

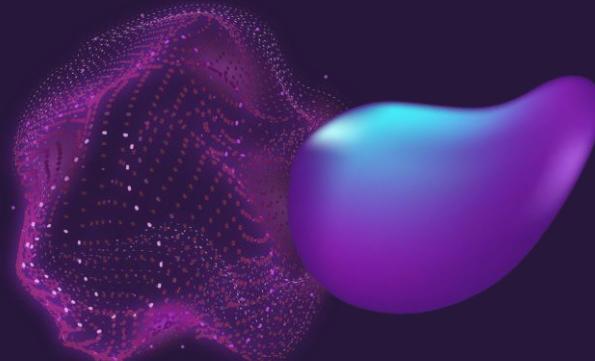
# BMEG 3103 (AI)

## PROJECT 1

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CHAN, Cheuk Ka (1155174356)



x



x



x



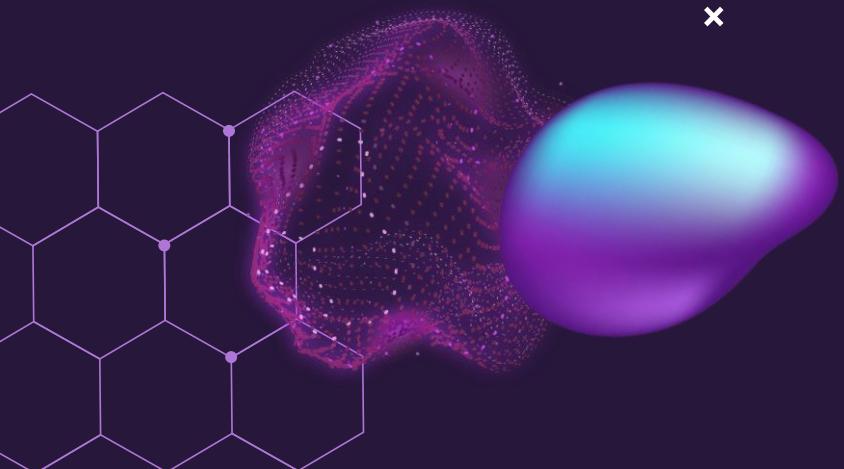
# OUR TEAM



**AU Wai Tak**

7.

x



**CHAN Cheuk Ka**

9.

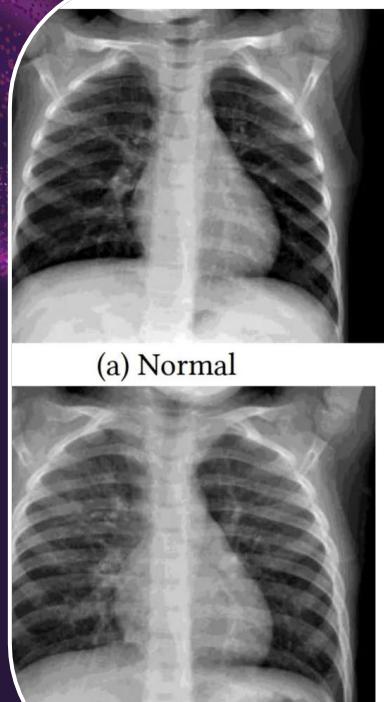


x

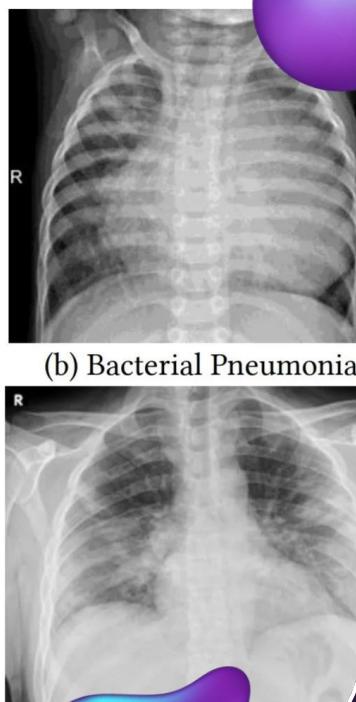


# INTRODUCTION

This project's task is to create a machine learning algorithm that can distinguish between normal and pneumonia chest x-ray.



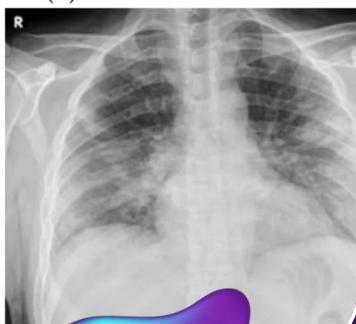
(a) Normal



(b) Bacterial Pneumonia



(c) Viral Pneumonia

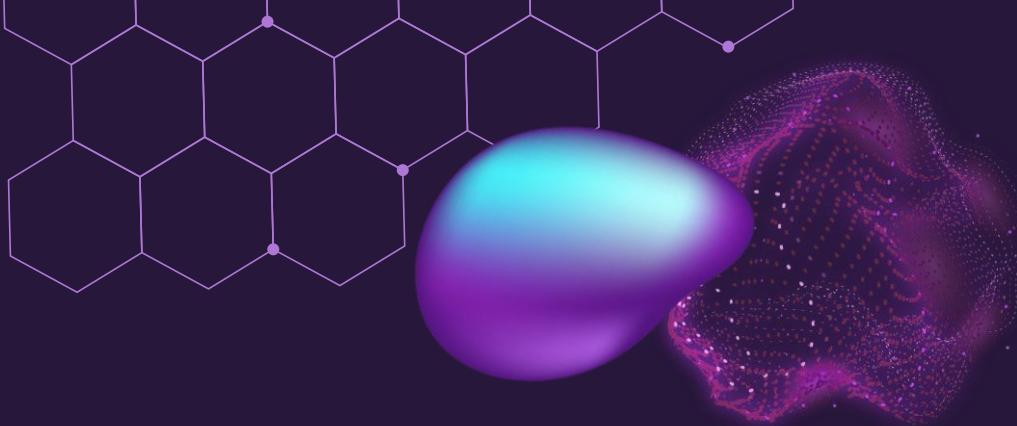


Bacterial Pneumonia

# 01

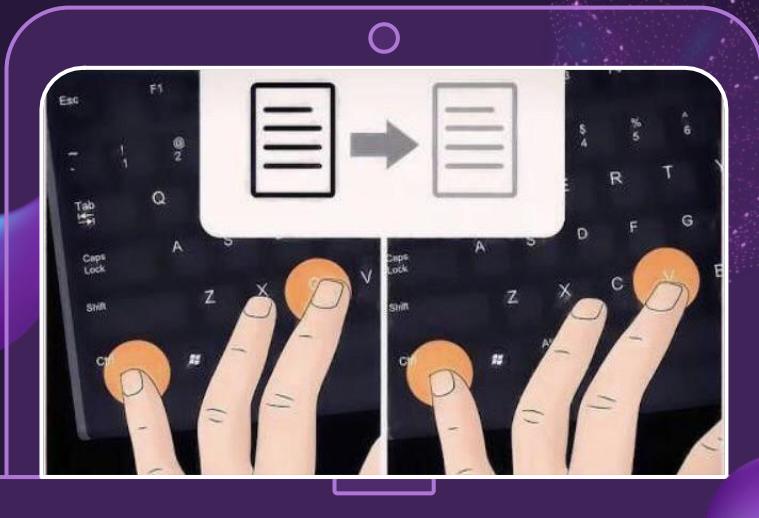
## DATA PRE-PROCESSING

+ data augmentation



# BIAS PADDING

We tripled the normal dataset from 1082 to 3246 to match the 3110 images in the pneumonia dataset to mitigate bias



# DATA AUGMENTATION

We augmented the training data  
to improve accuracy.

```
1 training_data_generator = ImageDataGenerator(  
2     rescale=1.0 / 255,  
3     rotation_range=20,  
4     width_shift_range=0.1,  
5     height_shift_range=0.1,  
6     zoom_range=0.2,  
7 )
```

# 02



## TRAINING AI MODEL

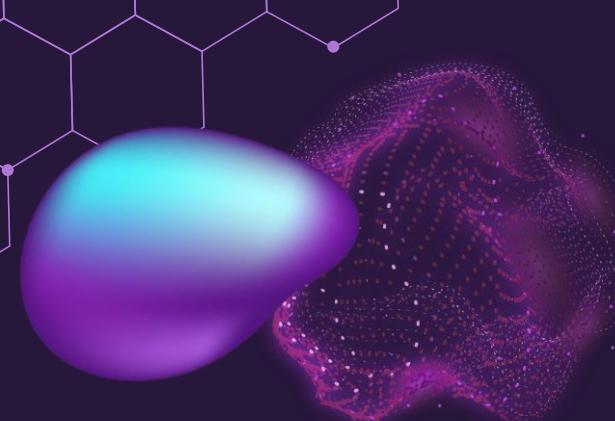
+ hyperparameters



\*



\*



\*



# CONVOLUTIONAL NEURAL NETWORK

From tensorflow.keras



x

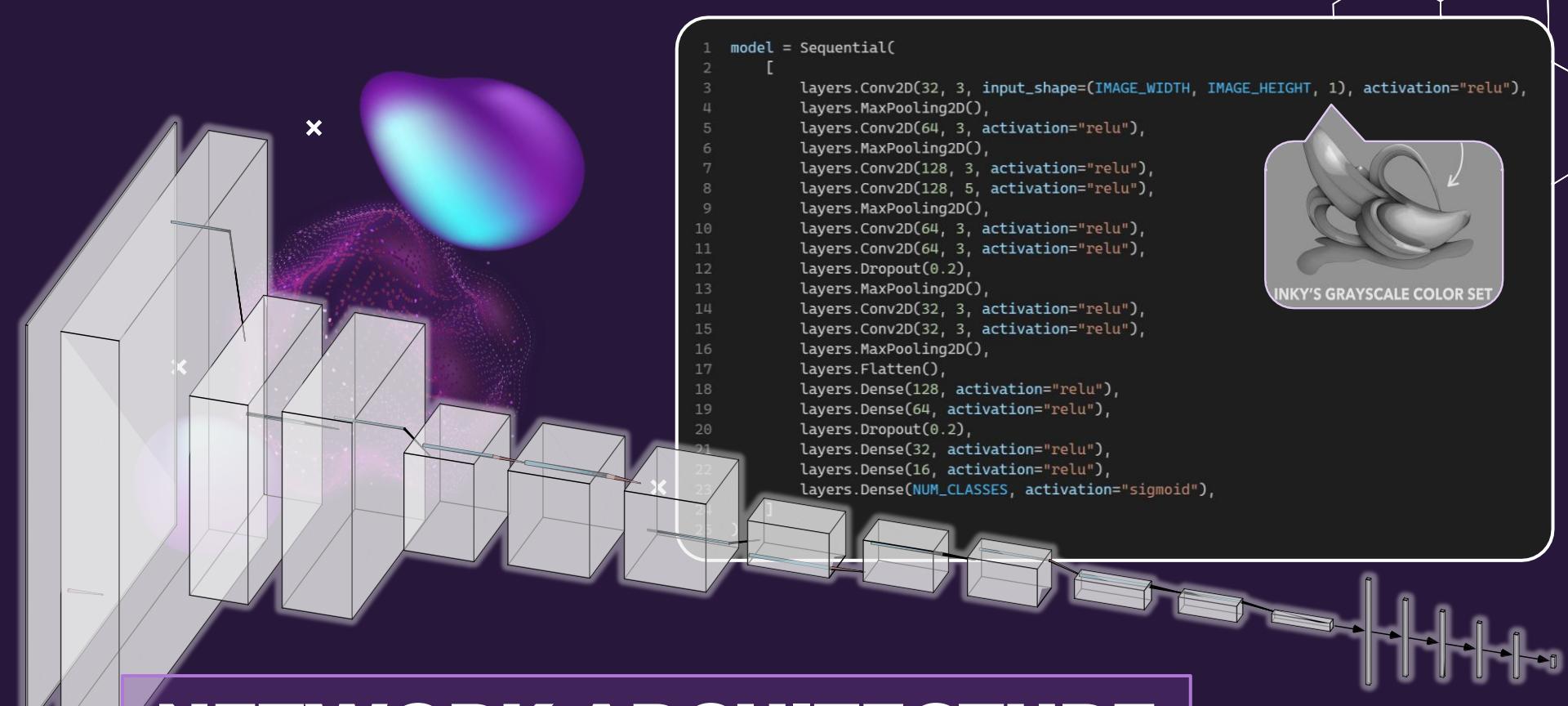


**BREAKING  
NEWS**



# NETWORK ARCHITECTURE

```
1 model = Sequential(  
2     [  
3         layers.Conv2D(32, 3, input_shape=(IMAGE_WIDTH, IMAGE_HEIGHT, 1), activation="relu"),  
4         layers.MaxPooling2D(),  
5         layers.Conv2D(64, 3, activation="relu"),  
6         layers.MaxPooling2D(),  
7         layers.Conv2D(128, 3, activation="relu"),  
8         layers.Conv2D(128, 5, activation="relu"),  
9         layers.MaxPooling2D(),  
10        layers.Conv2D(64, 3, activation="relu"),  
11        layers.Conv2D(64, 3, activation="relu"),  
12        layers.Dropout(0.2),  
13        layers.MaxPooling2D(),  
14        layers.Conv2D(32, 3, activation="relu"),  
15        layers.Conv2D(32, 3, activation="relu"),  
16        layers.MaxPooling2D(),  
17        layers.Flatten(),  
18        layers.Dense(128, activation="relu"),  
19        layers.Dense(64, activation="relu"),  
20        layers.Dropout(0.2),  
21        layers.Dense(32, activation="relu"),  
22        layers.Dense(16, activation="relu"),  
23        layers.Dense(NUM_CLASSES, activation="sigmoid"),  
24    ]  
25 )
```



# EARLY STOPPING

We monitored the loss on the validation dataset and stopped the training process if it has not improved after 20 epochs.



# HYPERPARAMETERS

\*



## OPTIMISER

We used *adam* with  
*learning\_rate* = 0.001  
and categorical  
cross-entropy as the  
loss function

\*



## DROPOUT RATE

We chose *dropout\_rate*  
= 0.2

\*



## BATCH SIZE

We chose *BATCH\_SIZE*  
= 32

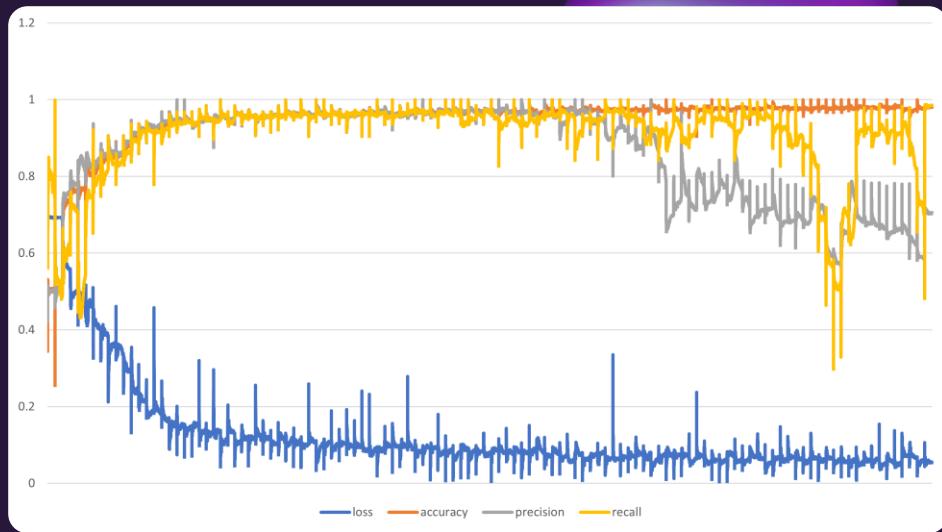


# \* METRICS

on the testing data, after hyperparameters tuning

<b>ACCURACY</b>	0.9526542425155640
<b>Precision</b>	0.7135249972343445
<b>Recall</b>	0.9612625241279602
<b>CONFUSION MATRIX</b>	88 177 156 276

\*





**FIN.**

The background features abstract geometric patterns of hexagons in light purple and white against a dark navy blue. Three glowing, translucent spheres in shades of blue and purple are scattered across the composition. One sphere is positioned in the upper left, another in the lower left, and a larger one in the center-right. Small white 'x' and '+' symbols are placed near the spheres in the upper left and lower left respectively. The word 'FIN.' is centered in large, bold, white, sans-serif letters.