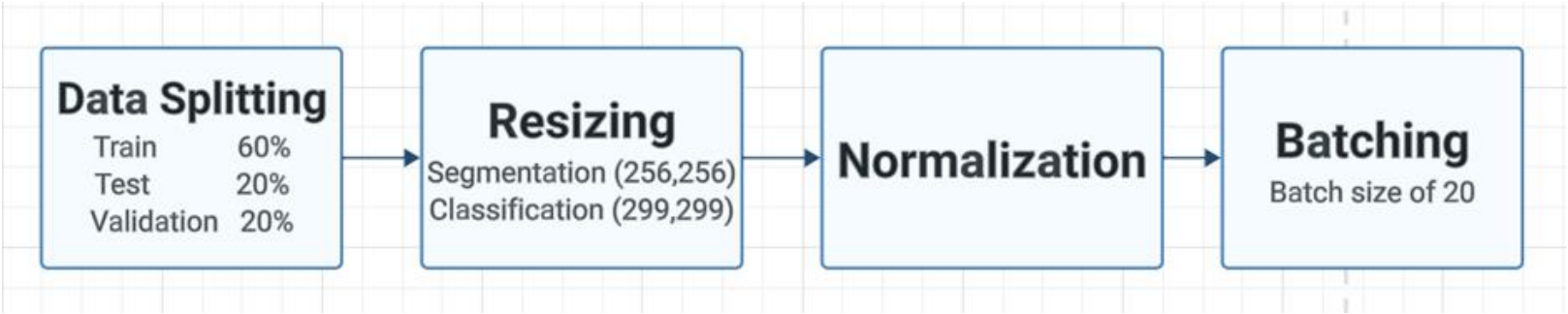
The classification dataset is ISIC 2018 dataset It contains 2594 images and corresponding ground truth response masks



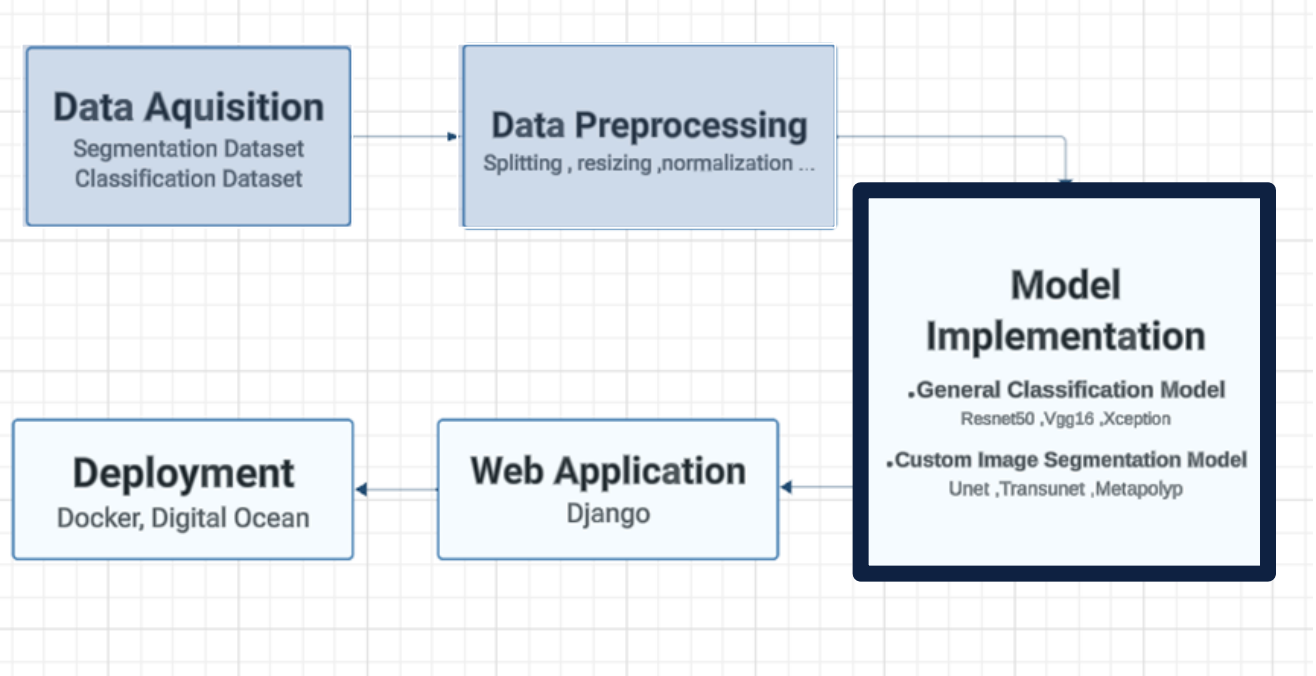
Data Preprocessing



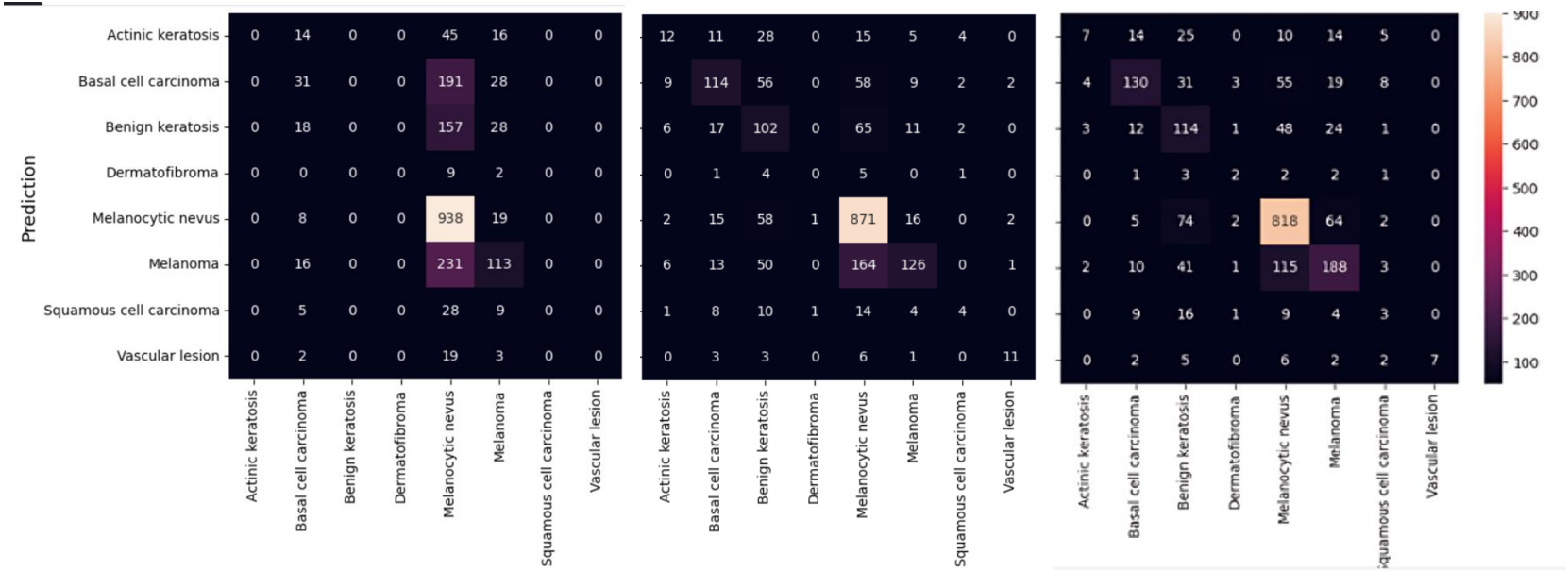
Data Preprocessing



Model Implementation



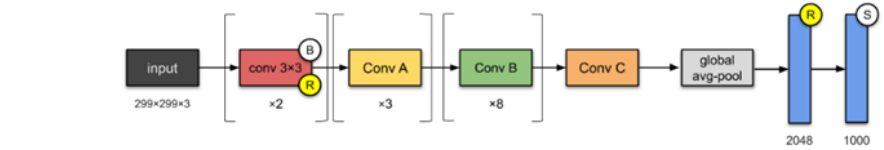
Classification Models

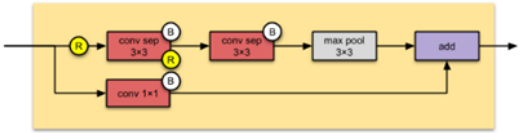


ResNet 50 VGG 16 Xception

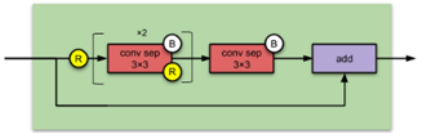
Classification Models

According to the results we selected Xception. We added a dropout layer with a dropout rate of 0.25, dense layer and augmentation layer

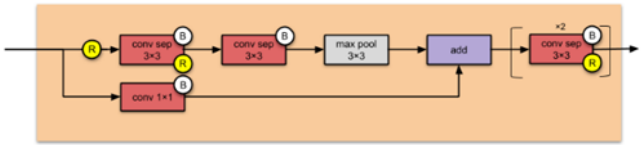




Conv A

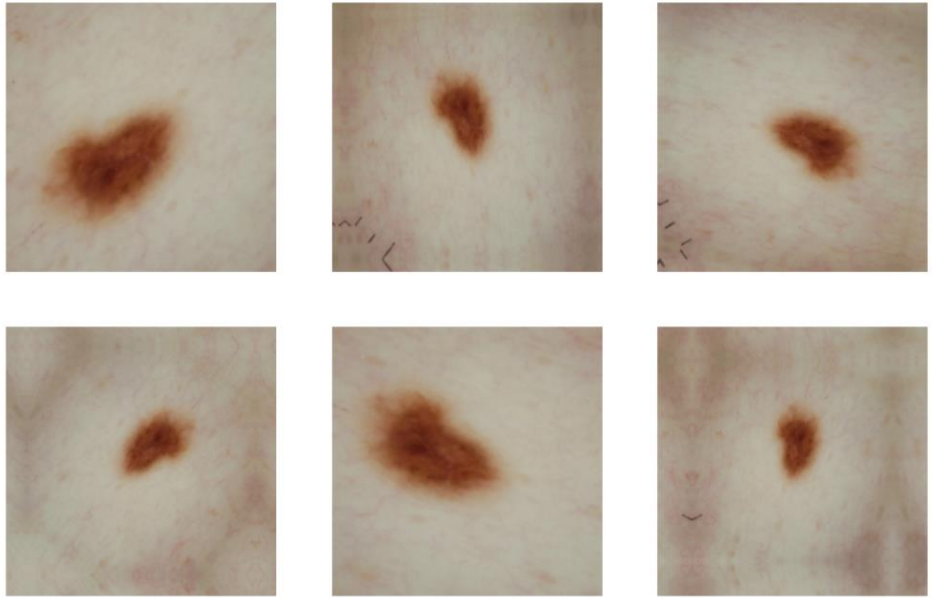


Conv B

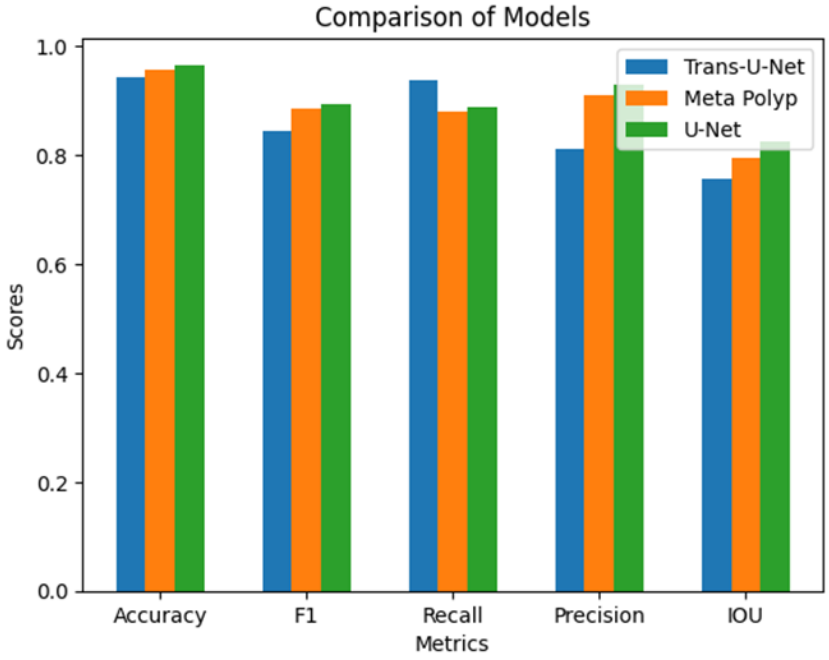


Conv C

Augmentation layer

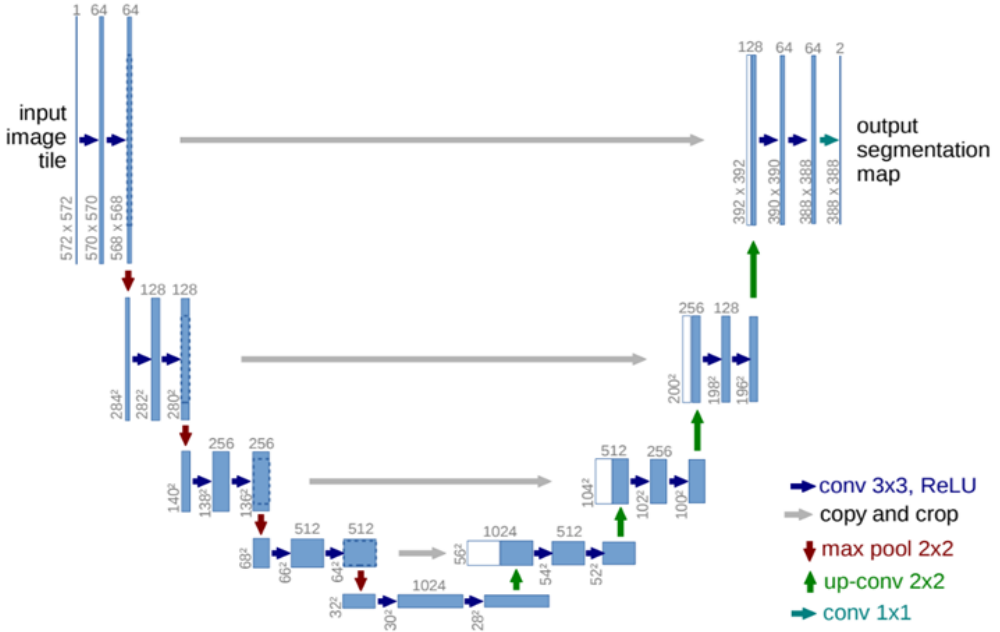


Segmentation Models



Segmentation Models

According to the results we selected U-Net. Then we tried to enhance the results so we added two encoder decoder layers



Results

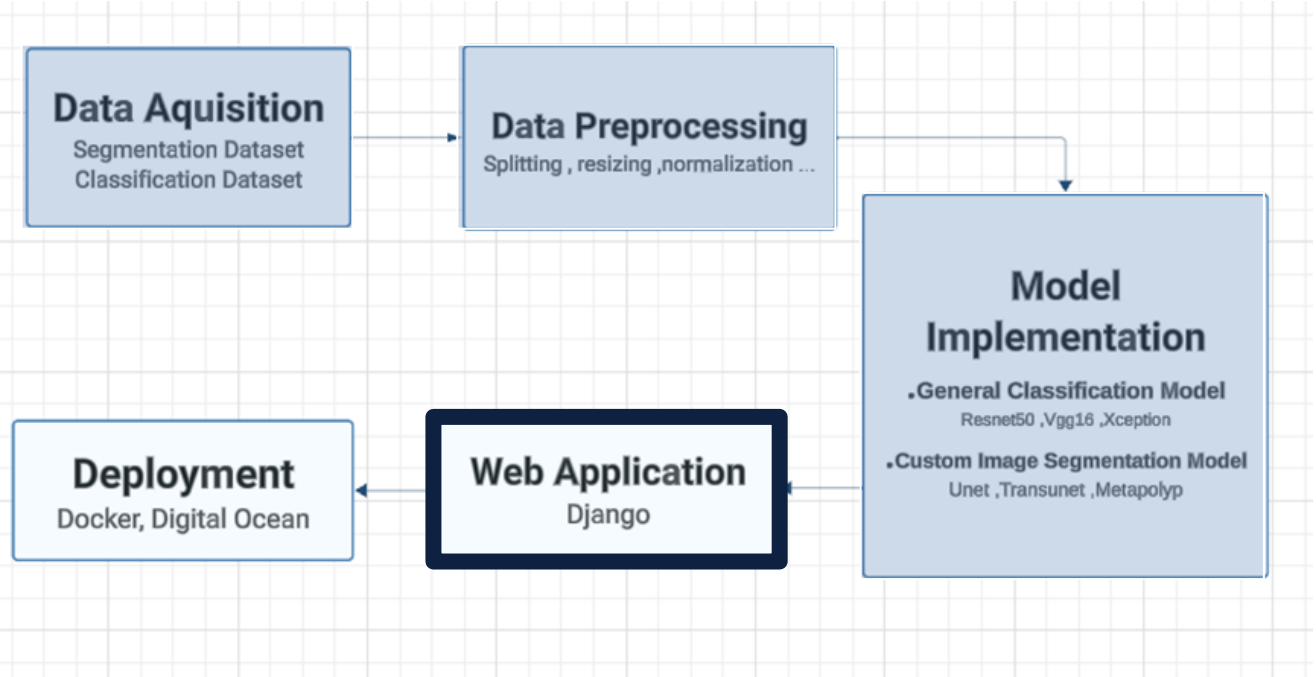
U-Net

Accuracy	F1	IOU	Recall	Precision
0.92947	0.80683	0.6372	0.90159	0.78761

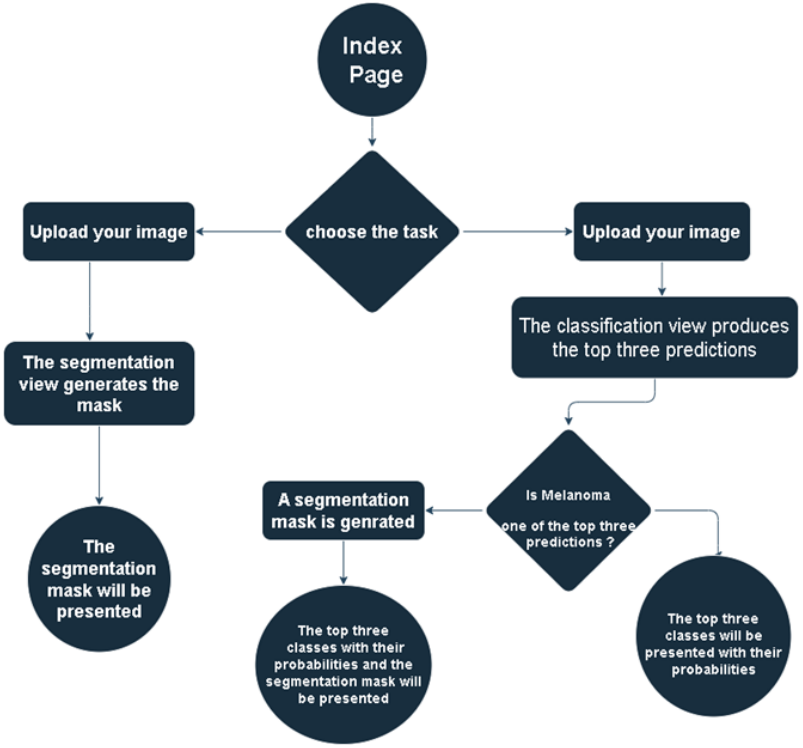
Xception

Loss	Categorical Accuracy	Top_2_Accuracy	Top_3_Accuracy
33%	89.5%	87.3%	99.3%

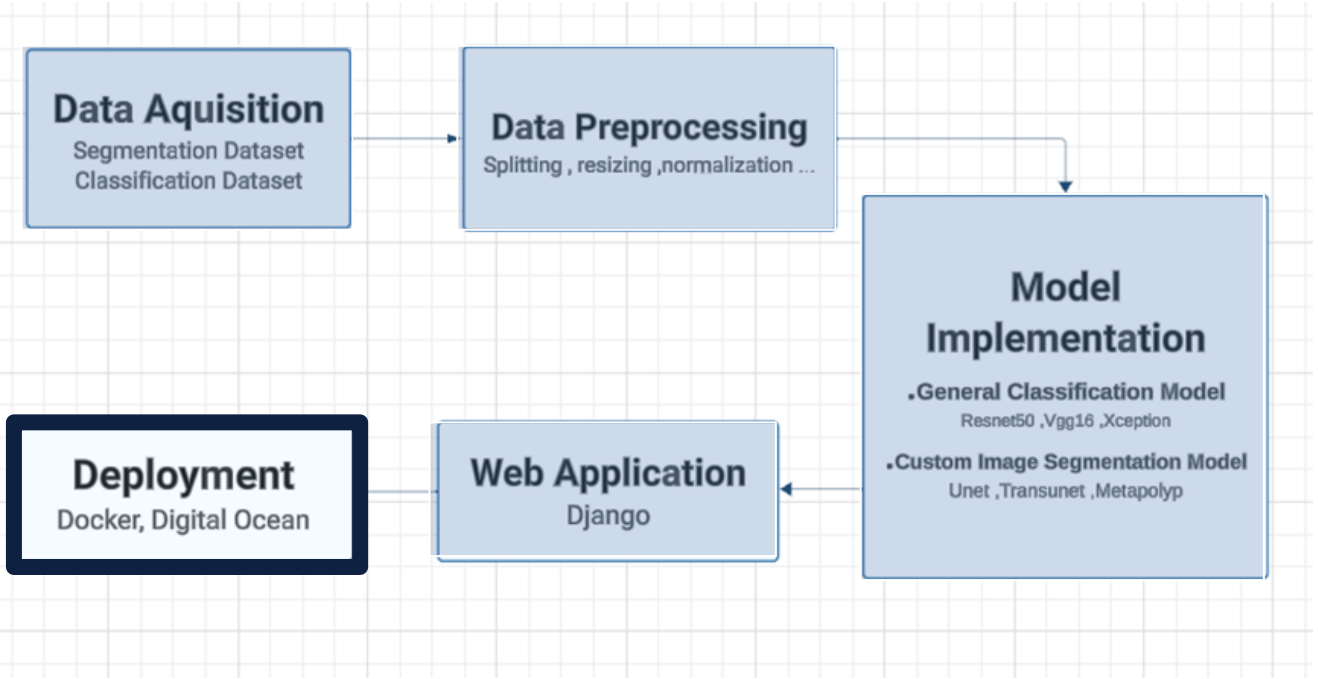
Web Application



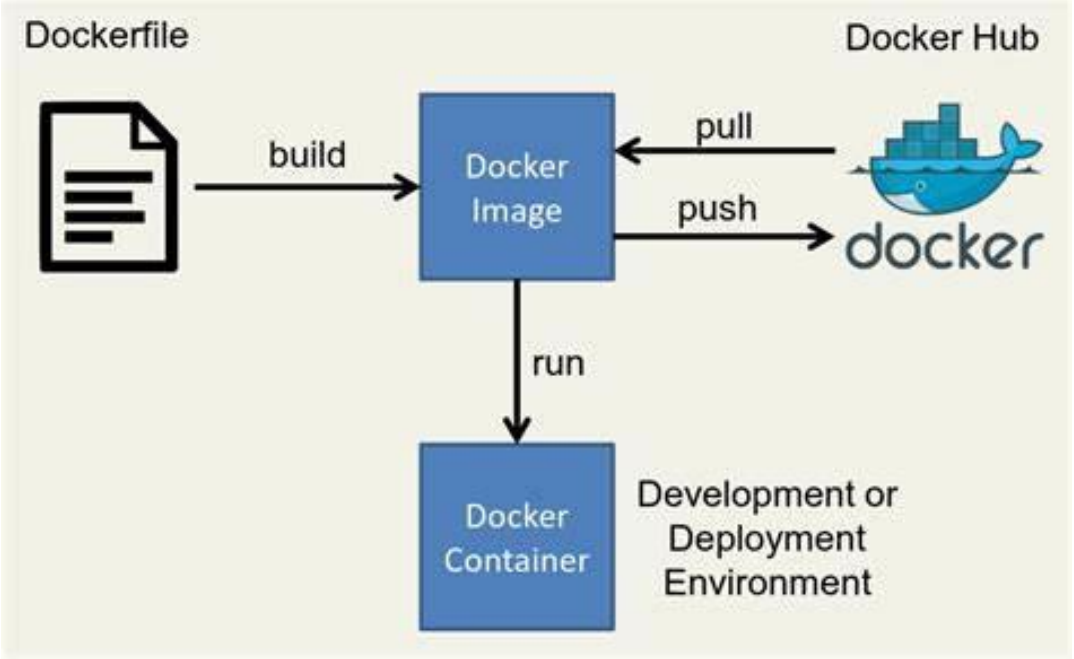
Web Application



Deployment


Data Aquisition
Segmentation Dataset
Classification Dataset
Data Preprocessing
Splitting , resizing ,normalization ...
Model Implementation
.General Classification Model
Resnet50 ,Vgg16 ,Xception
.Custom Image Segmentation Model
Unet ,Transunet ,Metapolyp
Web Application
Django
Deployment
Docker, Digital Ocean

Deployment Cont



Future Work

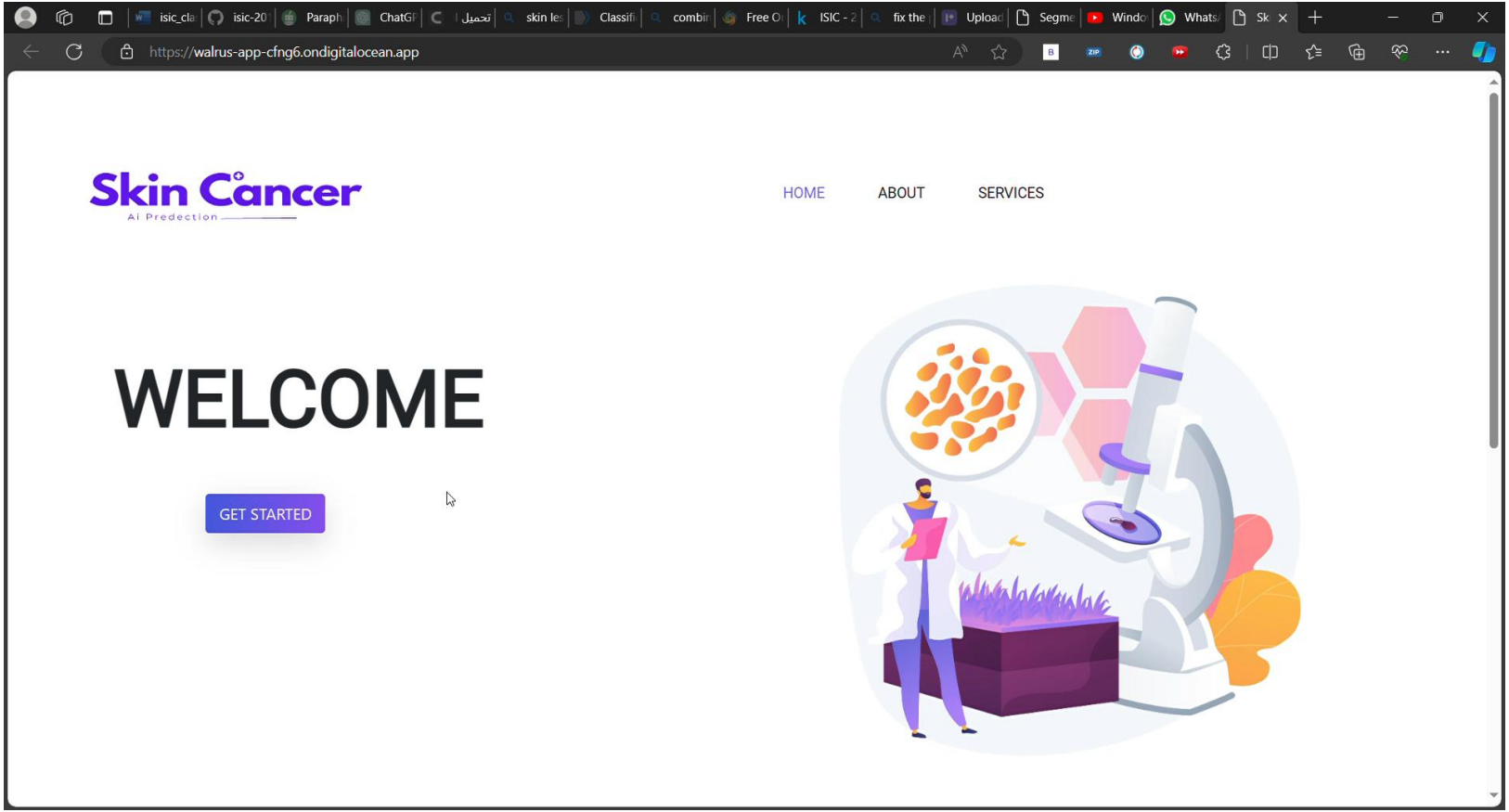
"Ask a doctor" Feature — Collaboration with domain experts so users gain the invaluable opportunity to seek advice and validation from healthcare professionals.

Mobile Application — The development of a mobile application enhanced accessibility.

Feedback Mechanism — Users provide information on the accuracy of their reports that enable users to contribute to the system's improvement over time.

Online Database — For securely storing patient records serves a dual purpose. To establish a foundation for sharing information exclusively with dermatologists.

Demo


https://walrus-app-cfng6.ondigitalocean.app
Skin Cancer
Ai Predection
HOME
ABOUT
SERVICES
WELCOME
GET STARTED

Thanks!

Do you have any questions?

Lana AlNimreen **Ola AlShatnawi** **Tamara AbuHawileh**