DEEP LEARNING

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CONVOLUTIONAL NEURAL NETWORKS

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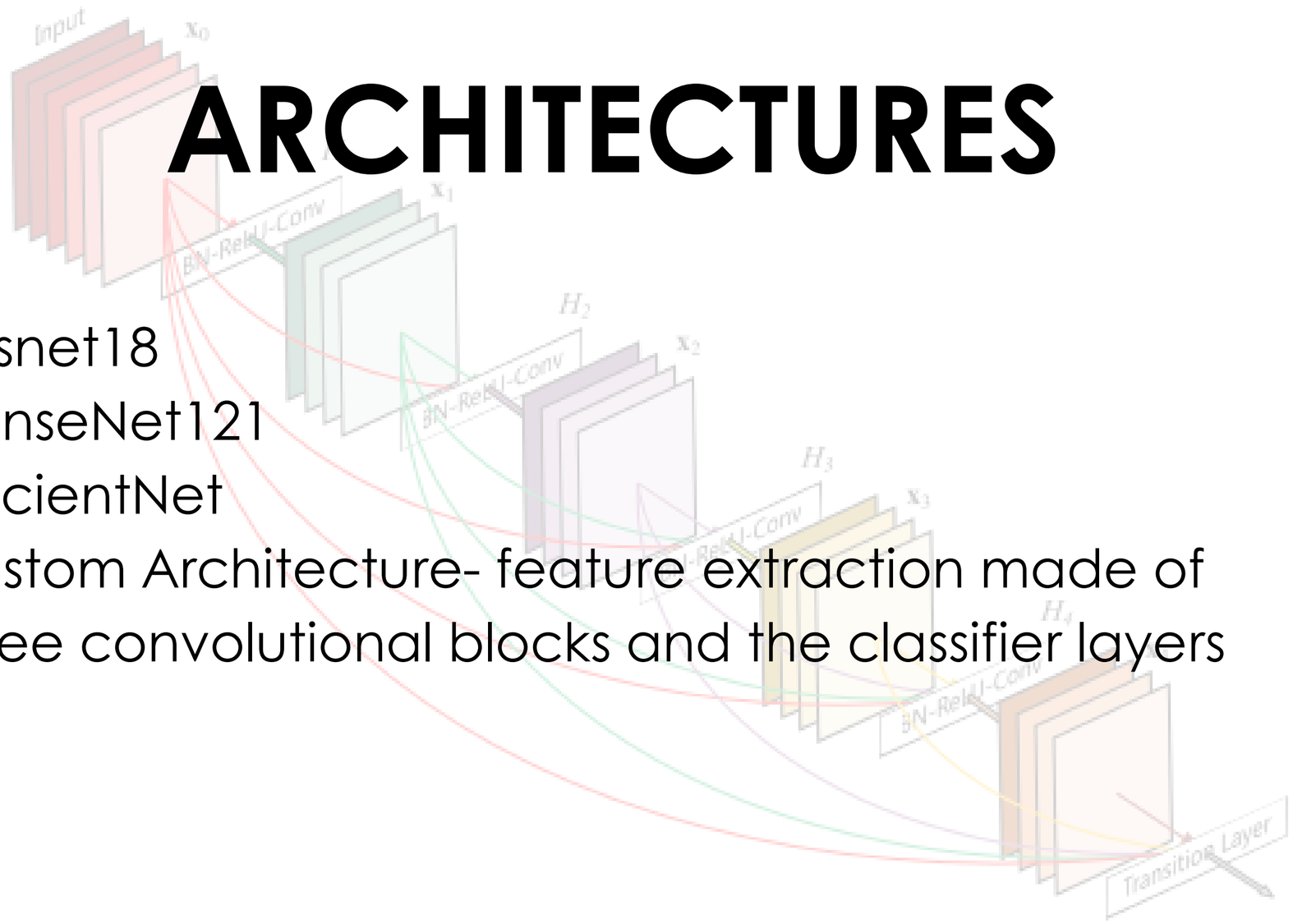
METHODOLOGY

- Each model was trained three times for every hyperparameter value
- Aggregated results using mean and standard deviation
- Random seed for all aspects involving randomness

ARCHITECTURES



- Resnet18
- DenseNet121
- EfficientNet
- Custom Architecture- feature extraction made of three convolutional blocks and the classifier layers

HYPERPARAMETERS

TRAINING PROCESS

Learning Rate

Optimizer

REGULARIZATION

Weight

Decay

Dropout

DATA AUGMENTATION

Horizontal Flip

Color Jitter

Random Crop

Rotation

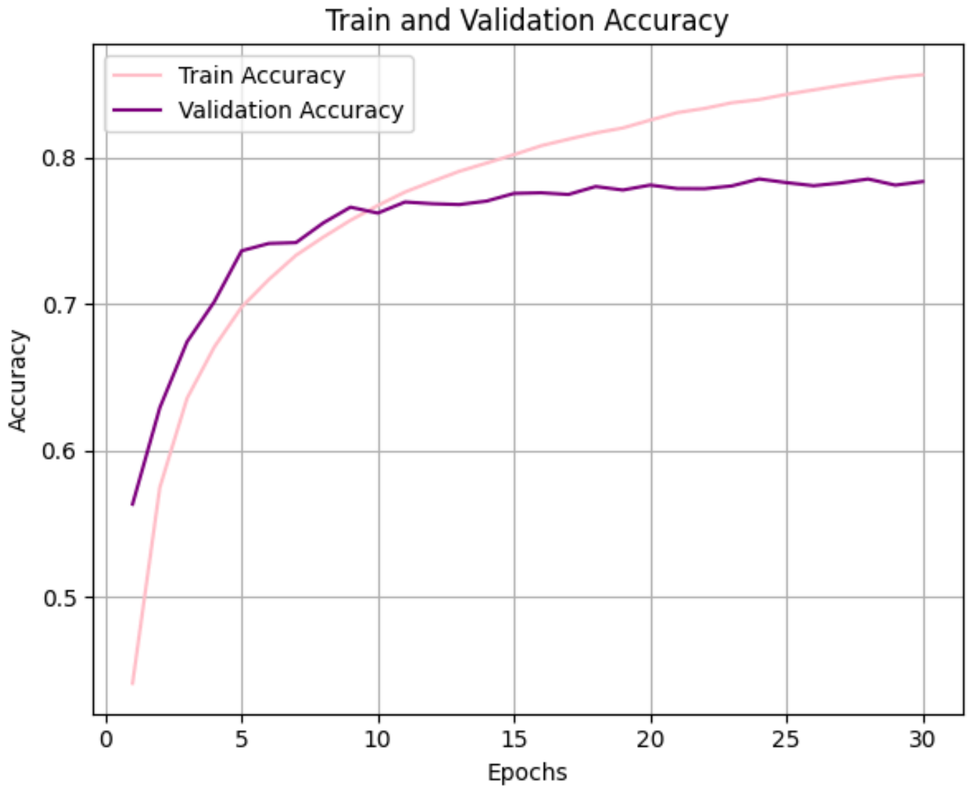
Cutout

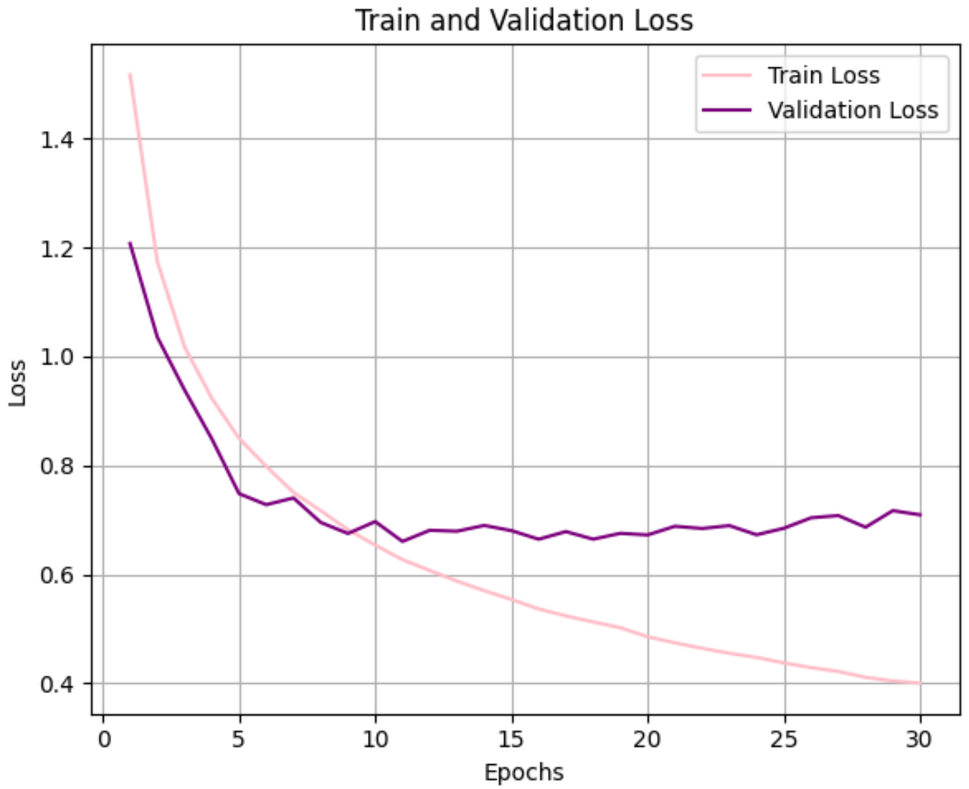
AutoAugment

INITIAL RESULTS

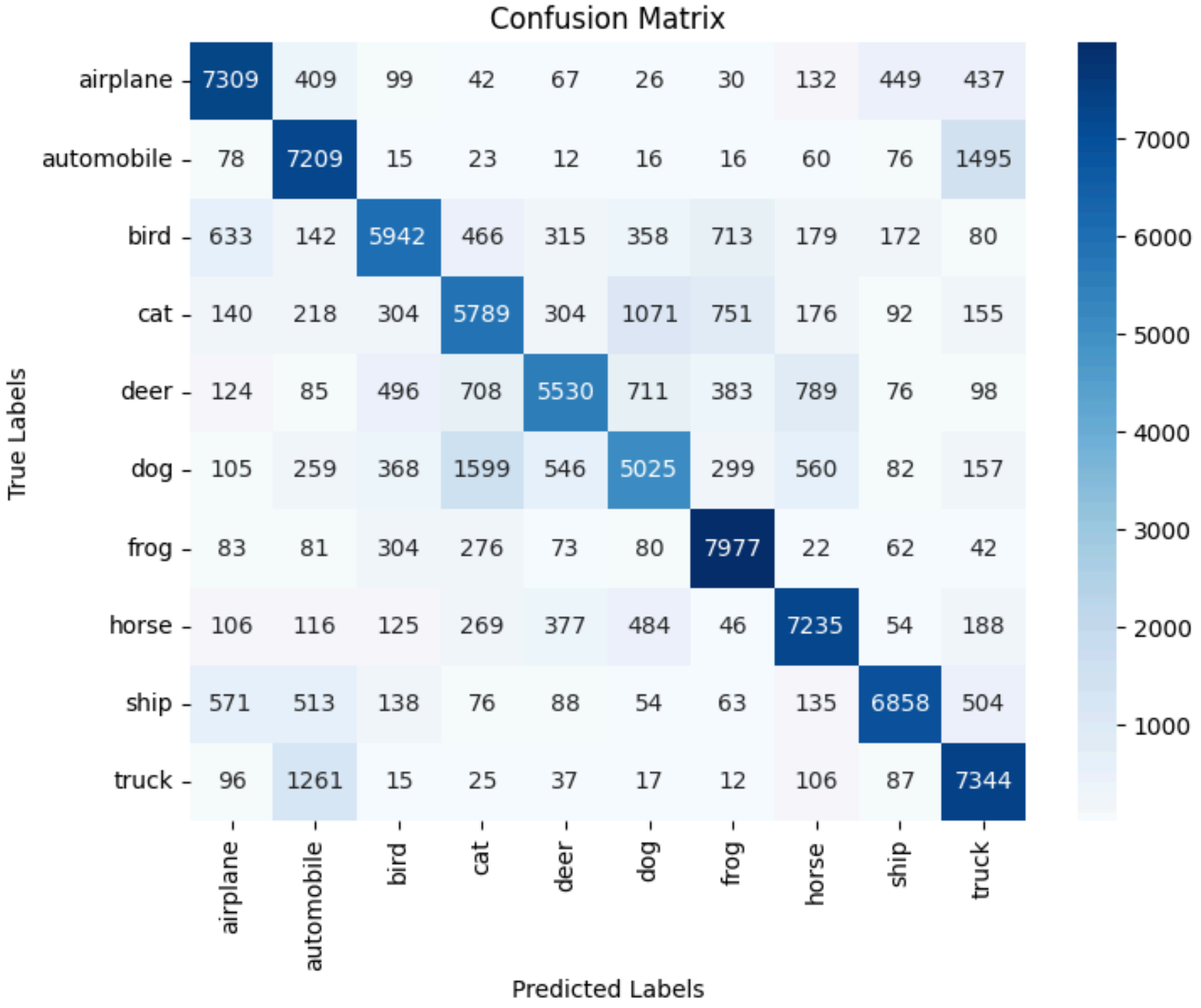
Architecture	Accuracy	Recall	Precision	F1 Score	Loss
Resnet18	0.6775±0.0015	0.6775±0.0015	0.6763±0.0010	0.6752±0.0017	0.9602±0.0293
DenseNet121	0.7197±0.0004	0.7194±0.0004	0.7198±0.0002	0.7181±0.0010	0.8725±0.0111
EfficientNet	0.7262±0.0011	0.7262±0.0009	0.7258±0.0011	0.7249±0.0010	0.8138±0.0232
Custom	0.7329±0.0026	0.7329±0.0026	0.7380±0.0013	0.7335±0.0023	0.8443±0.0425

OVERFITTING





INITIAL RESULTS



DATA AUGMENTATION

Basic

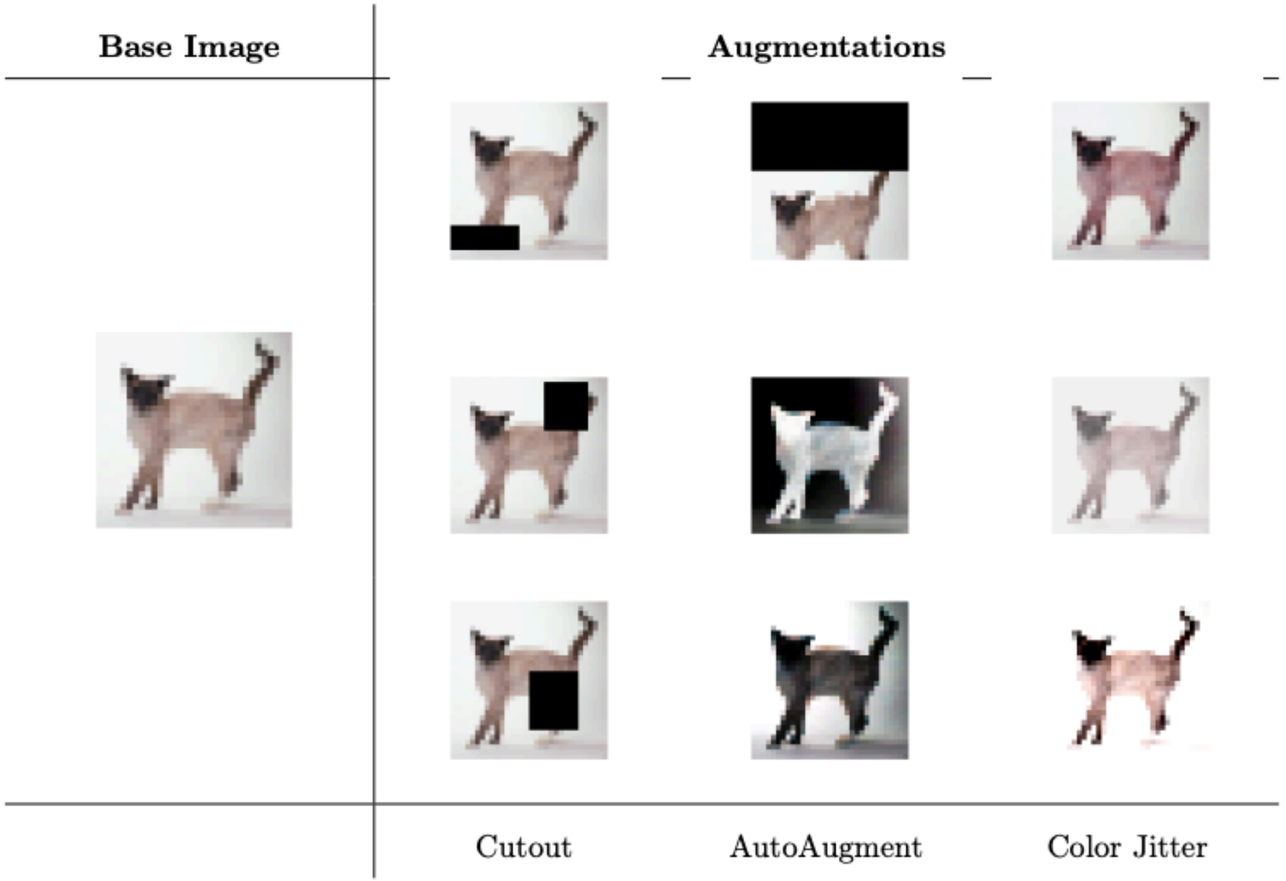
Architecture	Horizontal flip	Rotation	Random crop	Color jitter
Resnet18	0.6970±0.0030	0.6905±0.0015	0.6848±0.0028	0.6690±0.0025
DenseNet121	0.6548±0.0312	0.7222±0.0026	0.7197±0.0043	0.7151±0.0033
EfficientNet	0.7374±0.0121	0.7284±0.0008	0.7222±0.0039	0.1711±0.0427
Custom	0.7565±0.0022	0.7405±0.0013	0.7361±0.0015	0.6114±0.0019

DATA AUGMENTATION

Advanced

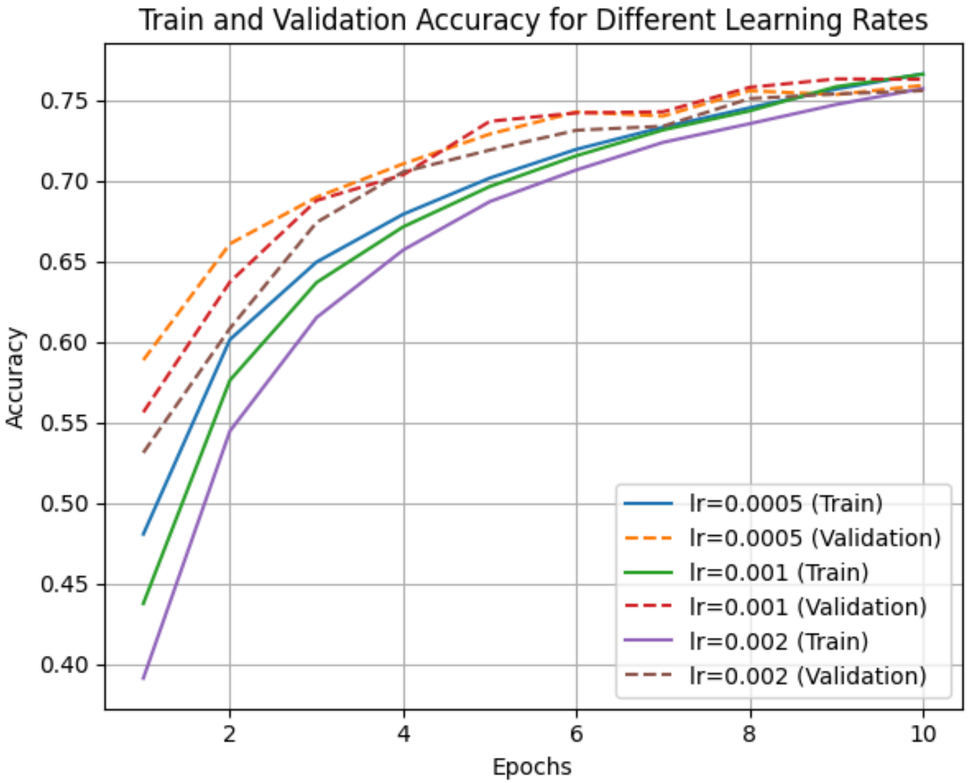
Architecture	AutoAugment	Cutout
Resnet18	0.6771 ± 0.0013	0.6827 ± 0.0055
DenseNet121	0.6858 ± 0.0118	0.7226 ± 0.0022
EfficientNet	0.7160 ± 0.0025	0.7252 ± 0.0001
Custom	0.7261 ± 0.0051	0.7368 ± 0.0021

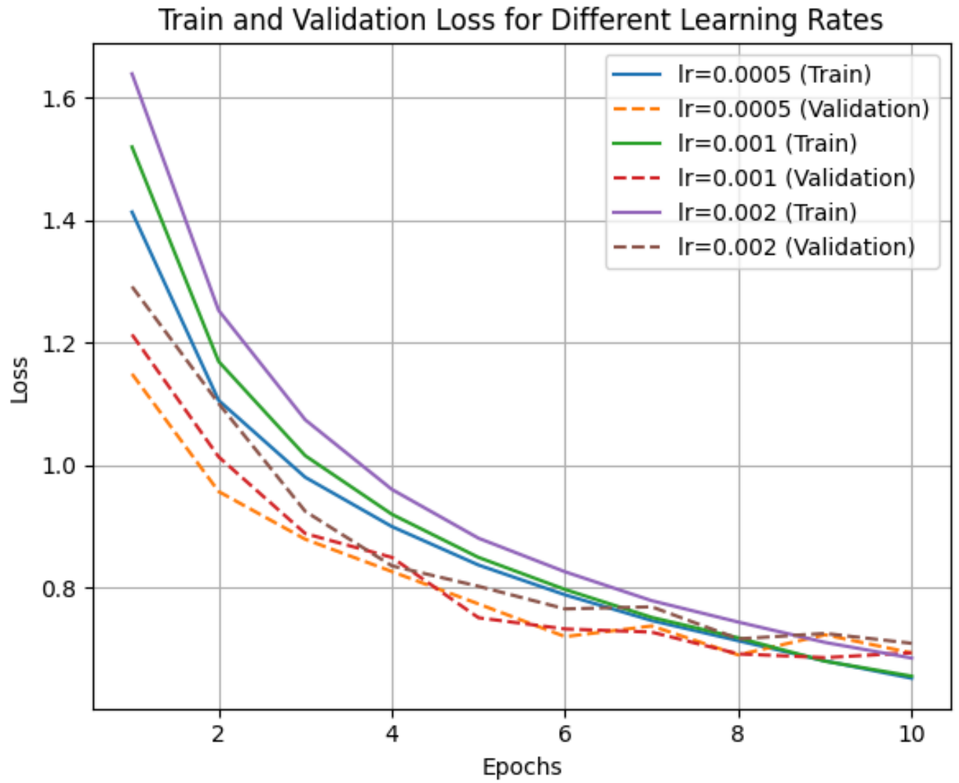
DATA AUGMENTATION



TRAINING PROCESS

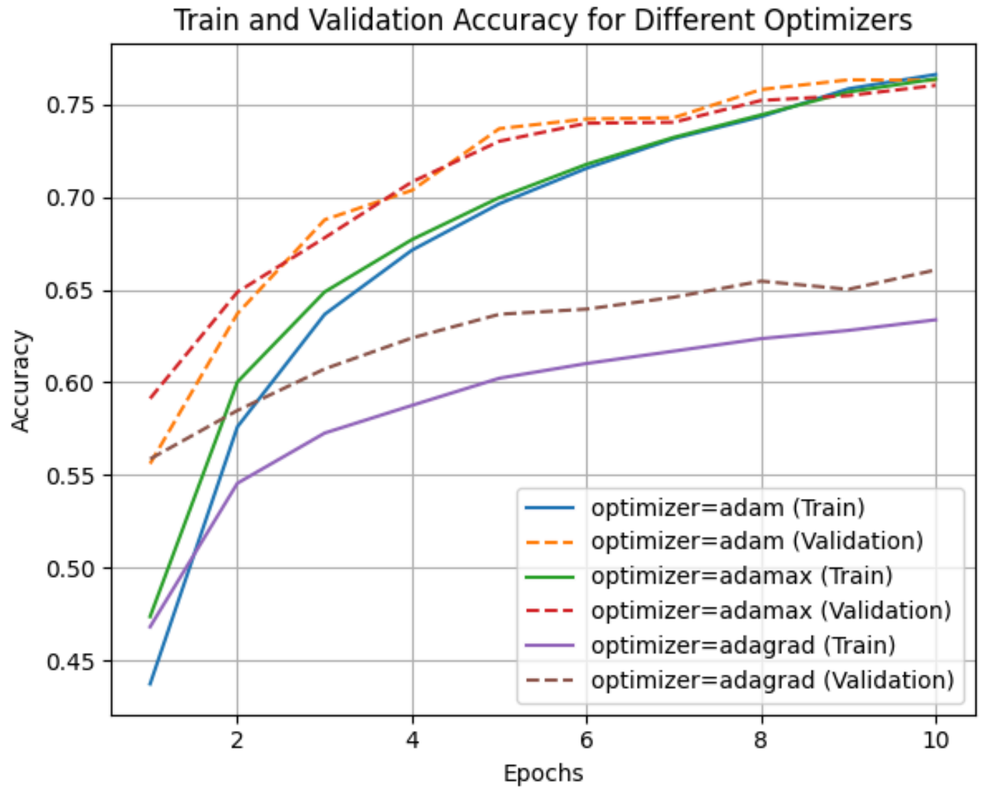
Learning Rate

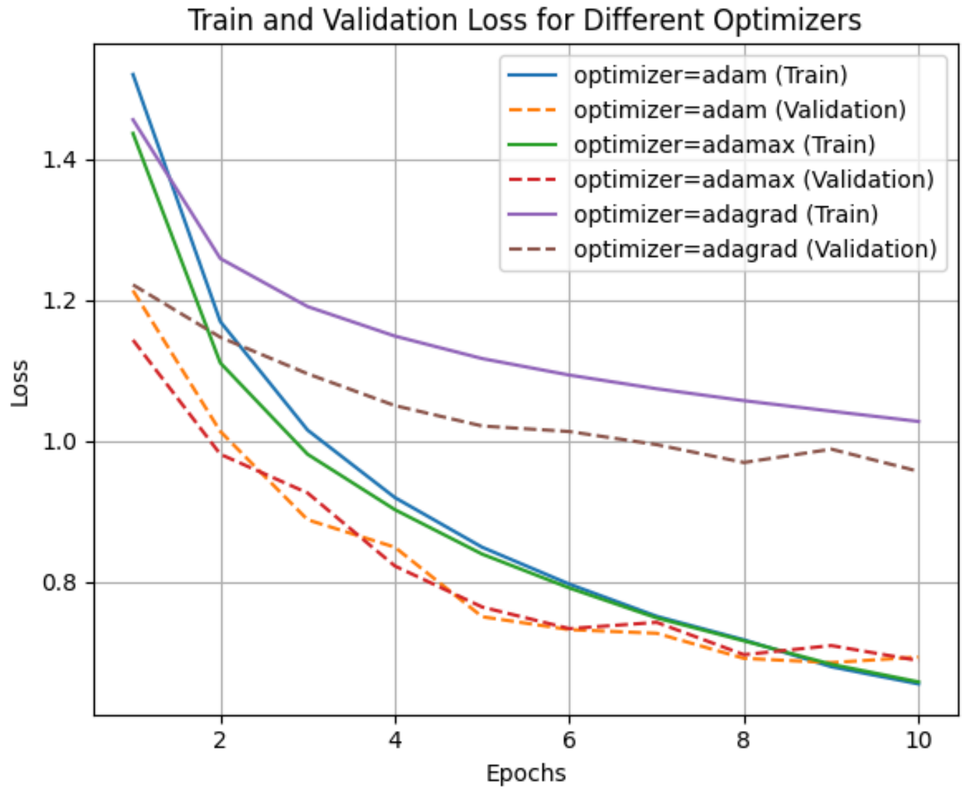




TRAINING PROCESS

Optimizer





REGULARIZATION

Weight Decay

Architecture	**wd = 0.0001**	**wd = 0.0002**	**wd = 0.00005**
Resnet18	0.6730±0.0020	0.6673±0.0034	0.6753±0.0028
DenseNet121	0.6667±0.0016	0.6604±0.0026	0.6656±0.0052
EfficientNet	0.7210±0.0018	0.7148±0.0020	0.7230±0.0011
Custom	0.7290±0.0031	0.7300±0.0081	0.7301±0.0010

Dropout

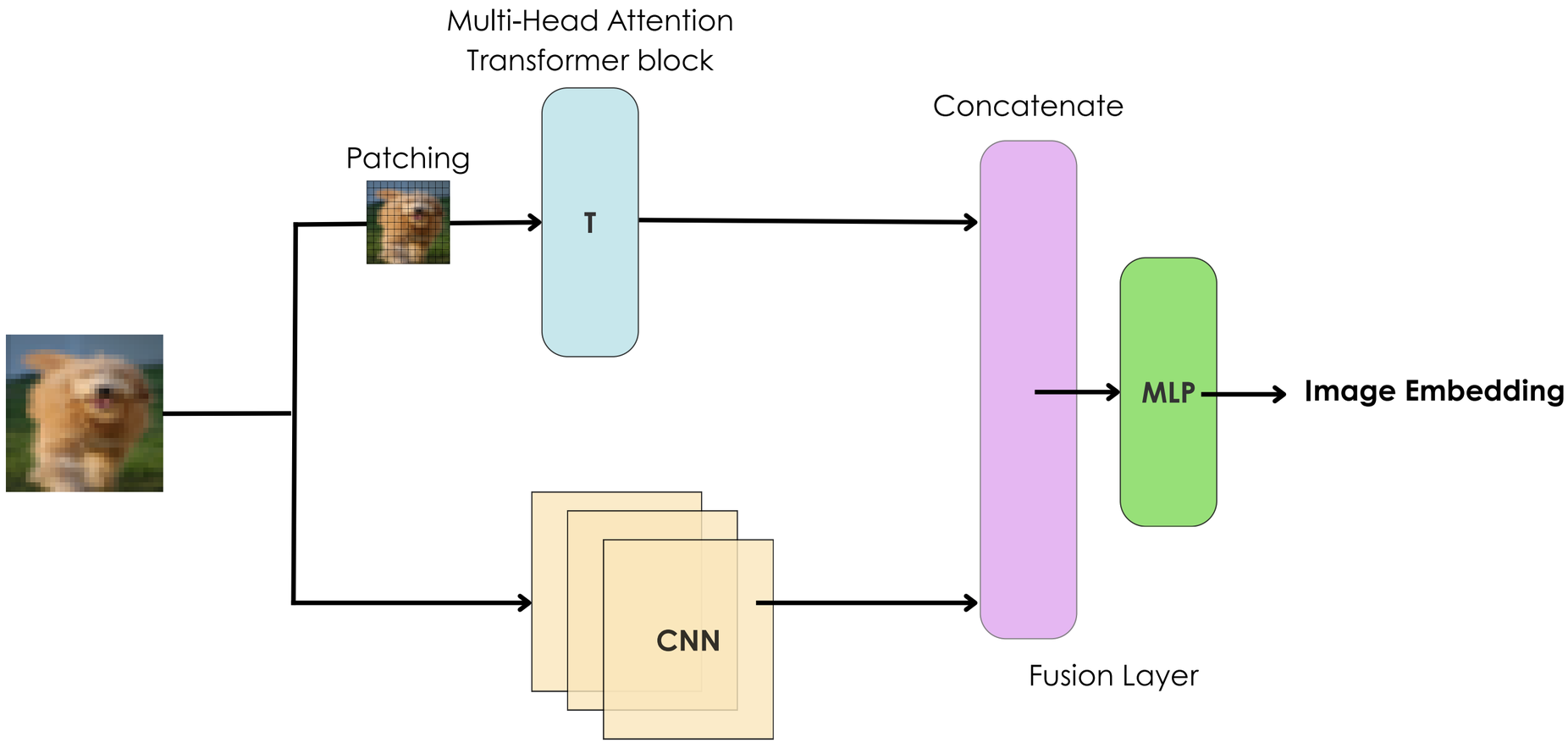
k	**Accuracy**	**Precision**
0.1	0.7356±0.0022	0.7409±0.0031
0.2	0.7935±0.0114	0.8003±0.0132
0.3	0.7411±0.0314	0.7322±0.0401
0.4	0.7031±0.0218	0.6909±0.0146

MIXTURE OF EXPERTS

1. Vehicles recognition Expert
2. Animal recognition Expert
3. The best permorming architecture from the previous experiments

Loss:0.6208, Accuracy:0.8034, F1 Score:0.8036, Precision:0.8040, Recall:0.8034

FEWSHOT: ARCHITECTURE



FEWSHOT: RESULTS

Few-shot architecture

p	**Accuracy**	**Recall**	**Precision**	**F1 Score**
0.001	0.2095±0.0015	0.2095±0.0015	0.2119±0.0010	0.2080±0.0017
0.002	0.2503±0.0004	0.2503±0.0004	0.2537±0.0002	0.2457±0.0010
0.005	0.2890±0.0011	0.2890±0.0009	0.2766±0.0011	0.2755±0.0010
0.01	0.3283±0.0026	0.3283±0.0026	0.3108±0.0013	0.3093±0.0023
0.02	0.3388±0.0026	0.3387±0.0026	0.3271±0.0013	0.3210±0.0023
0.05	0.3407±0.0026	0.3407±0.0026	0.3204±0.0013	0.3123±0.0023
0.1	0.3505±0.0026	0.3505±0.0026	0.3350±0.0013	0.3274±0.0023

Regular

p	**Accuracy**
0.001	0.1123±0.0083
0.002	0.1610±0.0281
0.005	0.1833±0.0255
0.01	0.2020±0.0162
0.02	0.3191±0.0204
0.05	0.3960±0.0151
0.1	0.4894±0.0116

THANK YOU