

Model Development Phase

Date	17 June 2025
Team ID	SWTID1749876754
Project Title	SynapseScan: AI Driven Classification of Ovarian Cancer Variants
Maximum Marks	5 Marks

Feature Selection Report

In the forthcoming update, each feature will be accompanied by a brief description. Users will indicate whether it's selected or not, providing reasoning for their decision. This process will streamline decision-making and enhance transparency in feature selection for CNN-based image classification models.

Feature	Description	Selected (Yes/No)	Reasoning
InceptionV3 Base Model	Pre-trained InceptionV3 model from ImageNet for transfer learning	Yes	Provides robust feature extraction capabilities with proven performance on medical imaging tasks. Pre-trained weights capture low-level features essential for image classification.
Image Rescaling (1./255)	Pixel normalization to scale image values between 0-1	Yes	Essential preprocessing step for neural networks to ensure stable training and faster convergence by normalizing input pixel values.

Image Resizing (224x224)	Standardizing input image dimensions to 224x224 pixels	Yes	Required for InceptionV3 architecture compatibility and ensures consistent input dimensions across all medical images for optimal processing.
Differential Attention Layer	Custom attention mechanism with query, key, value transformations	Yes	Enhances the model's ability to focus on critical regions in histopathological images, improving classification accuracy for subtle cancer variant differences.
Global Average Pooling	Reduces spatial dimensions while preserving important features	Yes	Prevents overfitting compared to fully connected layers and maintains spatial information while reducing computational complexity.
Gaussian Noise Layers	Regularization technique adding random noise during training	Yes	Acts as regularization to improve model generalization and robustness, particularly important for medical imaging where data variations are common.
Batch Normalization	Normalizes layer inputs to stabilize training	Yes	Accelerates training convergence and provides regularization effect, crucial for deep CNN architectures in medical image analysis.
Dropout Layer (0.25)	Randomly sets 25% of input units to 0 during training	Yes	Prevents overfitting by reducing co-adaptation of neurons, essential for small medical datasets to improve generalization.

Dense Layer (512 units)	Fully connected layer with 512 neurons and ReLU activation	Yes	Provides sufficient capacity for learning complex patterns in cancer variant classification while maintaining computational efficiency.
RandomOverSampler	Balances class distribution by oversampling minority classes	Yes	Addresses class imbalance in medical datasets, ensuring fair representation of all ovarian cancer variants during training.
Early Stopping	Stops training when validation loss stops improving	Yes	Prevents overfitting and saves computational resources by automatically stopping training at optimal performance point.
Adam Optimizer (lr=0.0001)	Adaptive learning rate optimization algorithm	Yes	Provides efficient and stable convergence for medical image classification tasks with appropriate learning rate for transfer learning.
Data Augmentation	Techniques like rotation, flipping to increase dataset diversity	No	Not implemented in current model. Could be beneficial for increasing dataset size and improving generalization, but may alter critical medical features.
Multiple Frozen Layers	Freezing all InceptionV3 base model layers	Yes	Preserves pre-trained ImageNet features while allowing custom layers to learn domain-specific medical imaging patterns. Reduces training time and prevents overfitting.