

Model Development Phase - 1

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Project Title	CardMaster: Intelligent Playing Card Recognition using Transfer Learning

Model Selection Report:

In our project, we explored and evaluated several deep learning architectures based on factors such as **accuracy**, **computational efficiency**, and **adaptability** to computer vision tasks. The following models were shortlisted:

Model	Description
VGG16	<p>The VGG-16 model is a convolutional neural network (CNN) architecture that was proposed by the Visual Geometry Group (VGG) at the University of Oxford. It is characterized by its depth, consisting of 16 layers, including 13 convolutional layers and 3 fully connected layers. VGG-16 is renowned for its simplicity and effectiveness.</p> <p>Despite its simplicity, VGG16 performs exceptionally well in feature extraction. Its pretrained weights on ImageNet make it highly useful for transfer learning, especially when working with limited data.</p> <p>Computational Needs: Moderate to high; larger model size but manageable on modern GPUs.</p>
InceptionV3	<p>Inception-v3 is a convolutional neural network architecture from the Inception family that makes several improvements including using Label Smoothing, factorized 7 x 7 convolutions, and the use of an auxiliary classifier to propagate label information lower down the network (along with the use of batch normalization for layers in the side head).</p>

	<p>It captures both fine-grained and large-scale features, making it suitable for complex image classification tasks. It also provides a good balance between depth and speed.</p> <p>Computational Needs: More efficient than VGG16; optimized for better performance with fewer parameters.</p>
Xception	<p>The Xception model is a deep learning architecture that utilizes depthwise separable convolutions, which are a more efficient alternative to traditional convolution operations.</p> <p>The Xception model replaces Inception modules with depthwise separable convolution layers, which allows for better efficiency and performance. It offers state-of-the-art accuracy while maintaining lower parameter count. It's ideal when model performance is critical but hardware resources are limited.</p> <p>Computational Needs: Efficient and lightweight; ideal for real-time applications and mobile deployment.</p>

Summary:

VGG16 was chosen for its simplicity and reliable feature extraction.

Inception V3 offered a balance between performance and speed using multi-scale convolutions.

Xception provided the best efficiency-to-performance ratio using depthwise separable convolutions.