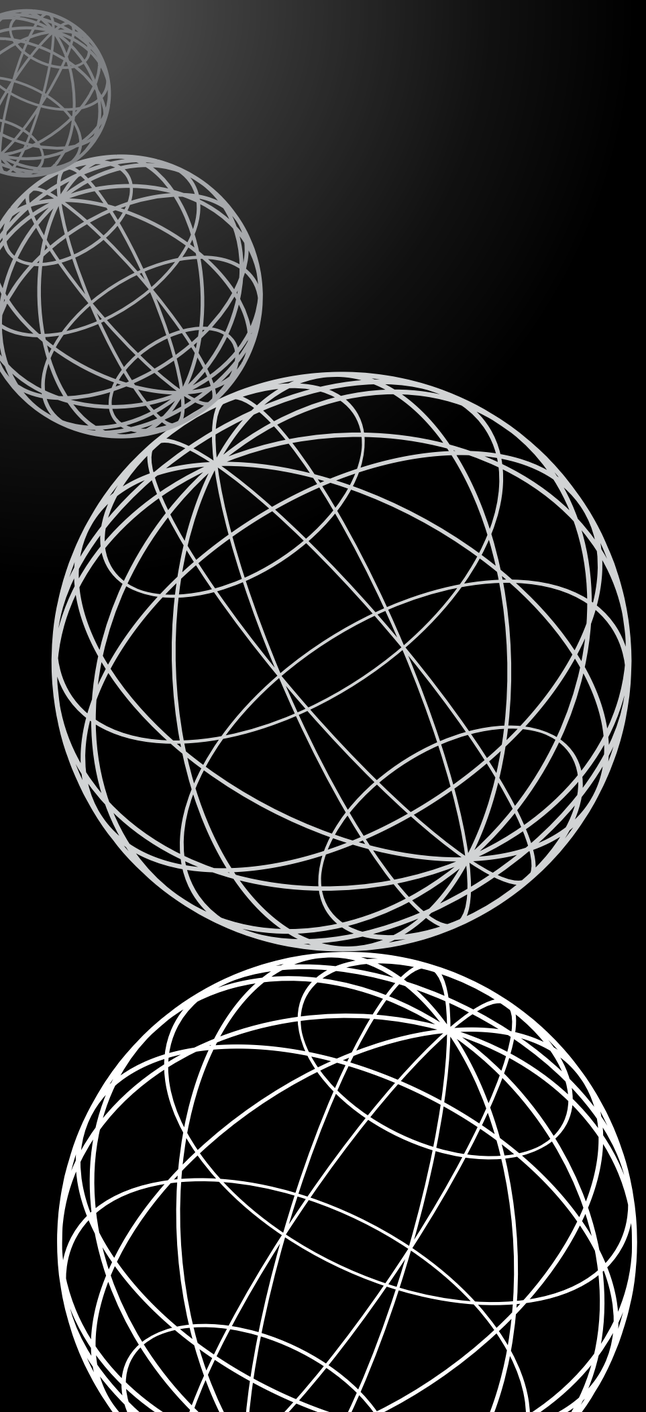
LUNG CANCER DETECTION

USING CNN AND
FUZZY LOGIC

AP21110010915,AP21110010925,
AP21110010927,AP21110010948



PROBLEM STATEMENT

In medical imaging, accurately classifying lung cancer subtypes is critical for timely and effective treatment. Traditional deep learning models may struggle with subtle variations in tumor texture and size, leading to potential misclassifications. This project integrates fuzzy logic to preprocess tumor characteristics (texture and size), assigning cancer probabilities.

CNN IN MEDICAL IMAGING TASKS

Feature Transfer: Models pretrained on ImageNet learn general image features such as edges, textures, and patterns that are transferable to medical imaging tasks.The pretrained model is adapted to the specific task of lung cancer detection by replacing and retraining the classification layers.

Improved Accuracy: Using ImageNet as a base enhances the CNN's ability to generalize, even with limited medical datasets.
. Uncertainty Management:
Medical images may have ambiguous features (e.g., unclear nodules). Fuzzy logic handles these uncertainties effectively.

THE XCEPTION MODEL ARCHITECTURE

Entry Flow:

- Conv2D(32 filters, 3x3, stride 2)
- Conv2D(64 filters, 3x3)
- Max Pooling (3x3, stride 2)

Middle Flow:

- 8 Repeated Residual Blocks:
- Each block consists of three depthwise separable convolutions (728 filters each).

THE XCEPTION MODEL ARCHITECTURE

Exit Flow:.

Residual Block:

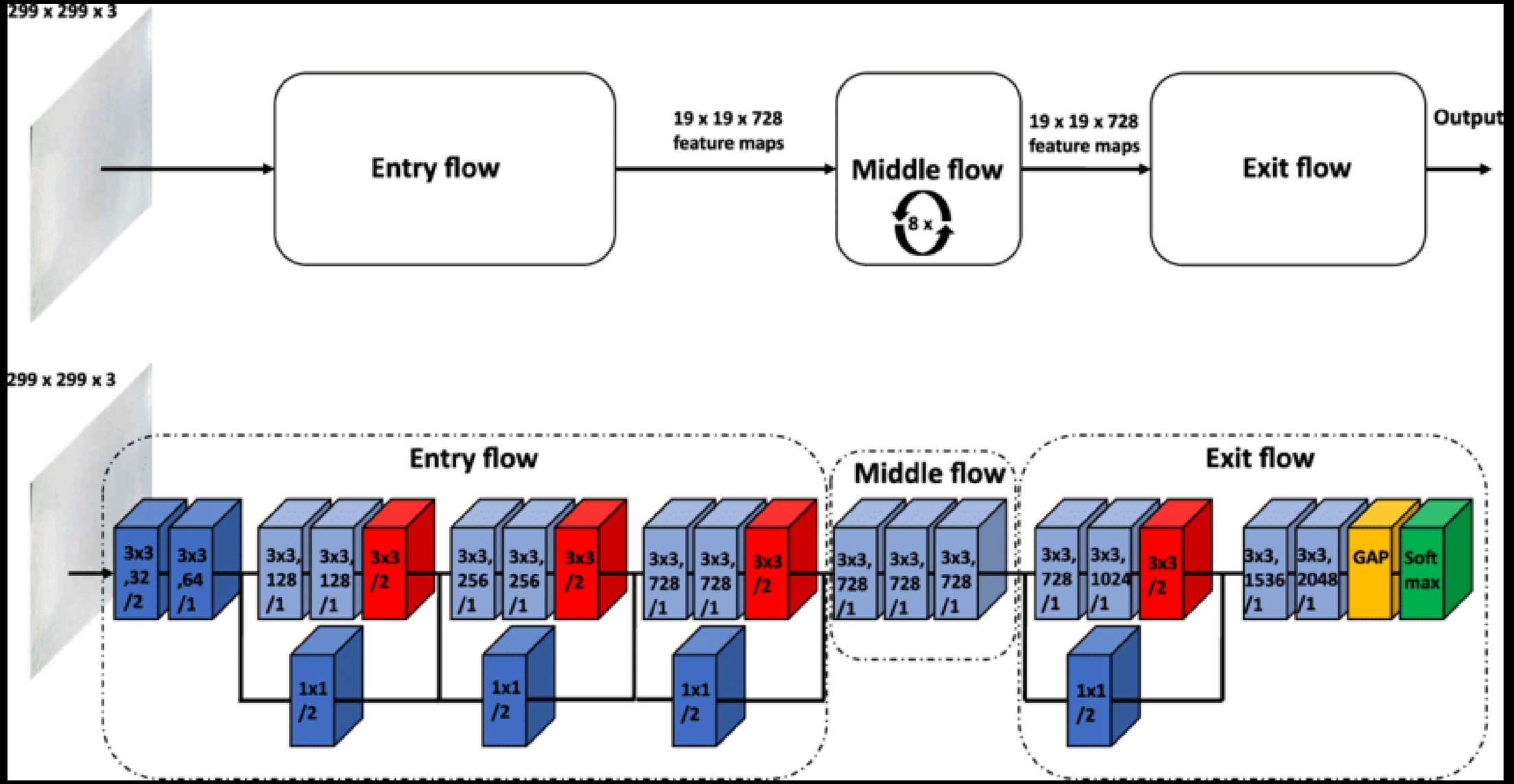
- Two depthwise separable convolutions (728 filters).
- A final depthwise separable convolution with 1024 filters.

Final Layers:

- Global average pooling.
- Fully connected (dense) layer

Activation Function: ReLU (hidden layers), Softmax (output layer)

Loss Function: categorical_crossentropy (one-hot labels)

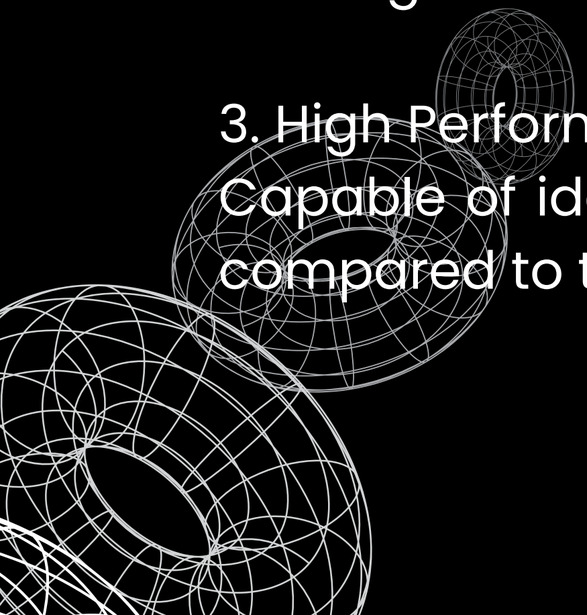

299 x 299 x 3
Entry flow
19 x 19 x 728
feature maps
Middle flow
8 x
19 x 19 x 728
feature maps
Exit flow
Output
299 x 299 x 3
Entry flow
Middle flow
Exit flow
3x3 ,32 /2
3x3 ,64 /1
3x3, 128 /1
3x3, 128 /1
3x3 /2
1x1 /2
3x3, 256 /1
3x3, 256 /1
3x3 /2
1x1 /2
3x3, 728 /1
3x3, 728 /1
3x3 /2
1x1 /2
3x3, 728 /1
3x3, 728 /1
3x3, 728 /1
3x3, 728 /1
3x3, 1024 /1
3x3 /2
1x1 /2
3x3, 1536 /1
3x3, 2048 /1
GAP
Soft max

ADVANTAGES OF XCEPTION FOR LUNG CANCER DETECTION:

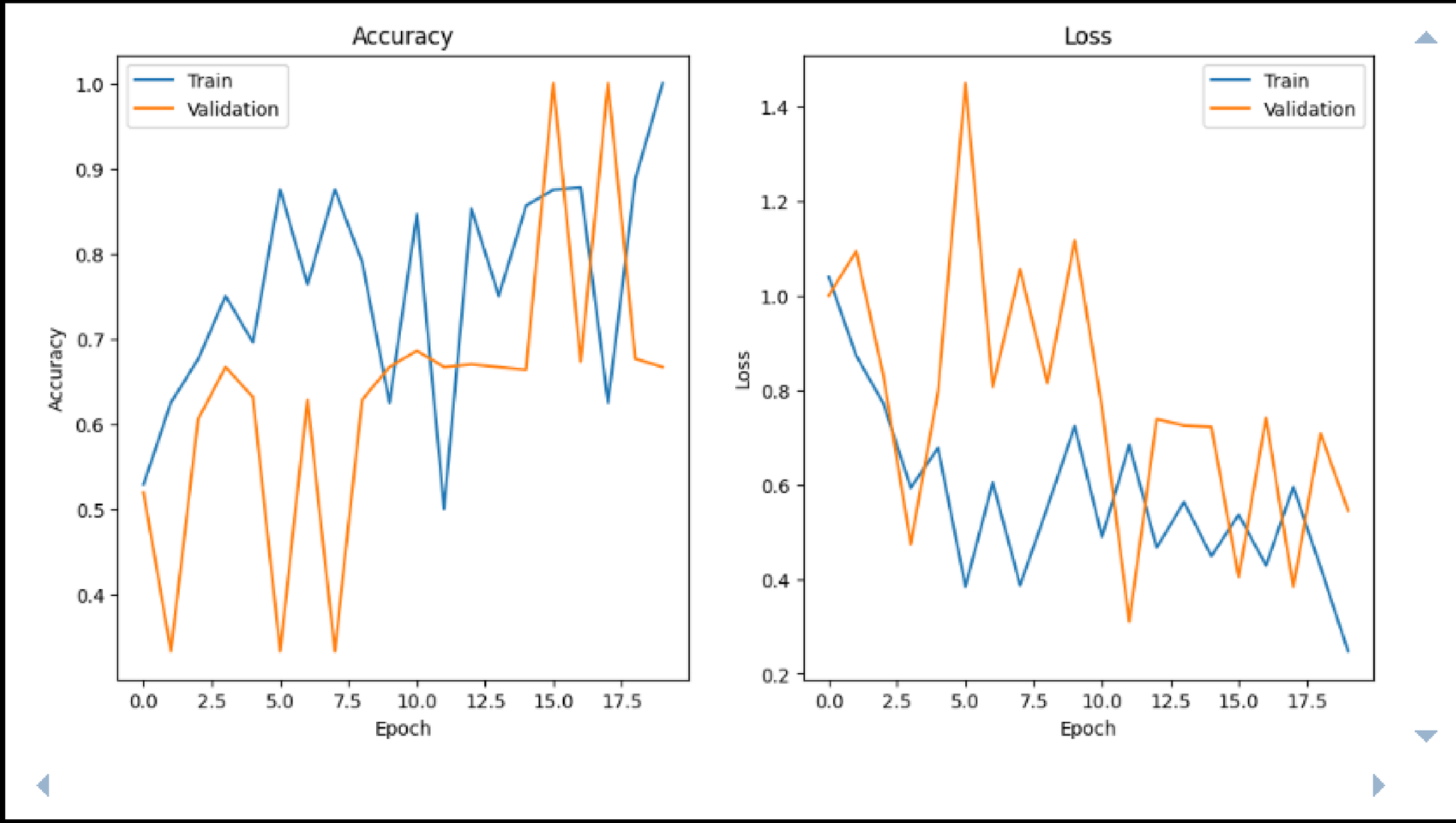
1. Efficient Feature Learning:
Separates spatial and channel correlations, making it highly effective for complex image analysis like CT scans.

2. Computational Efficiency:
Depthwise separable convolutions reduce computational load, enabling faster training and inference.

3. High Performance:
Capable of identifying intricate patterns in medical images with fewer parameters compared to traditional CNNs.



PLOT TRAINING AND VALIDATION METRICS



OUTPUT PREDICTION

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1/1 ━━━━━━━━━━━━━━━━━━━━ 1s 1s/step
Predicted Class: large.cell.carcinoma_left.hilum_T2_N2_M0_IIIa
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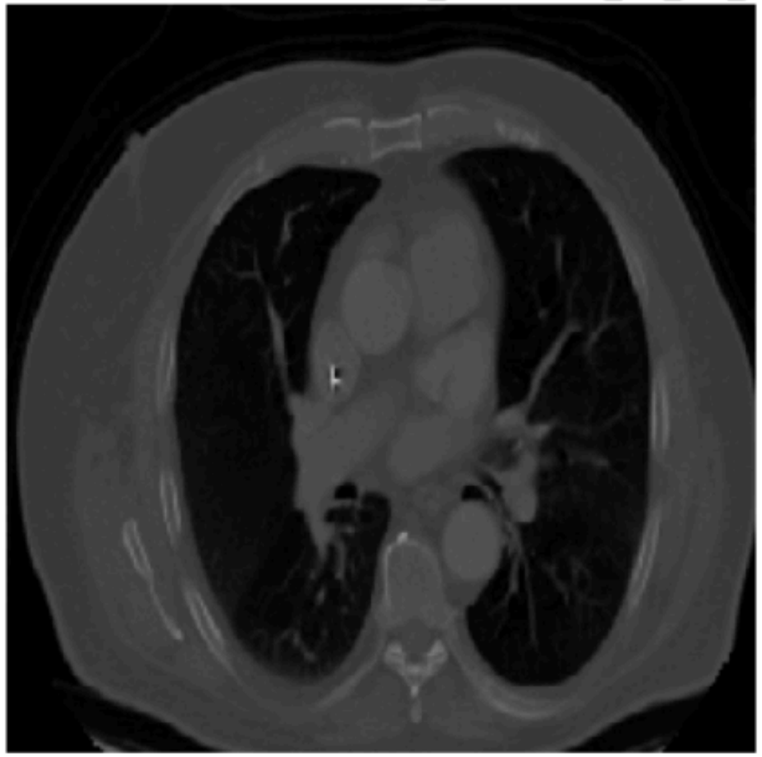
Prediction: large.cell.carcinoma_left.hilum_T2_N2_M0_IIIa



THANK YOU