

Dog breed Identification

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Problem Statement and Importance

Our main aim with this project is to identify the breed of the dog given the picture of the dog.

Importance:

Improved accuracy: Automatic identification using deep learning techniques can improve the accuracy of identifying dog breeds compared to human identification, as humans may have biases or lack knowledge about certain dog breeds.

Improved dog breeding: Automatic identification can aid in dog breeding by ensuring the correct breed of dogs are bred together, leading to healthier and more desirable offspring.

Better dog care: Knowing the breed of a dog can help with understanding its specific needs, such as dietary requirements, exercise needs, and potential health issues, leading to better care for the dog.

Time-saving: With automatic identification, it can save time for veterinarians or dog breeders to identify the breed of a dog quickly, especially in cases where the dog's breed is unknown.

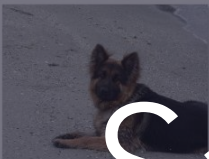
Dataset

- The dataset used for this project is taken from Kaggle which contains images of dogs belonging to 120 different breeds. The dataset contains a total of 10222 dog images, which are divided into three sets: training set (6,517 images), validation set (1,533 images), and test set (2,1712 images).
- Each image is given a unique name and the image name and the dog breed are provided in a separate CSV file. This can help us in determining what the dog breed is of an image.
- The dataset presents a challenging computer vision problem due to the high level similarity between some of the dog breeds.

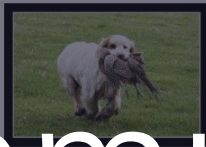


Sample

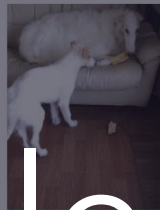
Images from the dataset



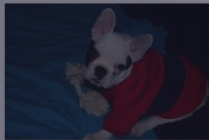
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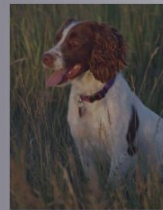
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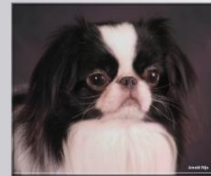
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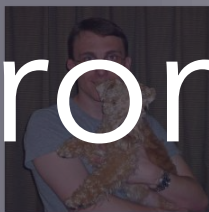
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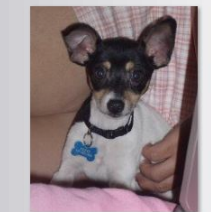
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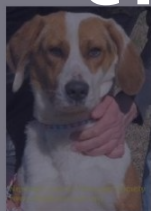
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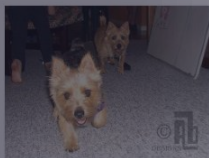
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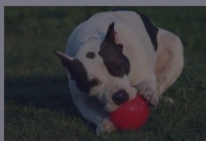
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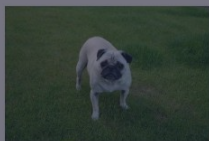
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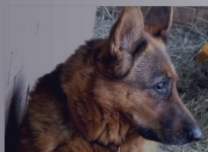
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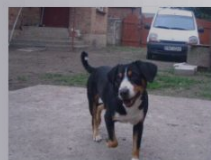
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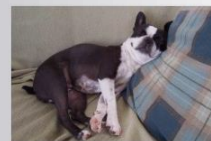
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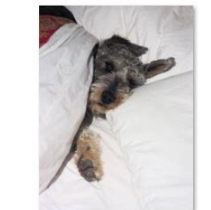
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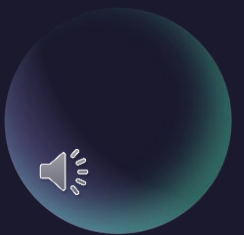
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Sample CSV file



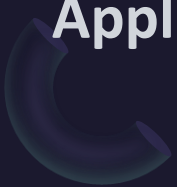
Proposed Models

- We are using multiple CNN architectures which will be commonly used for image classification tasks in computer vision.
- These are the architectures we have used:
 1. Resnet50
 2. InceptionV3
 3. EfficientNet
 4. VGG16
 5. MyCNN (our own CNN built using Pytorch)

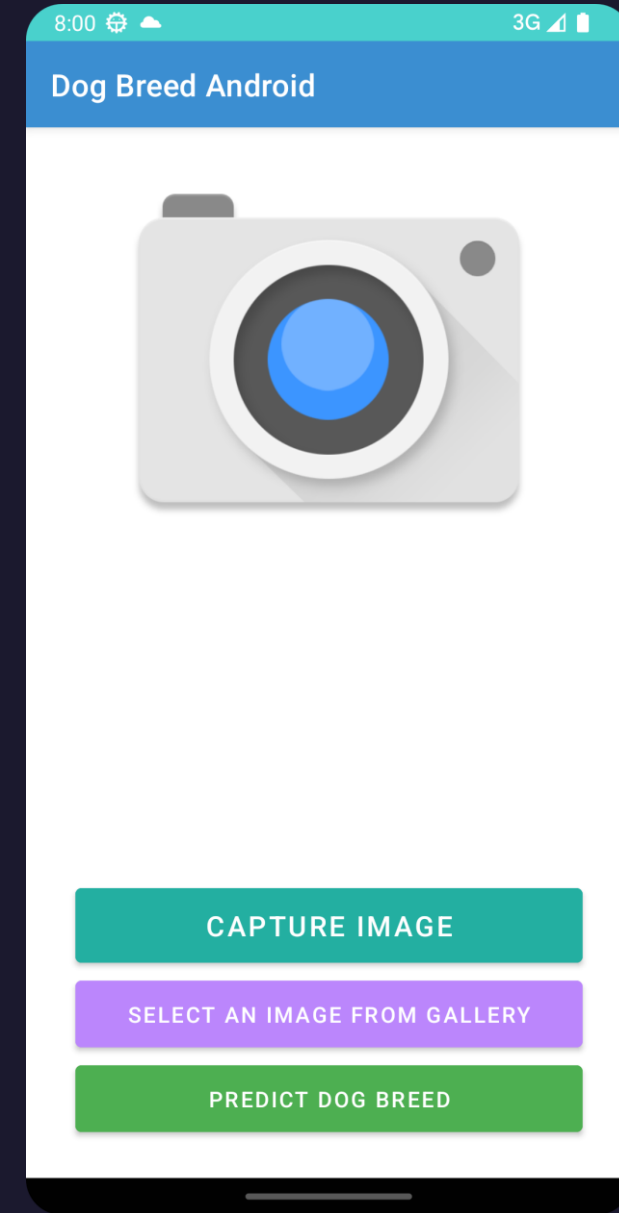


Proposed Models

- We have fine-tuned the pre-trained models on our dog breed dataset by training the last layer of the model while freezing the rest. The final output layer will have 120 features, each representing a dog breed. We have used the softmax activation function to obtain the probability of each breed and the breed with the highest probability will be predicted as output.
- Out of all the models, we have seen that InceptionV3 and EfficientNet produced highest accuracy. So, we saved those models and deployed them to Android Application.



Android App Preview – Home Screen





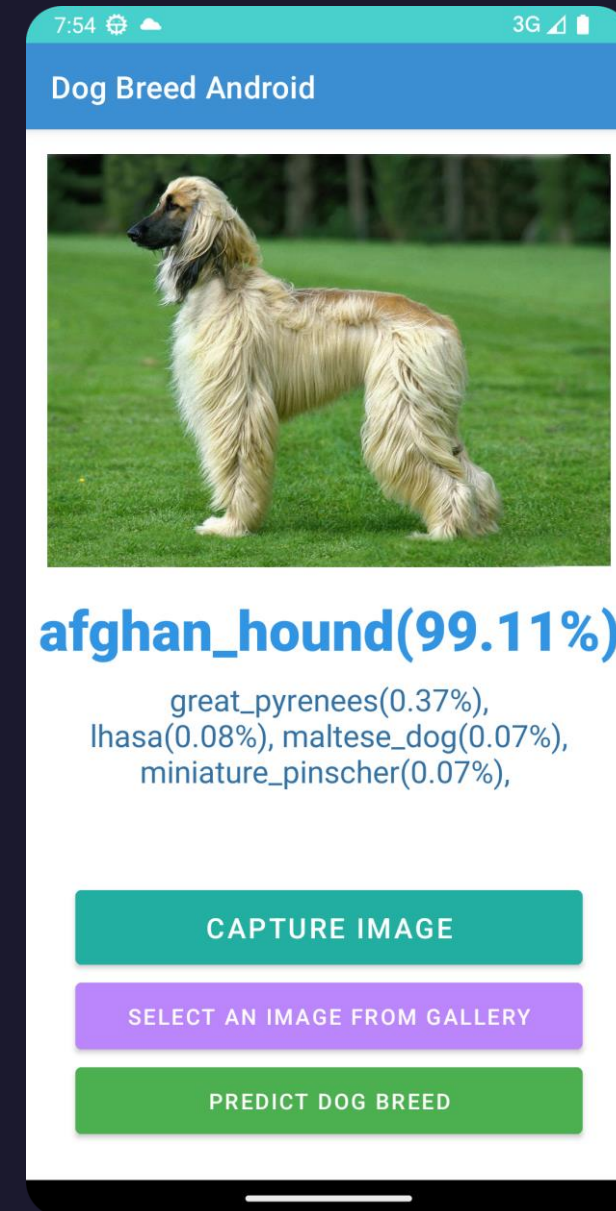
Android App Preview – Capture Image



Android App Preview – Select Images from Gallery



Android App Preview – Predict dog breed



Android App Preview

- If you have an Android Device try our app by downloading it from here!
- https://drive.google.com/file/d/1IR_H0E9-MomQvZa7heD4QEbatMtw2DOn/view?usp=sharing



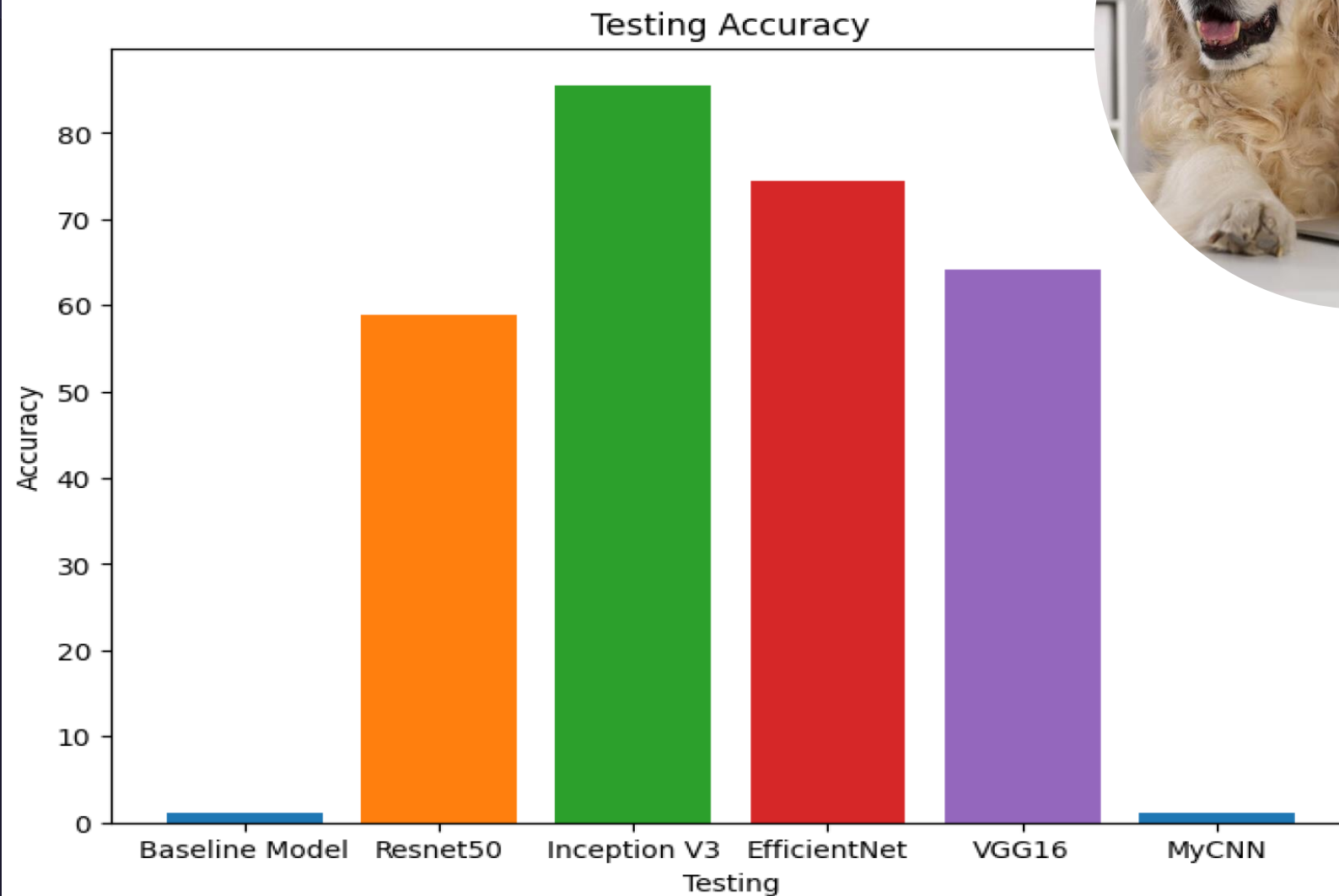
Results

Table 1. Models Performance on Dog Breed Dataset

Model	Validation Accuracy	Testing Accuracy
Baseline Model	1.09%	1.09%
Resnet50	57.14%	58.84%
Inception V3	82.19%	85.59%
EfficientNet	65.68%	74.54%
VGG16	60.59%	64.21%
MyCNN	1.11%	didn't check



Results




Discussion

- The InceptionV3 model achieved a classification accuracy of 85.59% on the test dataset, which is a pretty good result considering the complexity of the task. But one of the main drawbacks of this project is that the dataset size is very small. We could have scraped the web for more dogs and searched online for more dog datasets and combine them.
- However, we can see the potential of pretrained models and transfer learning in the field of Computer Vision.
- Our final conclusion is that **pretrained models work!** So, next time you think of solving a computer vision problem, the first thing that you have to think is of using pretrained models and modifying them to fit your own image classification tasks. There is no need to spend huge amounts of time and computing to train a model from scratch because as we can see that these models are robust and work quite well to most of the Computer Vision Problems.






**Special Thanks to Professor Yan Huang
and to the Teaching Assistants
Riyad Bin Rafiq and Zhaomin Xiao.**



**This project helped us gain valuable
experience in doing real world projects
and using CNNs and Transfer Learning**





Any Questions?

