Summary

In exploring the relationship between training sample size and choice of network through a series of experiments with six different models, several key findings arise. First, increasing the training sample size consistently improved the performance of our models, as seen with Models 2 and 3, where augmenting the sample size combined with strategies like data augmentation and dropout led to higher accuracy and lower loss rates. This suggests that larger datasets can significantly enhance the model's ability to generalize, reducing overfitting and improving overall performance.

The choice of network, particularly the transition to using pre-trained models such as VGG16 (Model 4) and MobileNetV2 (Models 5 and 6), marked a significant improvement in model performance. These pre-trained networks, armed with knowledge from a vast array of images, provided a substantial boost in accuracy and a decrease in loss, even when applied to datasets of varying sizes. Interestingly, the incorporation of pre-trained models allowed for elevated levels of accuracy with relatively lower loss percentages. This highlights their efficiency and strength in leveraging learned patterns and features from extensive prior training.

Moreover, the adaptation of MobileNetV2 in Models 5 and 6, alongside techniques like early stopping, showed an impressive capability to achieve optimal performance swiftly. This demonstrated the value of sophisticated, pre-trained networks in enhancing model efficiency and effectiveness. These findings highlight a clear relationship between training sample size and network choice: while larger sample sizes inherently improve model learning, the strategic selection of advanced, pre-trained networks can greatly magnify these improvements. This offers a pathway to high-performance models even when confronted with the challenges of varying dataset sizes and compositions.

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| --- | --- | --- | --- | --- |
| **Model Number** | **Data Source** | **Key Features** | **Final Accuracy (%)** | **Final Loss (%)** |
| Model 1 | Small Dataset | Data Augmentation | ~78% | ~47% |
| Model 2 | Increased sample | Data Augmentation, Dropout | ~80% | ~50% |
| Model 3 | Further increased sample | Data Augmentation, L2 Regularization, Dropout | ~84% | ~40% |
| Model 4 | Small Dataset | VGG16, Feature Extraction | ~97% | ~9% |
| Model 5 | Model\_2's data | MobileNetV2, Early Stopping | ~97% | ~6% |
| Model 6 | Model\_3's data | MobileNetV2, Early Stopping | ~96% | ~6% |

Model 1 Graphs:

A graph of a graph

Description automatically generated

A graph of a graph

Description automatically generated

Model 2 Graphs:A graph of training and validation loss

Description automatically generatedA graph of training and validation accuracy

Description automatically generated

Model 3 Graphs:  
A graph of a graph showing the value of a training

Description automatically generated with medium confidenceA graph of a graph

Description automatically generated

Model 4 Graphs: A graph of training and validation accuracy

Description automatically generatedA graph of a training and validation loss

Description automatically generated

Model 5 Graphs: A graph of training and validation accuracy

Description automatically generatedA graph of a graph

Description automatically generated

Model 6 Graphs: A graph of training and validation accuracy

Description automatically generatedA graph of training and validation loss

Description automatically generated