Lung Cancer prediction System Using Deep Learning

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Introduction

Lung Cancer Diagnosis Challenging

- High rate of Death.
- Time and effort needed to Diagnosis.
- The poor outcomes in patients with lately stages.
- Early detection of lung cancer can lead to better treatments and outcomes

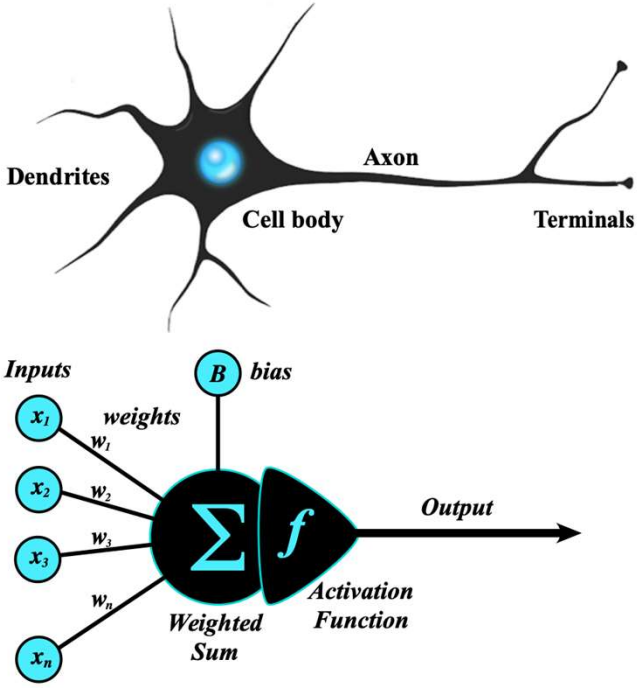
Introduction

How we Solved this Challenges

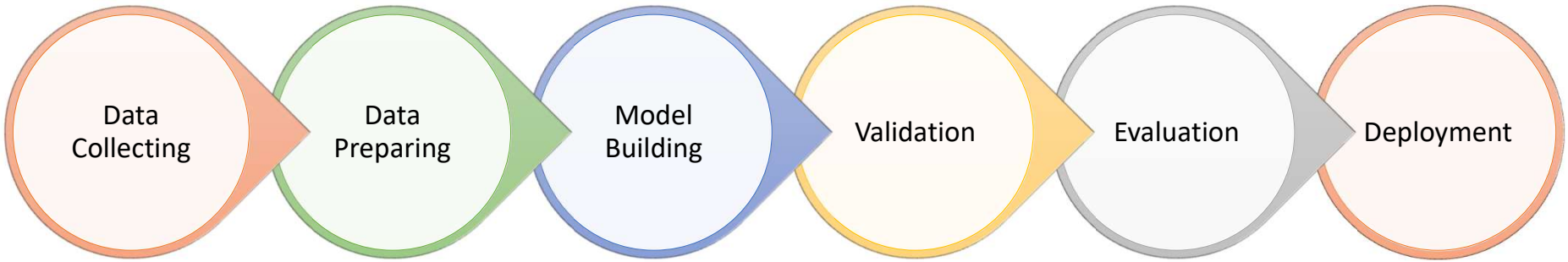
- Lung Cancer Prediction System is a web-based platform designed to help doctor prediction lung cancer in early stage
- Through its user-friendly interface, healthcare professionals can securely upload medical CT scans images, for analysis
- The system employs deep learning algorithm (CNNs) to process the images and provide predictive probabilities of lung cancer presence

Deep Learning

- Deep learning is the subset of machine learning methods based on neural networks.
- It works like human's neurons
- Train the DL model on CT-Scan Images to gain experience from them, and then use it to predict the probability of Lung Cancer for new unseen images.

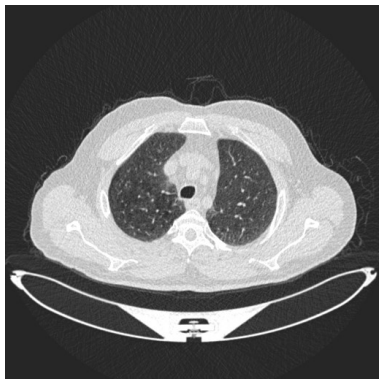


Steps


Data Collecting
Data Preparing
Model Building
Validation
Evaluation
Deployment

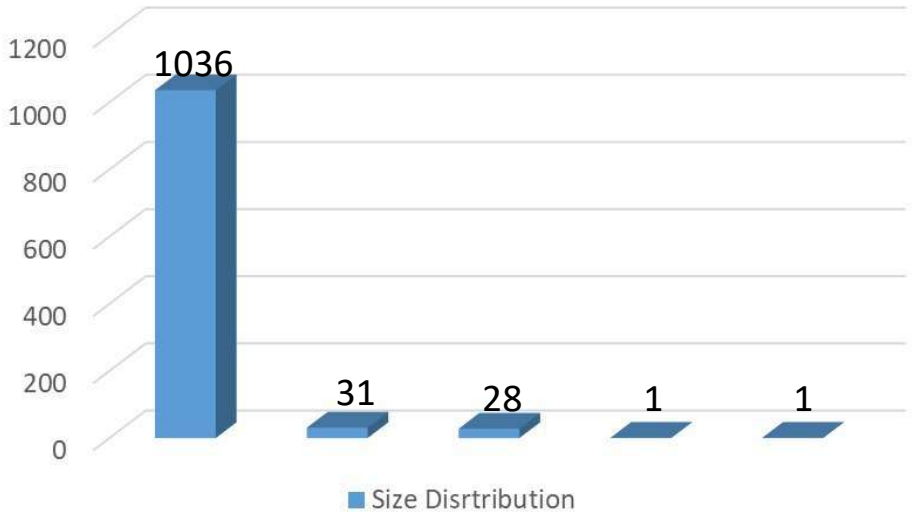
Data Collecting

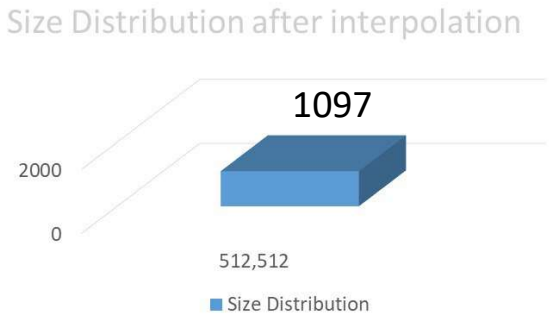
- We used Image Dataset from Kaggle.
- It contains 1097 images grouped into 3 classes.
- Samples from the dataset:

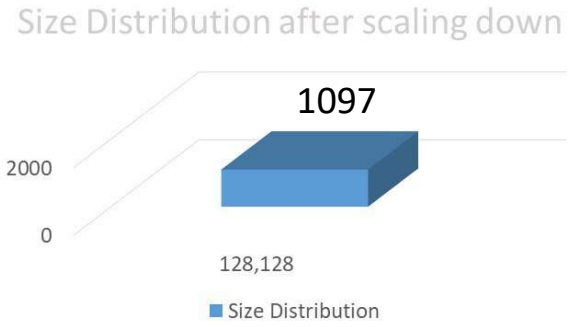


Data Preparing

Resizing

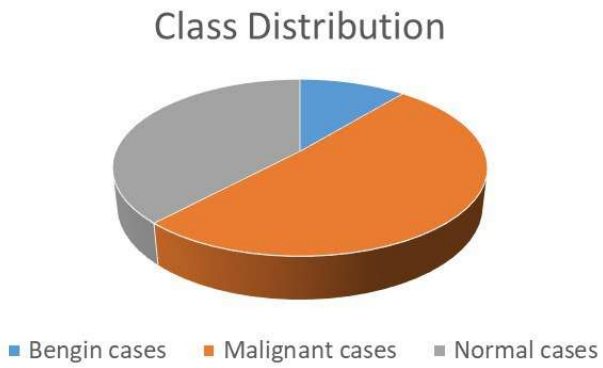


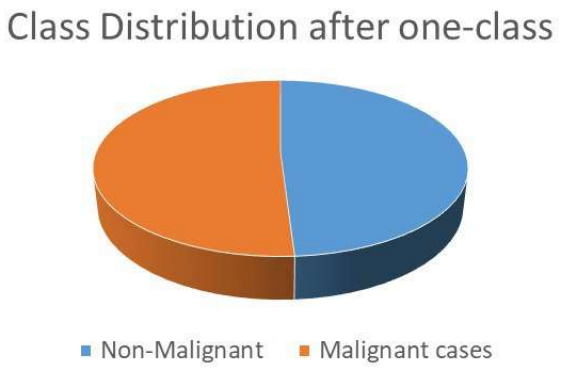




Data Preparing

Balancing the data using One-Class classification

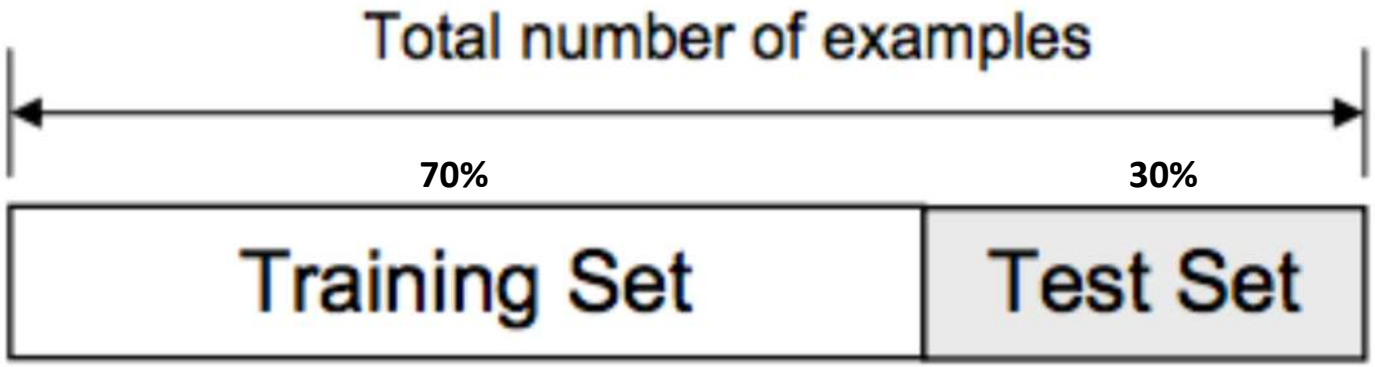




Data Preparing

Splitting Dataset to train and test

- Training Set used for train the model.
- Testing Set used for evaluation.



Data Preparing

Data Encoding

- Computer can’t work with string directly.
- Convert categorical values to numeric.

Convolutional Neural networks CNNs

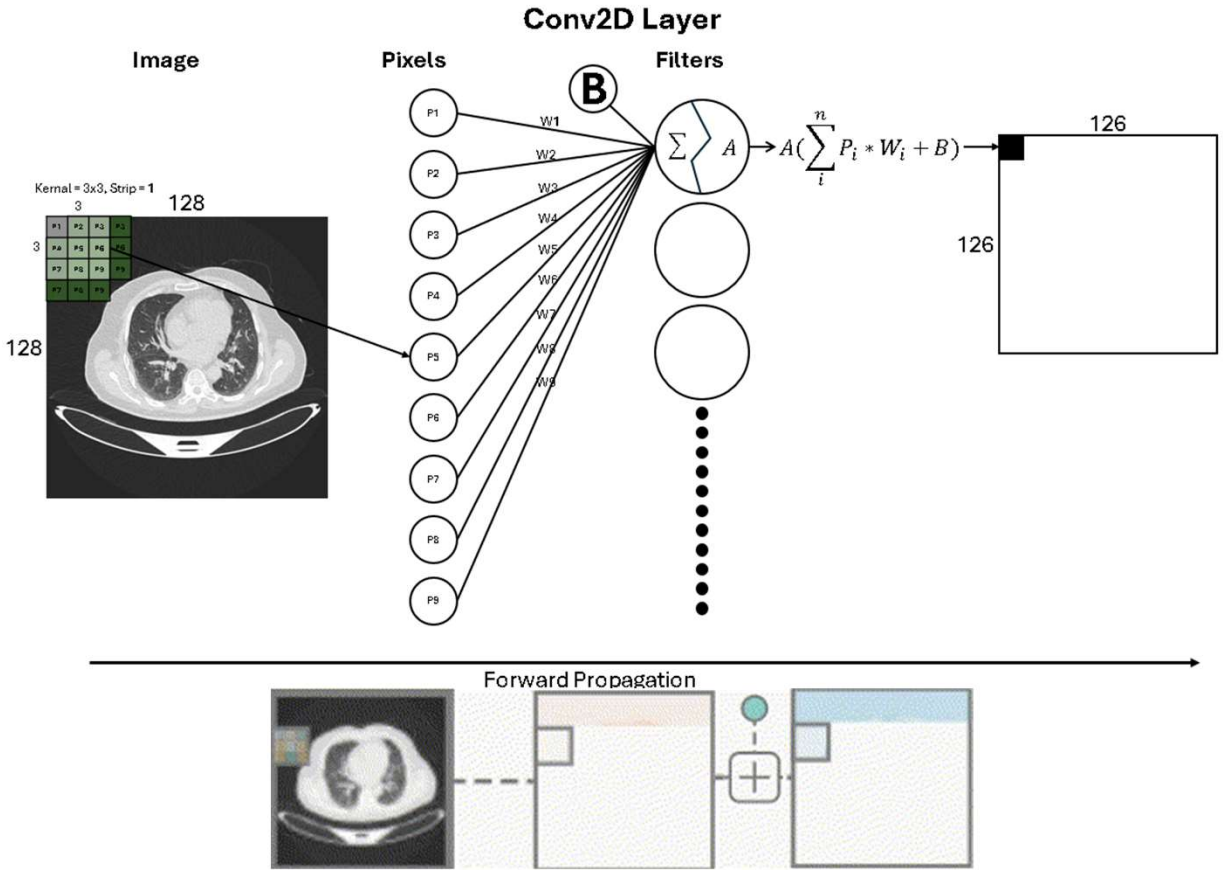
CNNs:

- Type of neural network Architecture that is widely used for performing deep learning on image data.
- CNN consists of an input layer, a hidden layer(s), and an output layer
- the hidden layers of a CNN consist of a special series of layers called the convolutional and pooling layers (Feature Extraction).

Convolutional Neural networks CNNs

Conv2D Layer

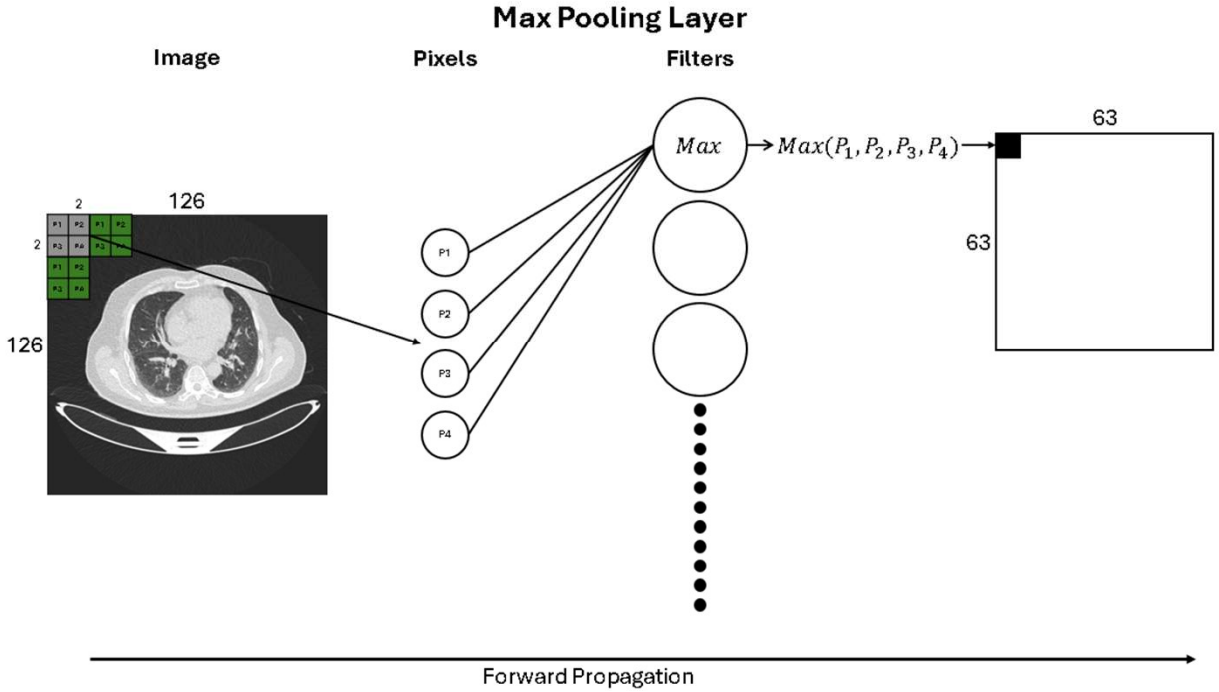
- Starting with random kernal.
- Applying the kernal on the input.
- It works as filter.
- Find the optimal kernal.



Convolutional Neural networks CNNs

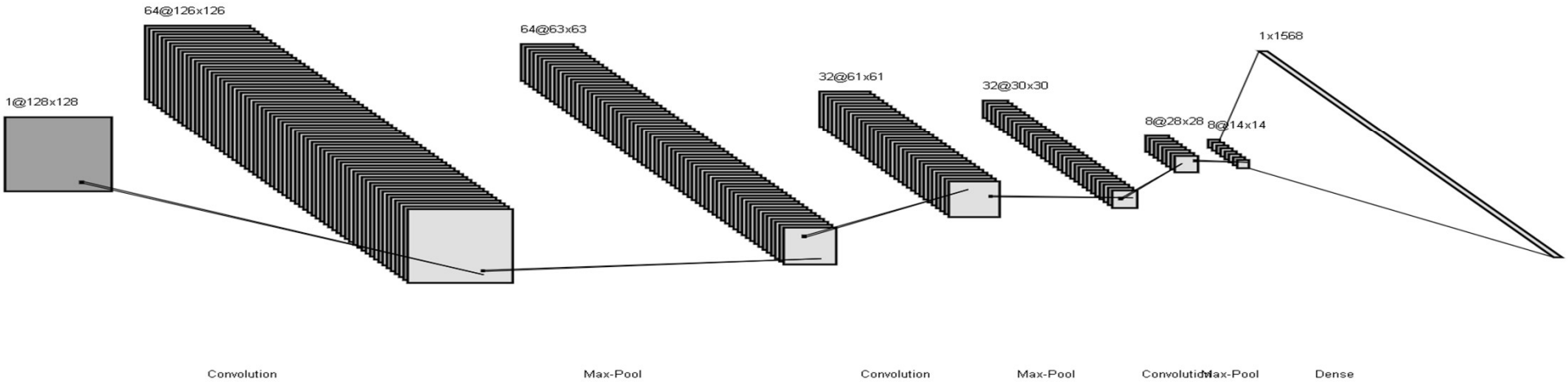
Max Pooling

- It used to decrease the size of image
- Increase the speed of training



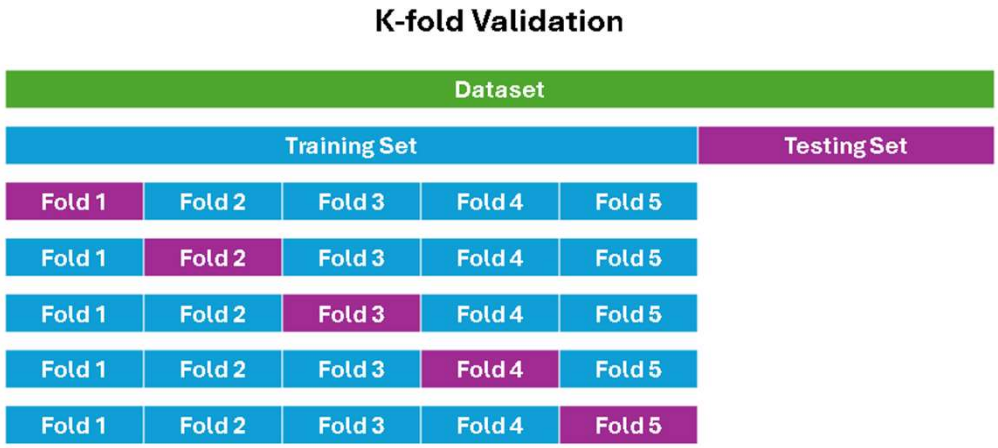
Model Structure

- Our model consists of 3 conv2D, 3 Max Pooling, 1 Flatten and 1 Dense Layer



Hyperparameter Tuning

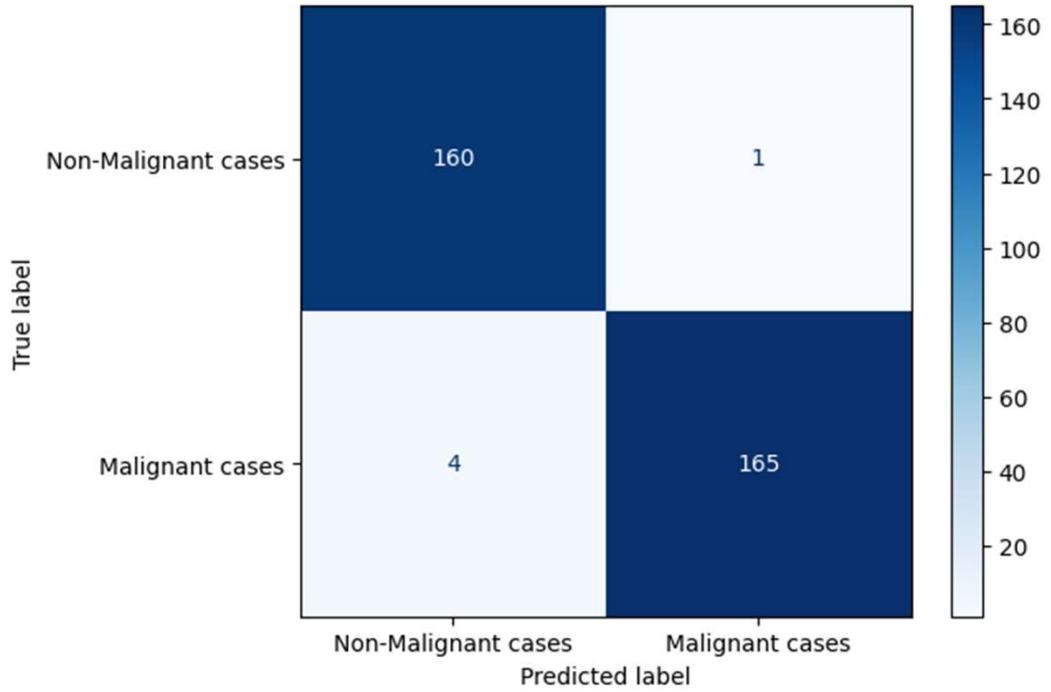
- We used GridSearchCV
- It’s a technique to find the best parameters by trying different combinations.
- CV stands for K-fold Cross validation
- This phase takes 1 hour of running to try 108 different combinations.



Evaluation

Confusion Matrix

- Accuracy: 99.091%
- Sensitivity: 99.379%
- Precision: 97.561%
- F1 Score: 98.462%



Web

- We used Web with AI to design a beautiful, intuitive user interface that meets the user's requirements. We also followed the companies' policy of dividing the team, where part of the team knew the web, so it had a front-end part, and the other part was specialized in deep learning.

User Interface

Front End

- The process of building components that interact with users.
- In our front-end design phase, our goal was to create a responsive website that functions seamlessly across all devices, while enhancing user Experience through a focus on their needs and ensuring compatibility.
- We utilized HTML, CSS, JavaScript, and Bootstrap to develop the front-end.

User Interface

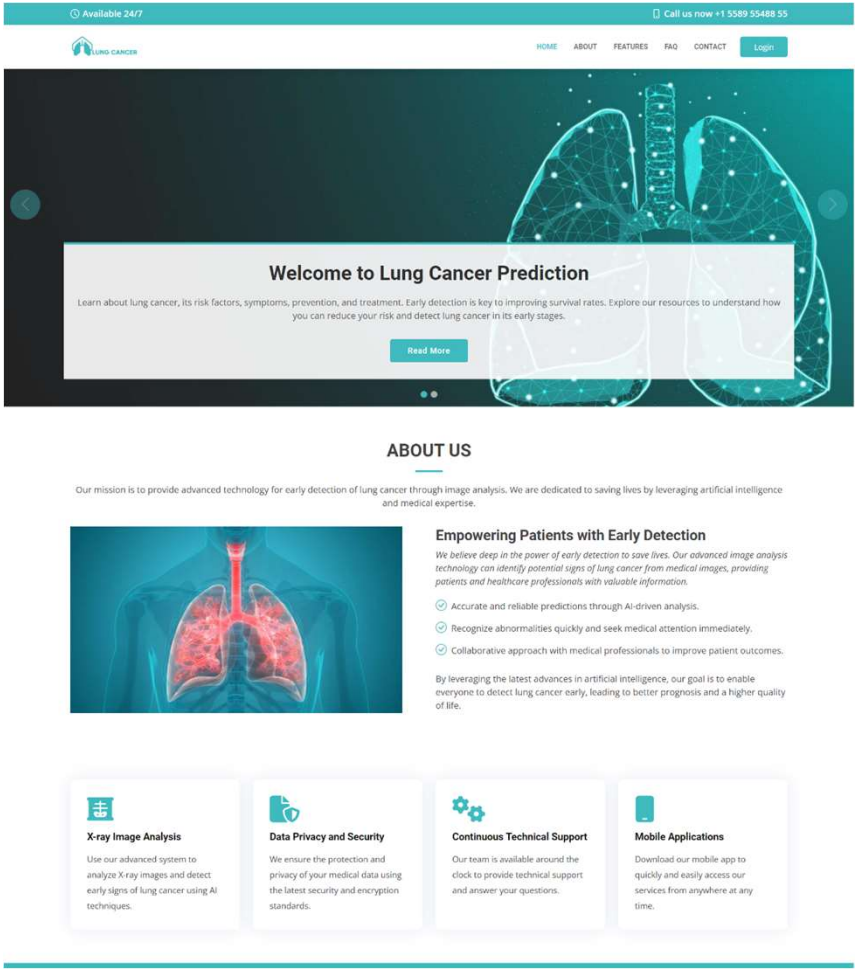
API

- Stands for Appliacation Programming Interface.

- helps two programs or applications to communicate with each other by providing them with the necessary tools and functions. It takes the request from the user and sends it to the service provider and then again sends the result generated from the service provider to the desired user.

- We Used Flask Framework to connect a web application with Deep Learning Model.

Home Page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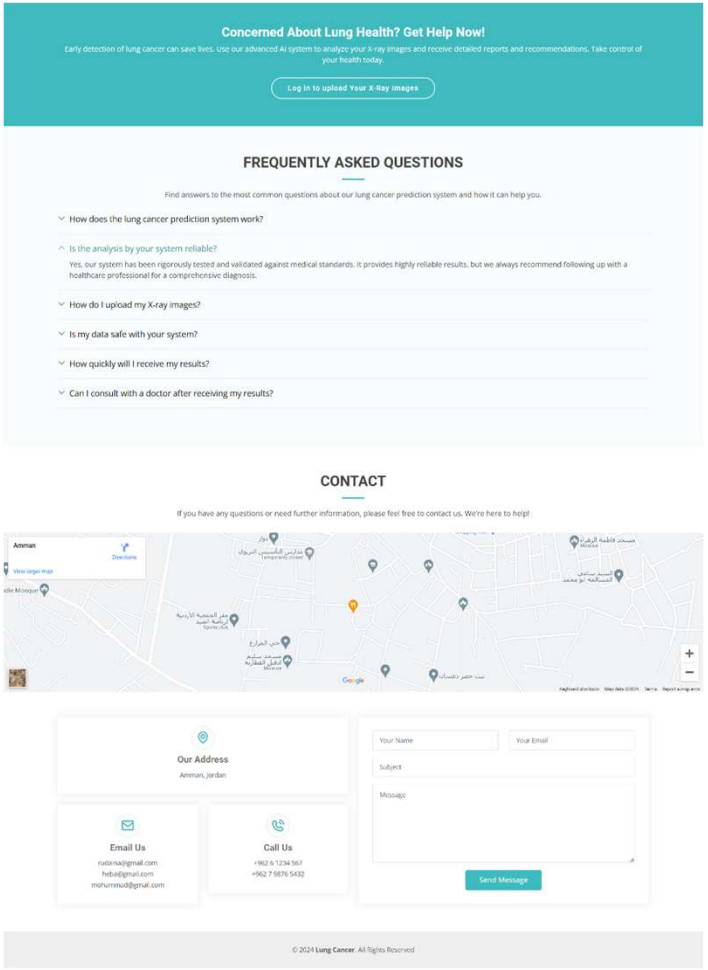
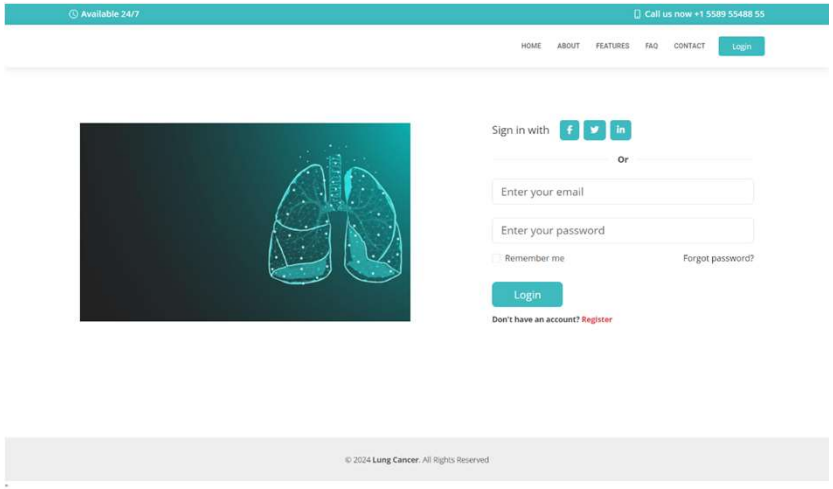
Welcome to Lung Cancer Prediction
Learn about lung cancer, its risk factors, symptoms, prevention, and treatment. Early detection is key to improving survival rates. Explore our resources to understand how you can reduce your risk and detect lung cancer in its early stages.
Read More
ABOUT US
Our mission is to provide advanced technology for early detection of lung cancer through image analysis. We are dedicated to saving lives by leveraging artificial intelligence and medical expertise.
Empowering Patients with Early Detection
We believe deep in the power of early detection to save lives. Our advanced image analysis technology can identify potential signs of lung cancer from medical images, providing patients and healthcare professionals with valuable information.
Accurate and reliable predictions through AI-driven analysis.
Recognize abnormalities quickly and seek medical attention immediately.
Collaborative approach with medical professionals to improve patient outcomes.
By leveraging the latest advances in artificial intelligence, our goal is to enable everyone to detect lung cancer early, leading to better prognosis and a higher quality of life.
X-ray Image Analysis
Use our advanced system to analyze X-ray images and detect early signs of lung cancer using AI techniques.
Data Privacy and Security
We ensure the protection and privacy of your medical data using the latest security and encryption standards.
Continuous Technical Support
Our team is available around the clock to provide technical support and answer your questions.
Mobile Applications
Download our mobile app to quickly and easily access our services from anywhere at any time.

FAQ,Contact Page



Sign in Page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Remember me
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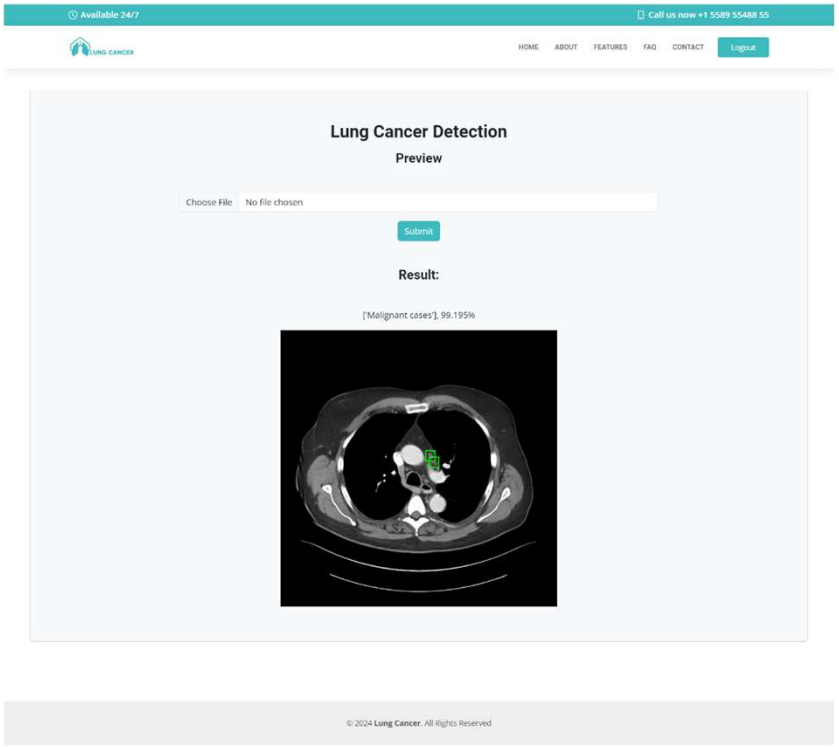
Result Page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CONTACT
Logout
Lung Cancer Detection
Preview
Choose File
No file chosen
Submit
Result:
['Malignant cases'], 99.195%
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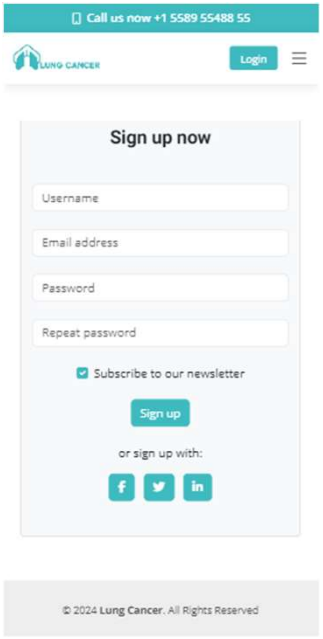
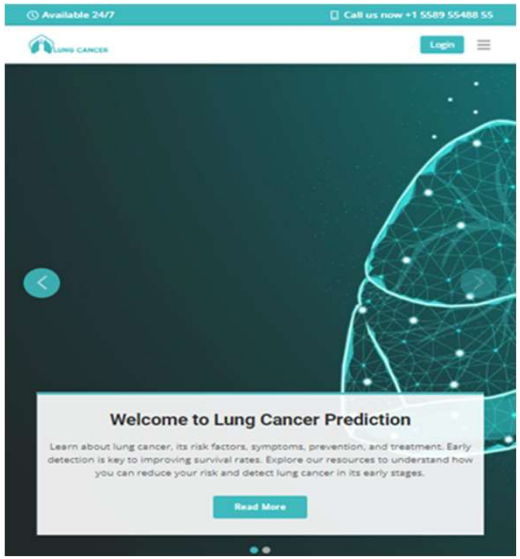
Responsive Website





Future Work

- Enhance the mode to get higher precision.
- New model to detect the location of Cancer
- Improve the dataset to contain the patient records
- New models for another diseases.

References

- Deep Learning (DL) - Questions and Answers in MRI (mriquestions.com)
- NN SVG (alexlenail.me)
- CNN Explainer (poloclub.github.io)
- The IQ-OTH/NCCD lung cancer dataset | Kaggle
- New respiratory airway secretory (RAS) cells discovered inside lungs | SYFY WIRE
- Yarmouk University (yu.edu.jo)

Thank You