Image Classification and Recognition in Lung Cancer Detection with Deep Learning

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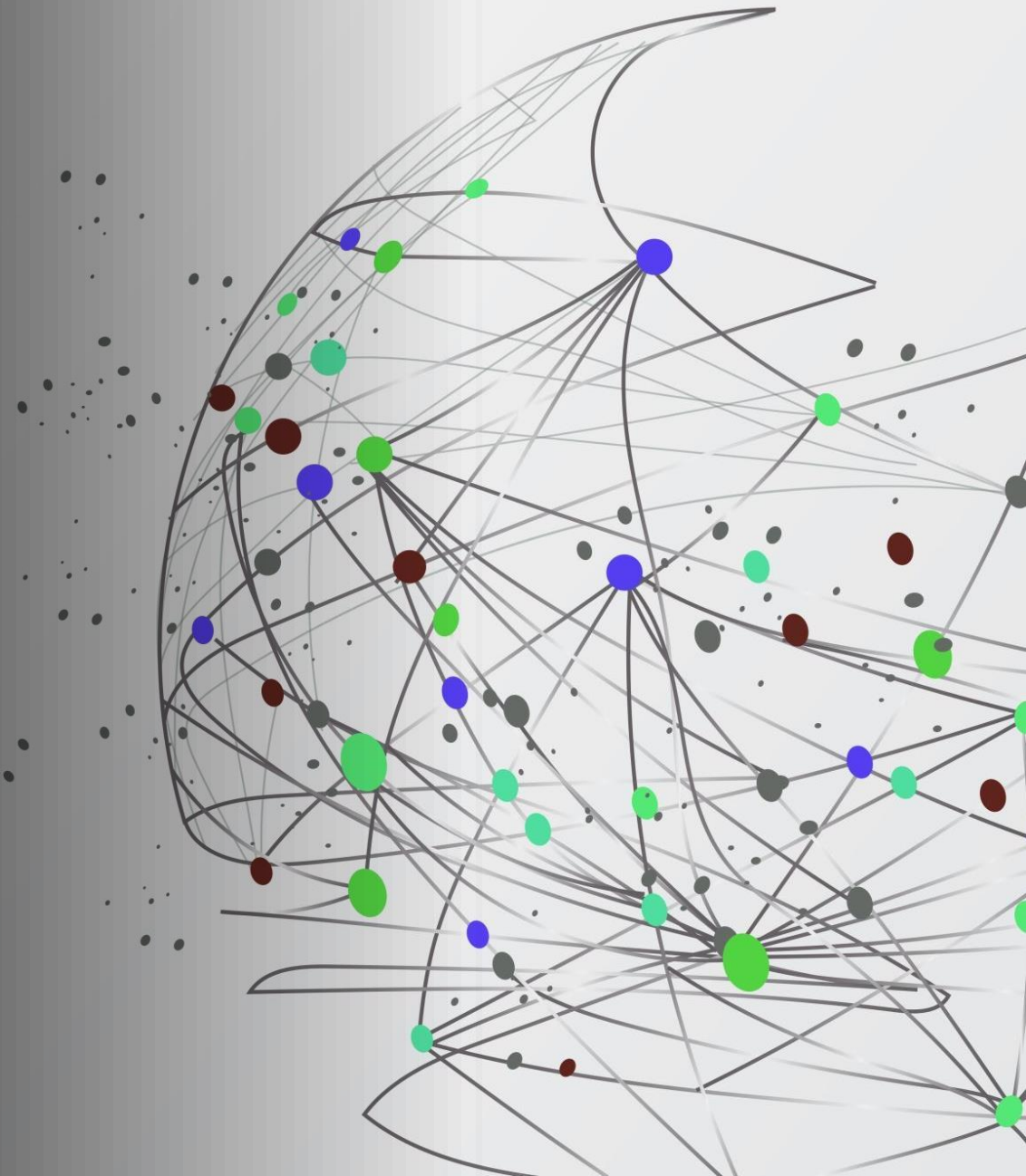
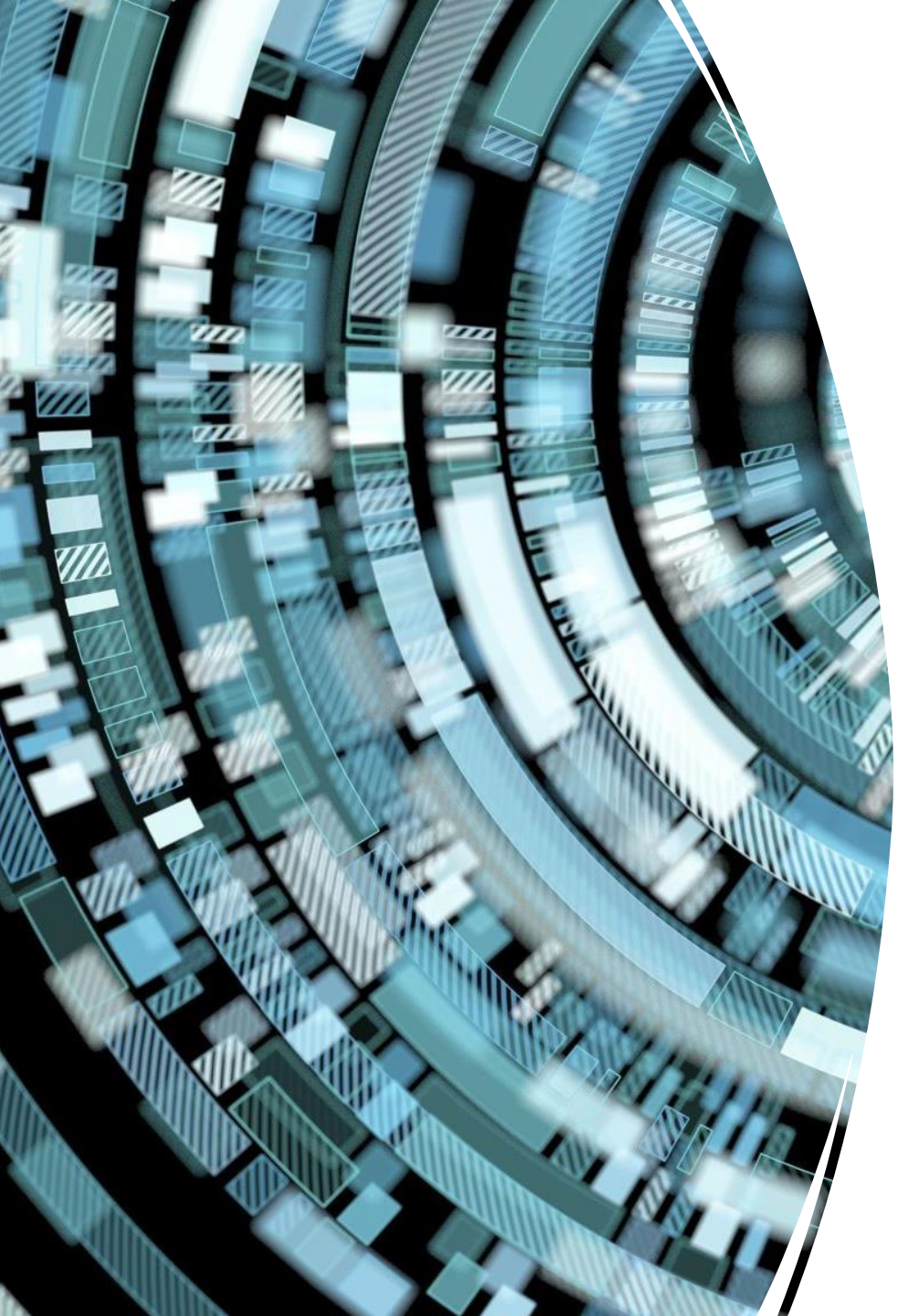
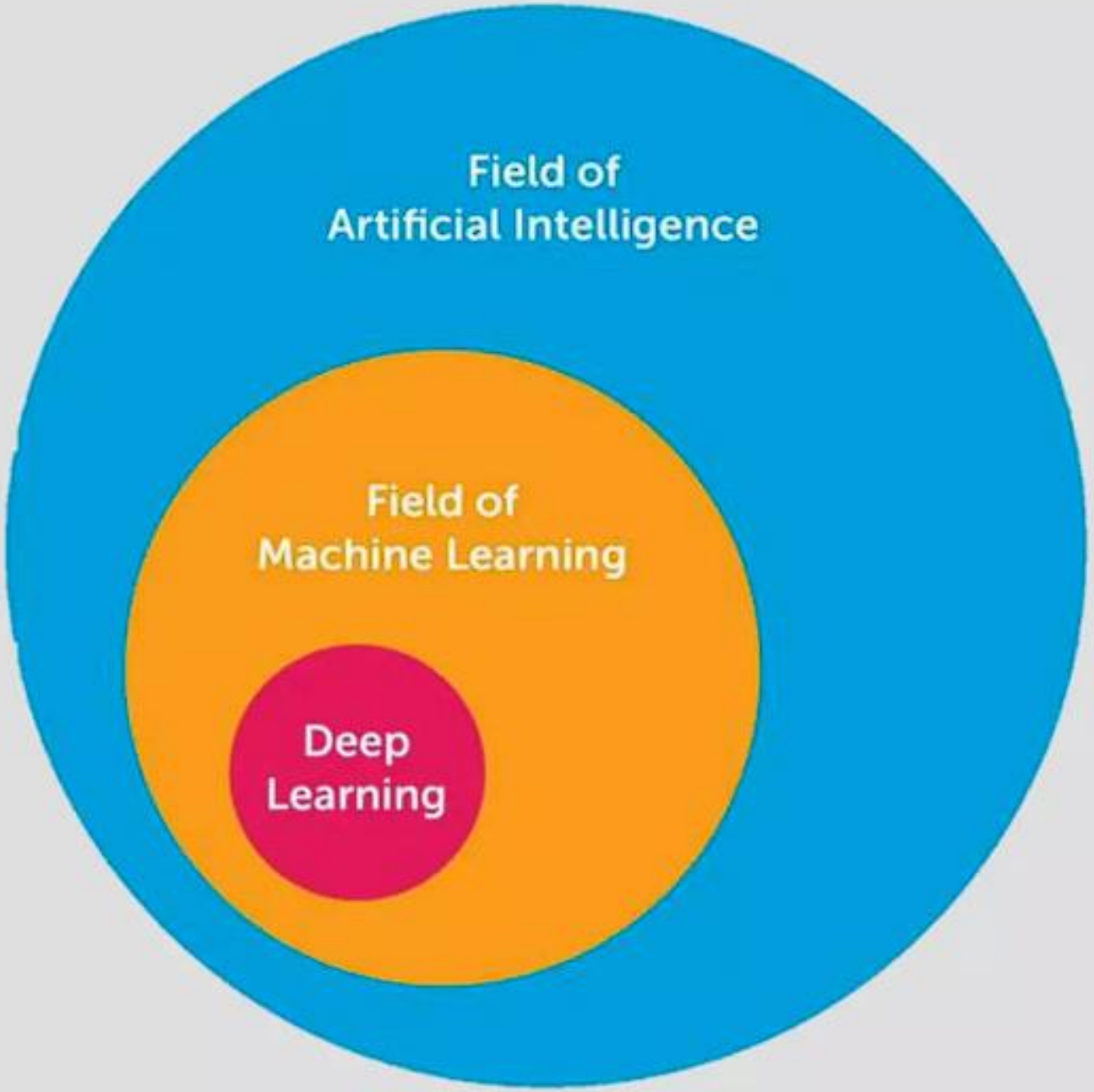




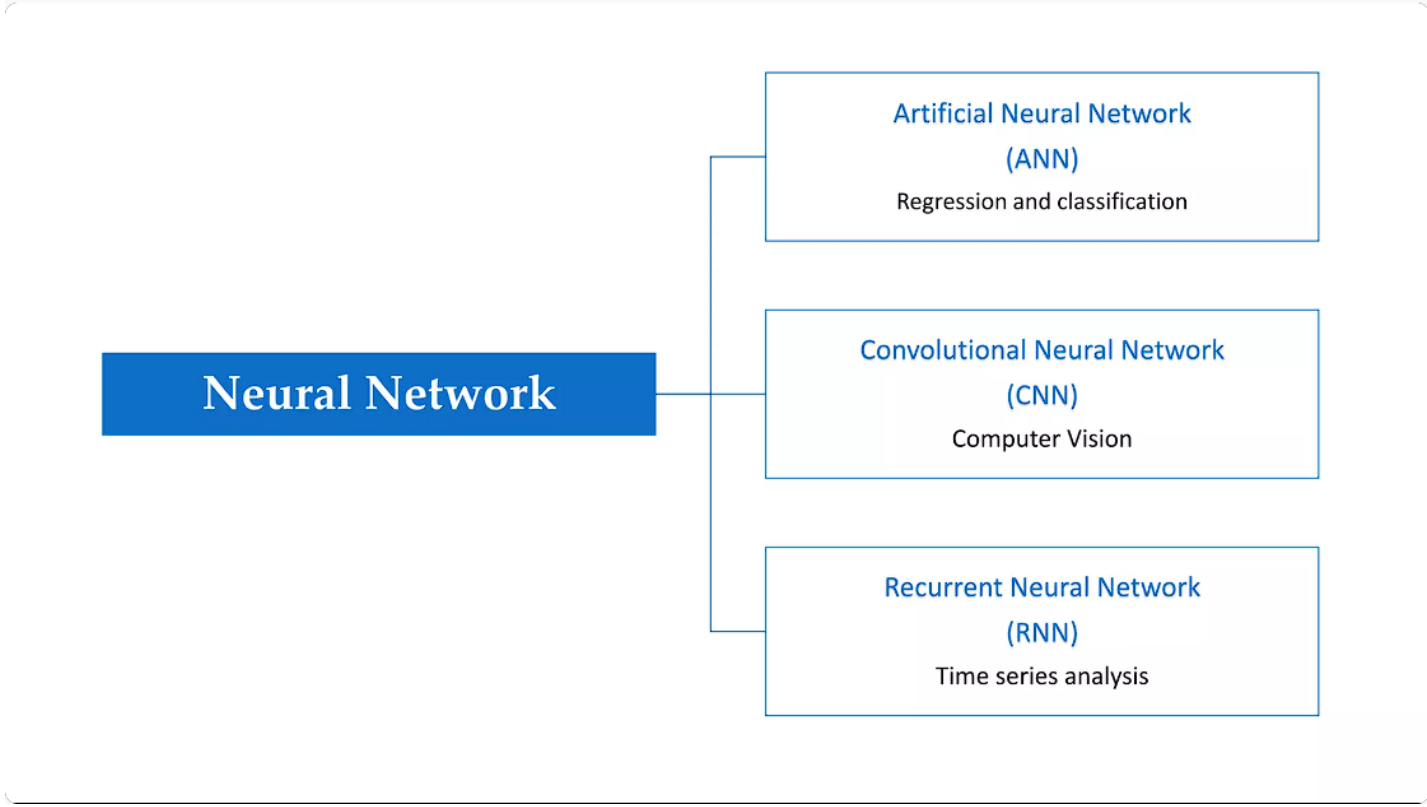
Abstract

- The application of deep learning techniques to image classification and recognition the Lung Cancer Detection . Lung cancer, a leading cause of cancer-related deaths globally, can benefit significantly from the precision and efficiency of deep learning algorithms.

Data Science

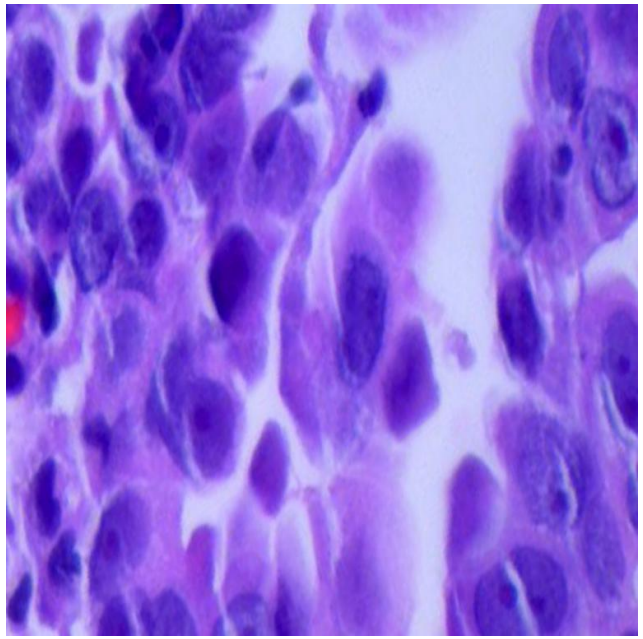


A Convolutional Neural Network (CNN) is a type of artificial neural network specifically designed for processing and analyzing visual data, such as images and videos. CNNs have been incredibly successful in tasks like image classification, object detection, and image recognition

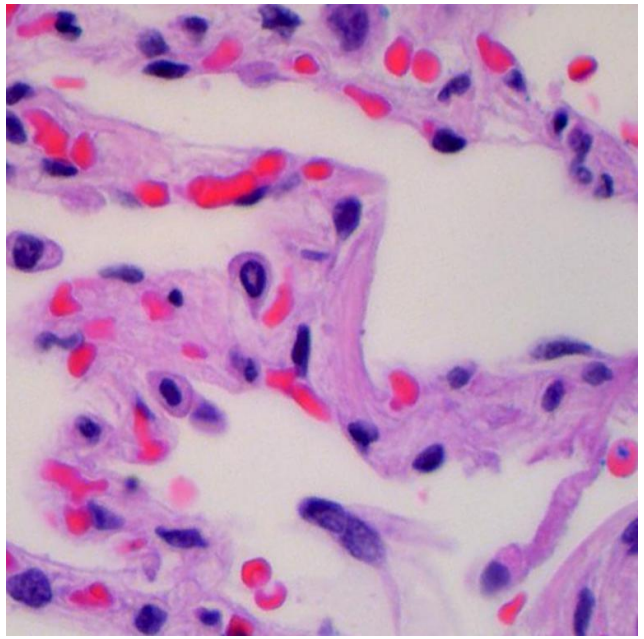


Lung Cancer Histopathological Images

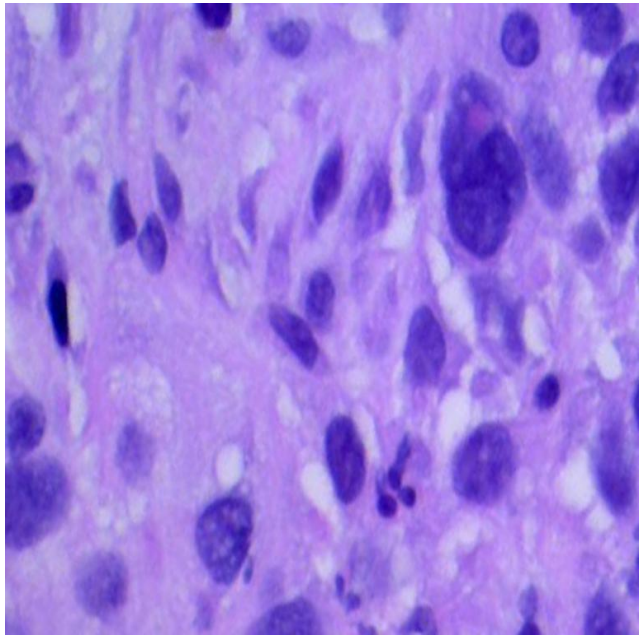
Lung adenocarcinoma(**Non-Small Cell Lung Cancer**)



Lung benign tissue(**Normal cells**)



Lung squamous cell carcinoma (**Small Cell Lung Cancer)**



Technology stack and Libraries

Technology stack

- Deep Learning Frameworks
- Data Handling and Manipulation
- Convolutional Neural Networks (CNNs)
- Programming Languages:

  Python

Libraries

- Tensorflow
- Numpy
- Pandas
- Conv2D,
- MaxPool2D,

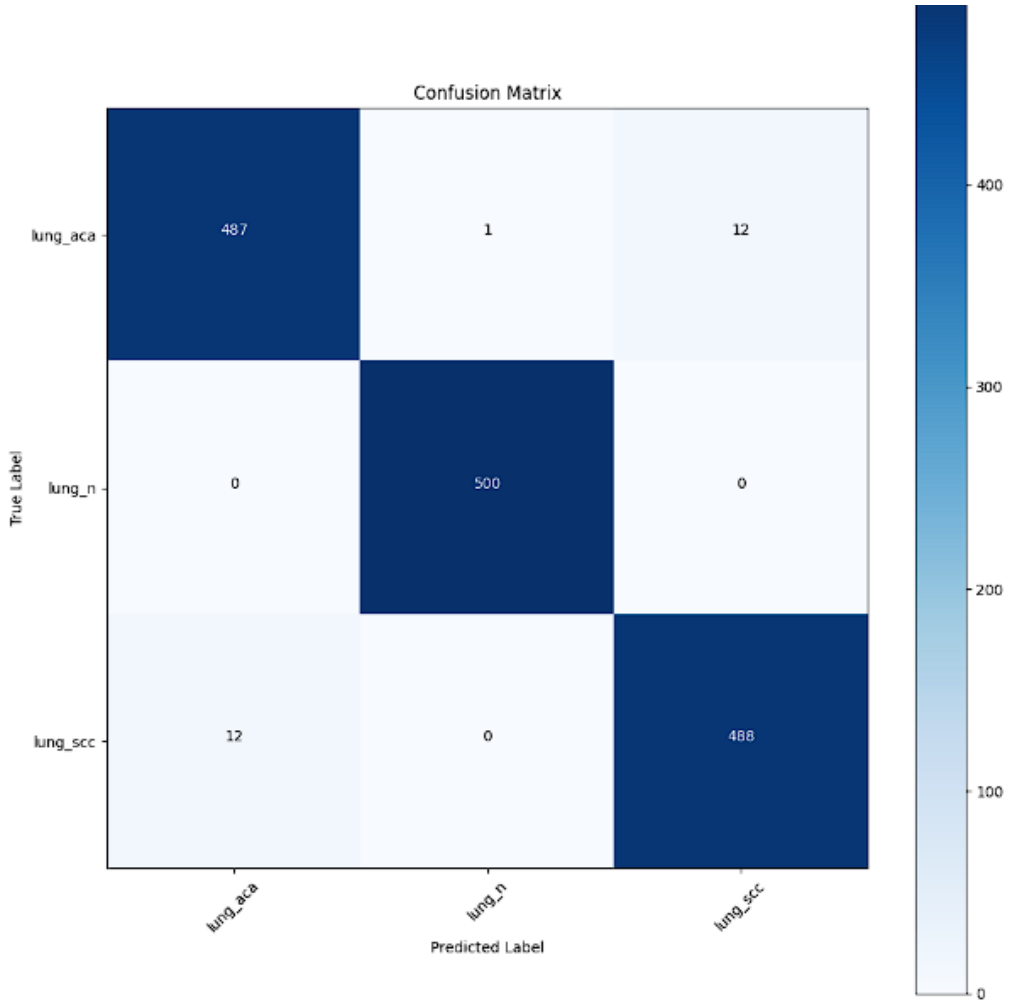
```
model_10=tf.keras.Sequential([
  Conv2D(filters=64,kernel_size=3,
                          activation='relu',
                          input_shape=(224,224,3),padding = 'same'),
  Conv2D(64,3,activation='relu',padding = 'same'),
  MaxPool2D(),
  Conv2D(128,3,activation='relu',padding = 'same'),
  Conv2D(128,3,activation='relu',padding = 'same'),
  MaxPool2D(),
  Conv2D(256,3,activation='relu',padding = 'same'),
  Conv2D(256,3,activation='relu',padding = 'same'),
  Conv2D(256,3,activation='relu',padding = 'same'),
  MaxPool2D(),
  Conv2D(512,3,activation='relu',padding = 'same'),
  Conv2D(512,3,activation='relu',padding = 'same'),
  MaxPool2D(),
  Flatten(),
  tf.keras.layers.BatchNormalization(axis= -1, momentum= 0.99, epsilon= 0.001),
  Dense(256,kernel_regularizer= regularizers.l2(l= 0.016),
          activity_regularizer= regularizers.l1(0.006),
          bias_regularizer= regularizers.l1(0.006),
          activation= 'relu'),
  Dense(64,activation='relu'),
  tf.keras.layers.BatchNormalization(),
  Dense(3,activation='softmax')
])
```

Classification report and confusion matrix

```
94/94 [==============================] - 8s 81ms/step
              precision    recall  f1-score   support

           0       0.98      0.97      0.97       500
           1       1.00      1.00      1.00       500
           2       0.98      0.98      0.98       500

    accuracy                           0.98      1500
   macro avg       0.98      0.98      0.98      1500
weighted avg       0.98      0.98      0.98      1500
```

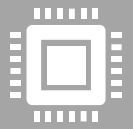


Advantages

- **Early Detection:** Deep learning models can identify subtle patterns and anomalies in medical images that may be challenging for human experts to detect
- **Speed:** Deep learning algorithms can analyze medical images rapidly, significantly reducing the time required for diagnosis.
- **Improved Accuracy:** Deep learning models can achieve high accuracy rates in image classification tasks, minimizing the risk of false positives and false negatives in lung cancer diagnosis.
- **Scalability:** Deep learning models can be trained on large datasets and deployed at scale across healthcare institutions

Disadvantages

Data Requirements: Deep learning models typically require large amounts of labeled data to achieve high accuracy



Computational Power: Computational power refers to the ability of a computing system, including its CPUs and GPUs, to perform complex calculations and process large amounts of data quickly and efficiently. In deep learning, computational power is crucial for training deep neural networks on vast datasets.(Tesla 4(T4) IN GOOGLECOLAB)

Computational time: It take each model to run 1.5 hours to 2 hours to complete

Drawback

Pretrained image from dataset

True label : Lung adenocarcinoma

Prediction: lung_aca

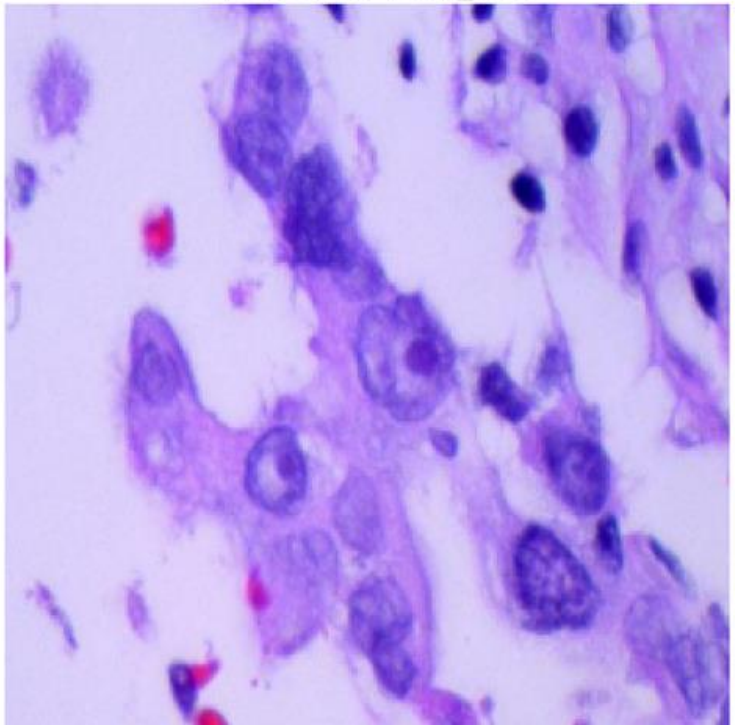
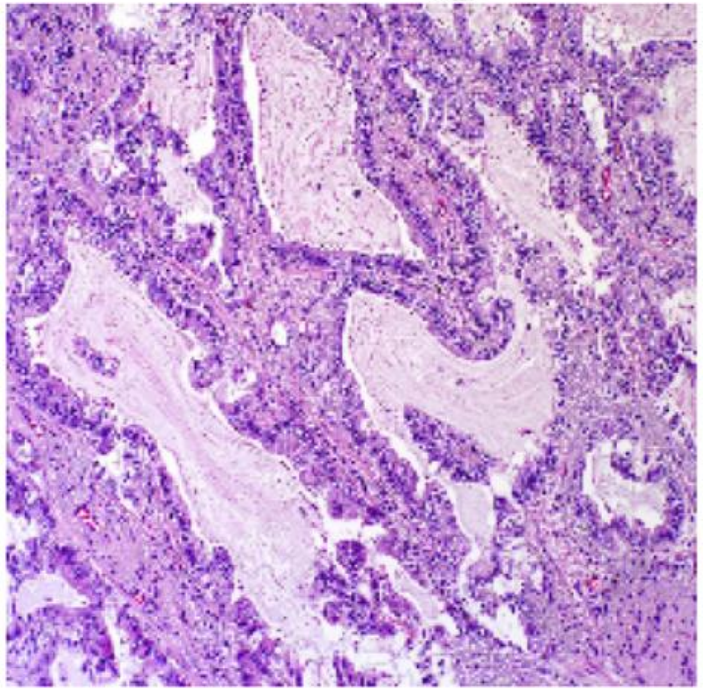


Image from Google

True label : Lung adenocarcinoma

```
1/1 [==============================] - 0s 40ms/step
```

Prediction: lung_n



Thank You