REPORT

Assignment 2: Convolution

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INTODUCTION:

- In this report we aim to explain the effectiveness of how to construct a convolutional neural network by using the Dogs and Cats data.
- During the model development phase, we will investigate several changes and approaches to find the best one.
- When it comes to converting there are two basic approaches that are usually used to classify dogs and cats.
- By using a network that has already been trained or building a network from scratch we will examine these approaches to identify the benefits and consequences of each.

Methodology:

- Here it is observed that three pre trained models and six scratch models using various configurations have been generated through this.
- The number of layers, nodes, optimizers, dropout rates, and other elements vary across these configurations.

Training from Scratch:

Initial Training Sample (1000 Samples):

- Describe the architecture of the network trained from scratch.
- Discuss techniques used to reduce overfitting and improve performance (e.g., data augmentation, regularization).
- Present the performance achieved on the validation and test datasets.

Increased Training Sample Size:

- Describe the adjustments made to the network architecture or training process.
- Discuss the impact of the increased training sample size on performance.
- Present the improved performance achieved.

Optimal Training Sample Size:

- Describe the adjustments made to further optimize the network.
- Discuss the rationale behind selecting the optimal training sample size.
- Present the performance achieved with the optimal sample size.

Using Pretrained Networks:

Training with Pretrained Network:

- Describe the architecture of the pretrained network used.
- Discuss any fine-tuning or transfer learning techniques applied.
- Present the performance achieved on the validation and test datasets.

Impact of Sample Size on Pretrained Network:

- Compare the performance achieved with the pretrained network using different sample sizes.

Scratch Models:

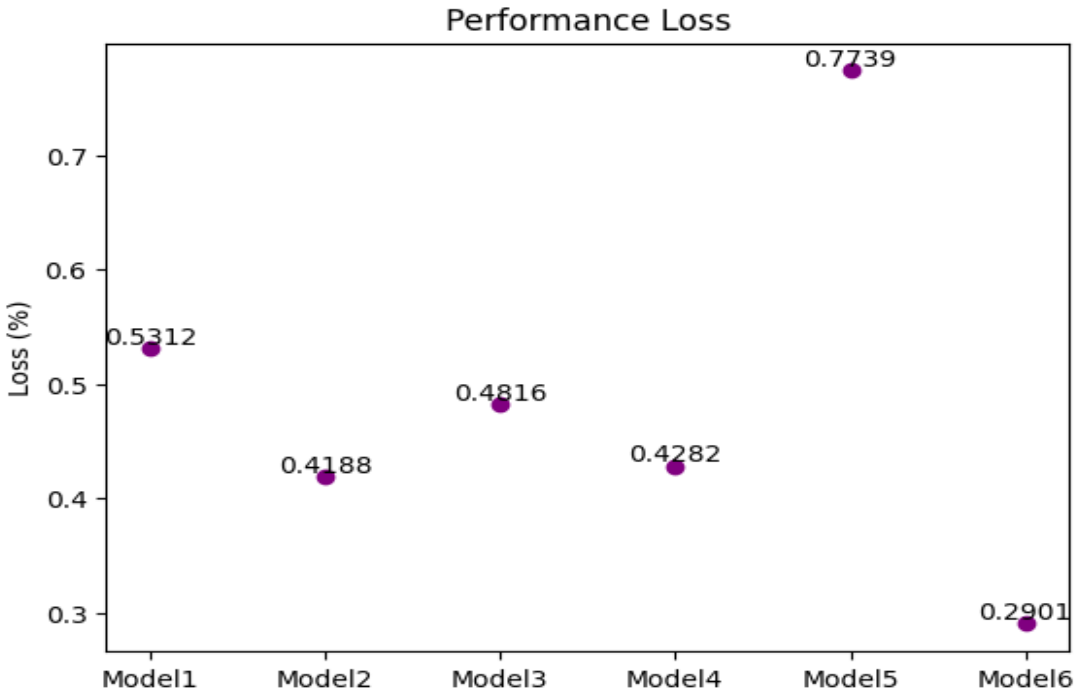
Models	Training Size	Validation Accuracy	Test Loss	Test Accuracy
Model 1	1000	0.7370	0.5348	0.737
Model 2	1000	0.8190	0.4246	0.819
Model 3	1000	0.7580	0.5331	0.758
Model 4	1000	0.8180	0.4004	0.818
Model 5	5000	0.8870	0.6666	0.887
Model 6	10000	0.8830	0.3237	0.883

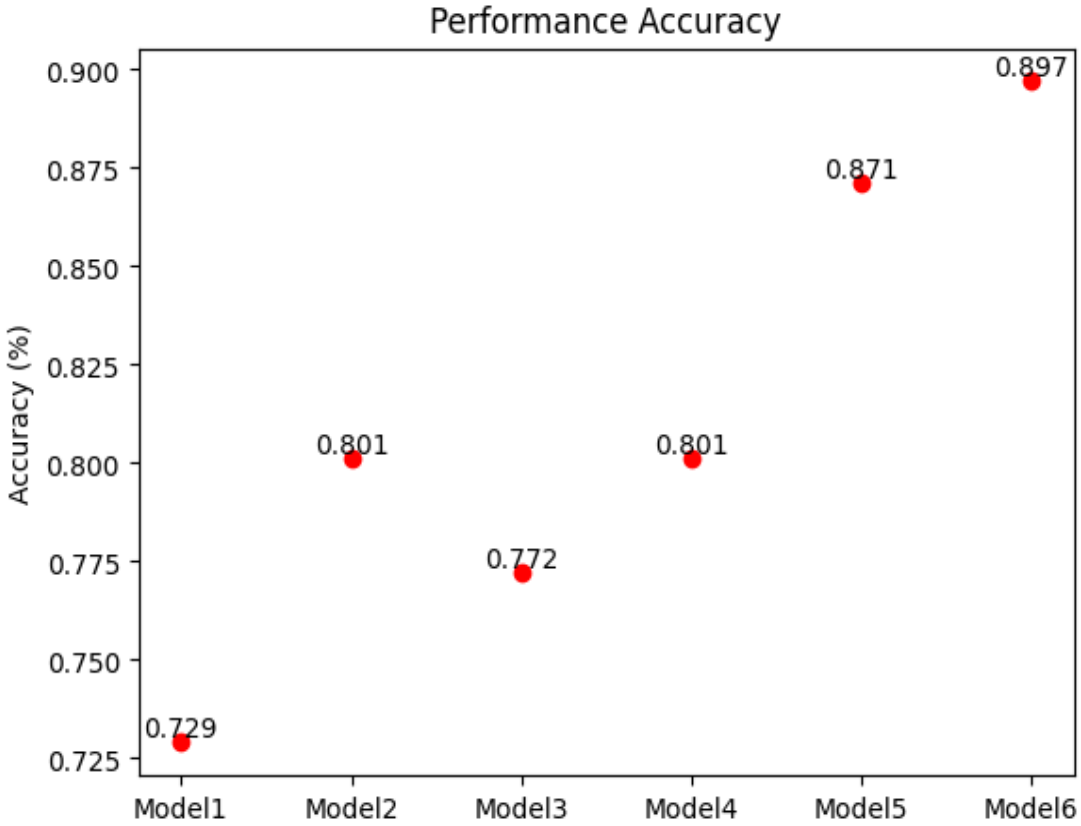
Pre-Trained Models:

Models	Training Size	Validation Accuracy	Test Loss	Test Accuracy
Model 7	1000	0.9710	0.1539	0.971
Model 8	5000	0.9810	0.0723	0.981
Model 9	10000	0.9750	0.1100	0.975

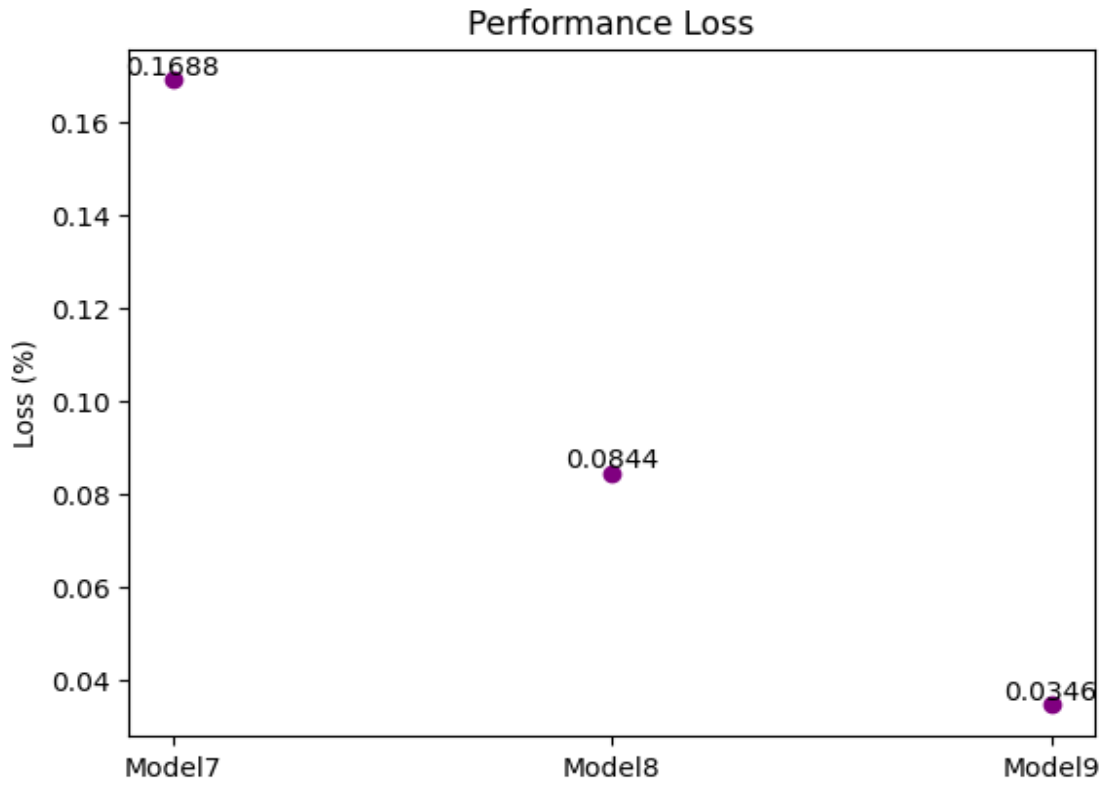
Visual Representation

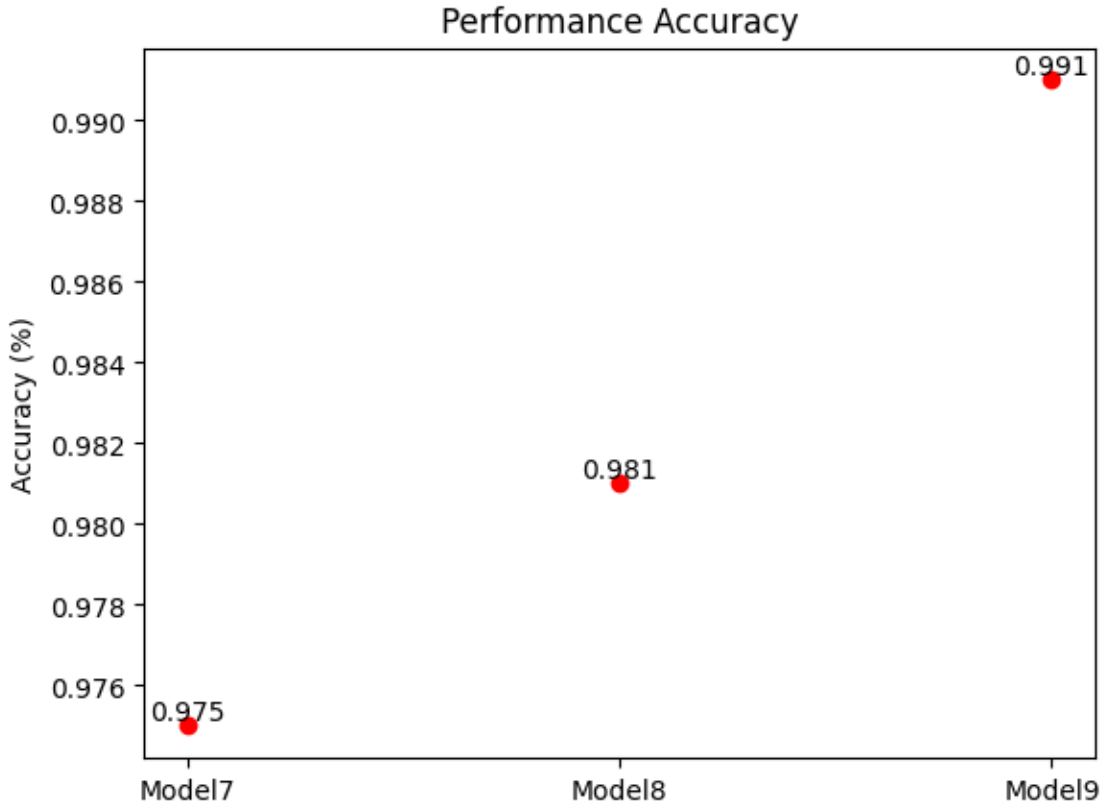
Scratch Models:


Performance Loss
Loss (%)
0.7
0.6
0.5
0.4
0.3
0.7739
0.5312
0.4816
0.4188
0.4282
0.2901
Model1
Model2
Model3
Model4
Model5
Model6


Performance Accuracy
Accuracy (%)
0.900
0.875
0.850
0.825
0.800
0.775
0.750
0.725
0.897
0.871
0.801
0.801
0.772
0.729
Model1
Model2
Model3
Model4
Model5
Model6

Pre-Trained Models:





Conclusion:

- The experiments with scratch models and pre-trained models highlight the importance of dataset size and model architecture in image classification tasks.

Scratch Models:

- Increasing the training size from 1000 to 5000 samples improves performance, but further increases show diminishing returns.
- Techniques like data augmentation and regularization help reduce overfitting and improve accuracy.
- Model 5 with 5000 samples demonstrates significant improvement over earlier models.

Pre-Trained Models:

- Pre-trained models consistently outperform scratch models across different training sizes.
- Even with a small training size of 1000 samples, pre-trained models achieve high accuracy due to leveraging pre-existing knowledge.
- Fine-tuning pre-trained models with larger training sizes yields the best performance.

Overall Observations:

- Pre-trained models are more effective and efficient for image classification tasks.
- Larger training sizes generally lead to better performance, but careful consideration of computational resources is necessary.
- In summary, leveraging pre-trained models with appropriate training sizes offers a powerful and efficient approach for image classification.