Deep Learning Project 1

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Introduction

Problem

Test and compare different network architectures (preferably CNN) with different hyperparameters and data augmentation techniques on a CINIC-10 dataset[1].

Architectures

- MobileNetv3
- EfficientNet

Hyperparameters

- For the hyper-parameters related to the training process we chose batch size, learning rate, and number of epochs
- For the hyper-parameters related to Regularization we decided to use L2 Regularization (Weight Decay) and Dropout Rate

Data Augmentation

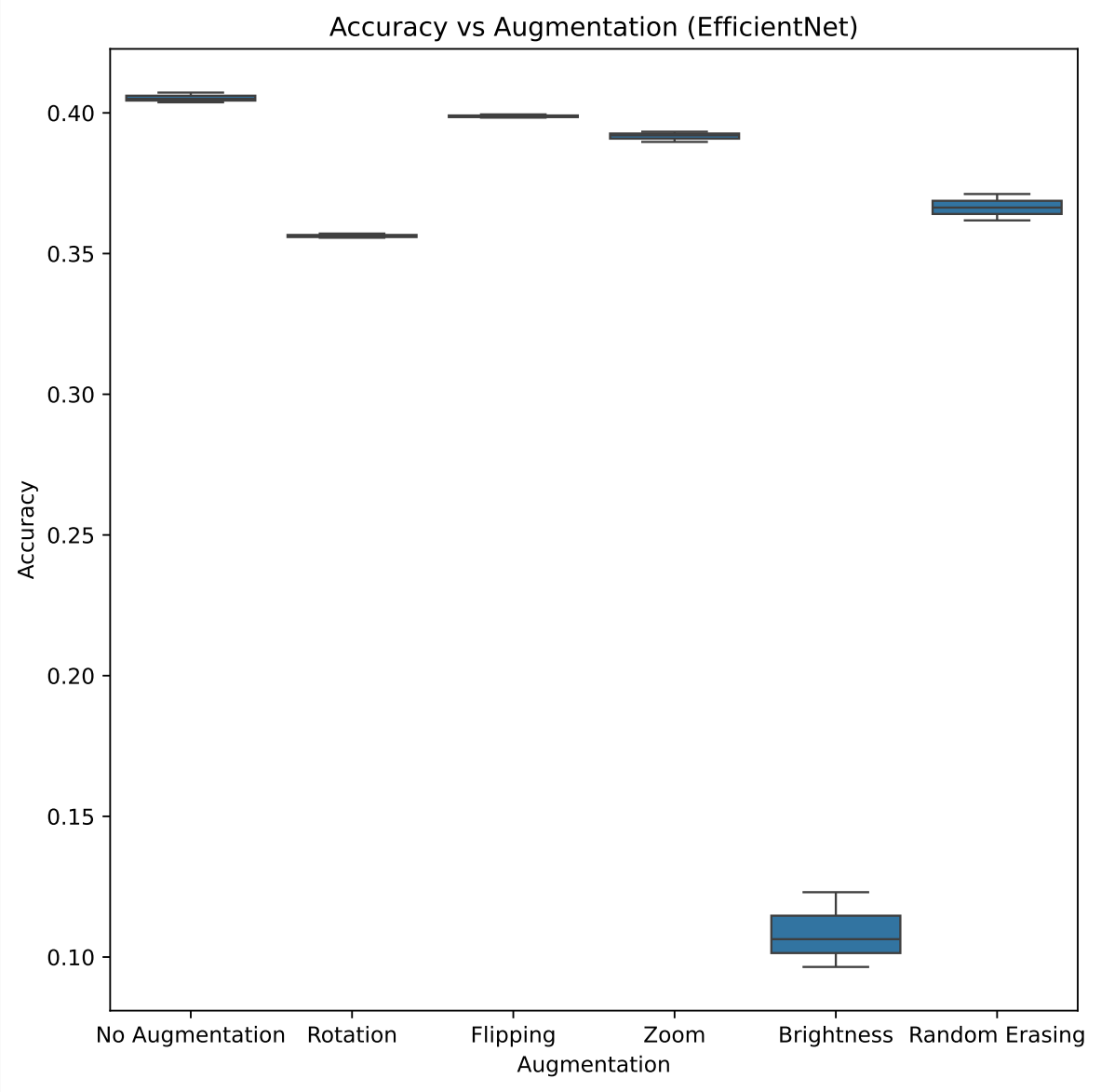
- Basic augmentation: rotation, flipping, zoom, brightness change
- Advanced augmentation: random erasing

Experiments

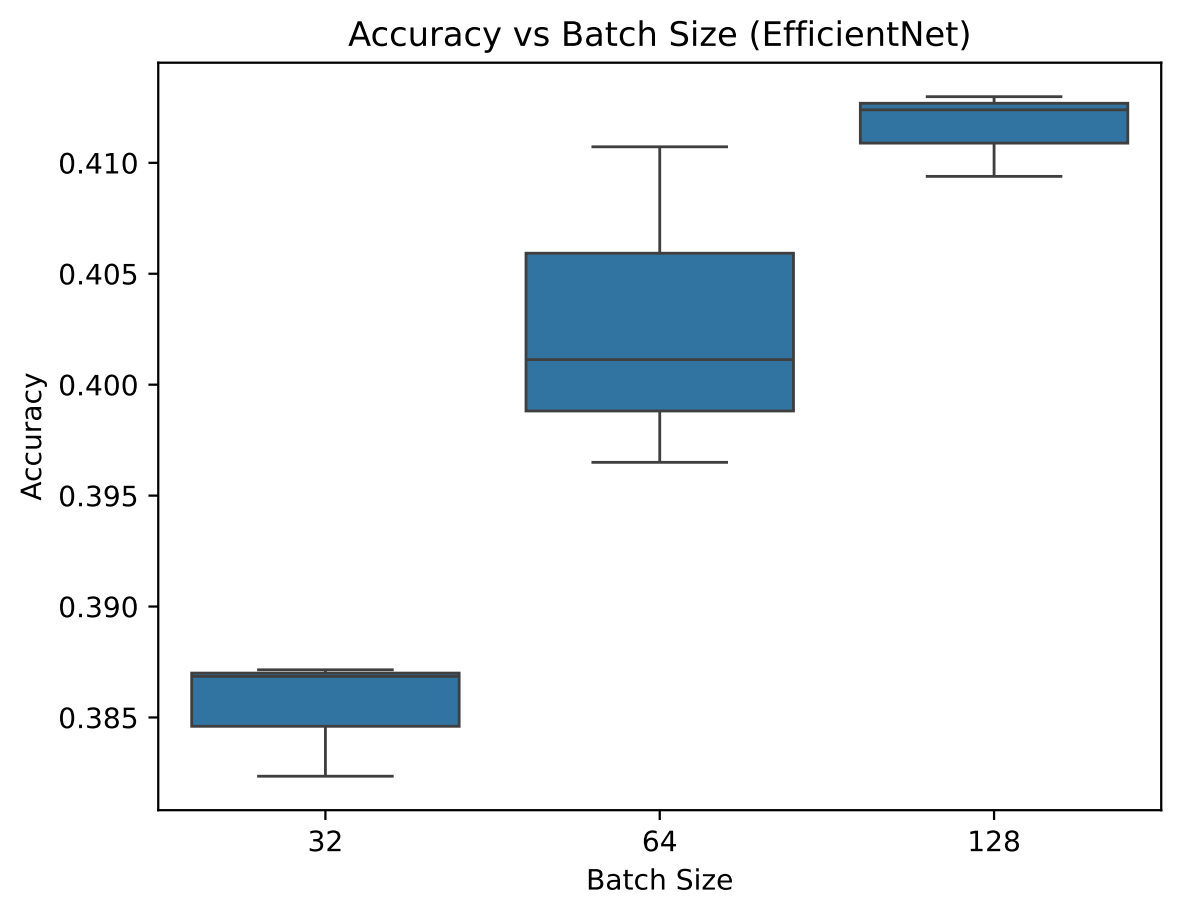
Procedure

1. Choose a starting parameter X (such as batch size) and answer the following question: given a set of basic (commonly seen in literature) parameter values (such as a hyperparameter or data augmentation technique) excluding parameter X, what value for X results in best accuracy?
2. Choose the best-found value for parameter X and replace the parameter's basic initial value, then choose a different parameter X and start from 1.

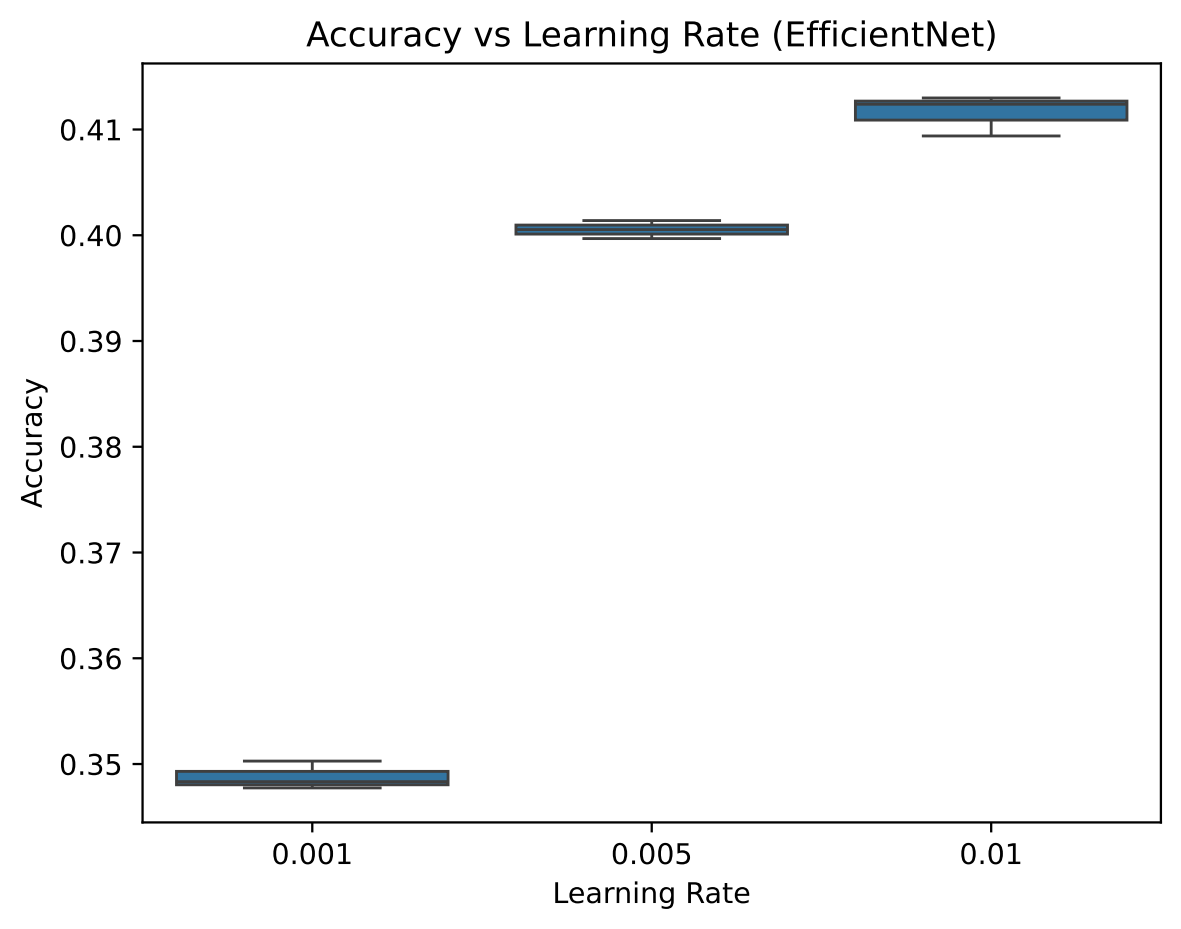
EfficientNet



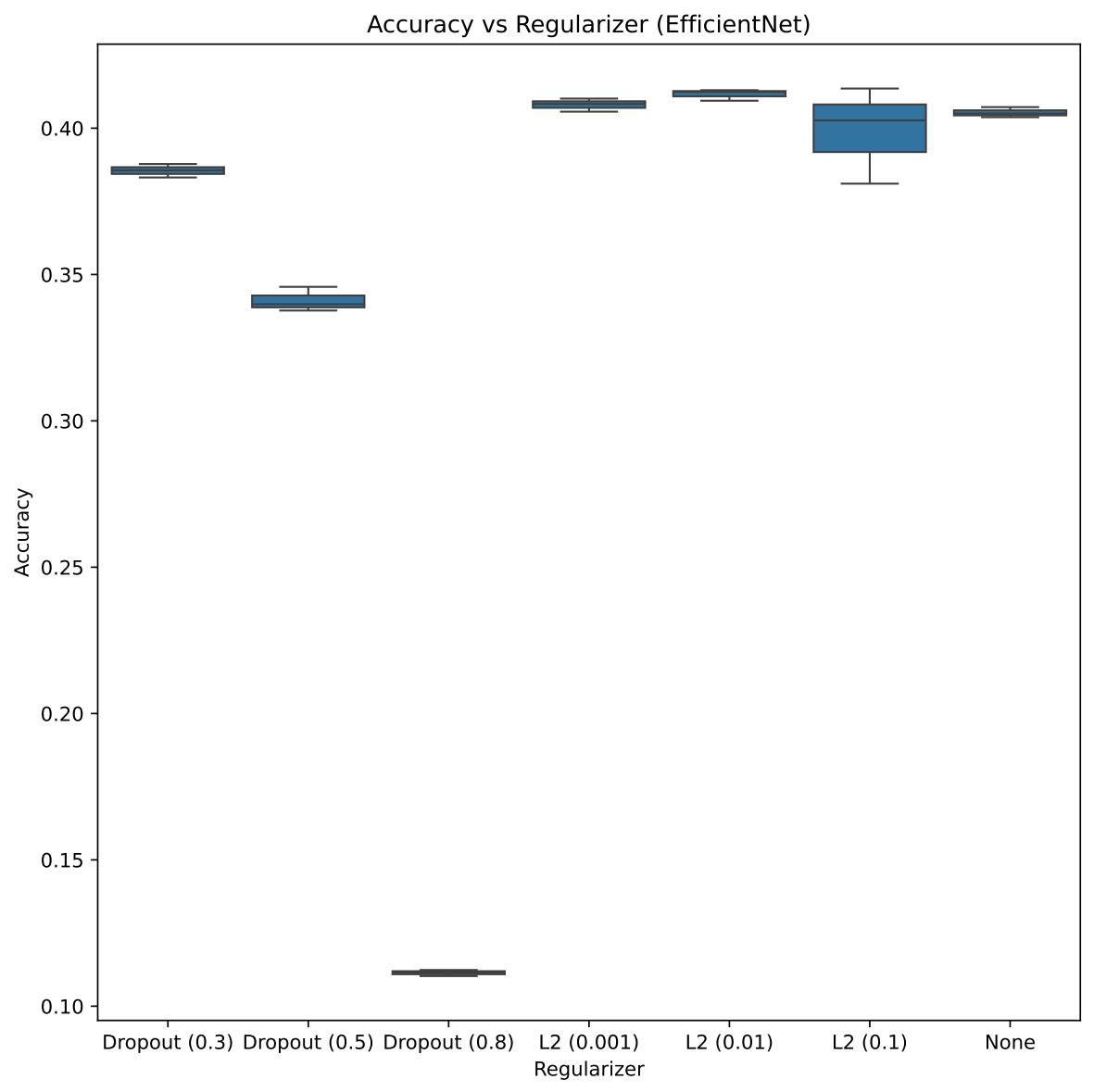
EfficientNet



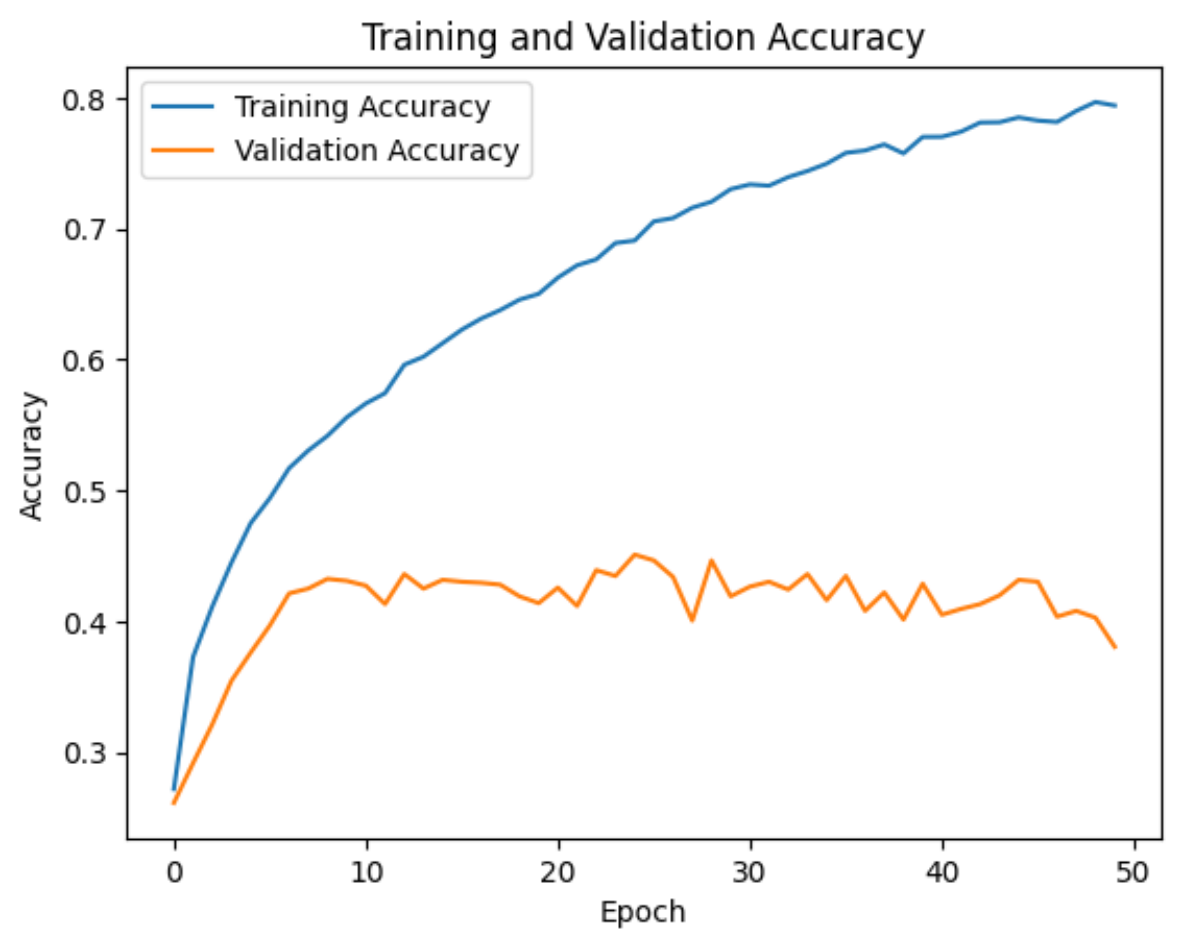
EfficientNet



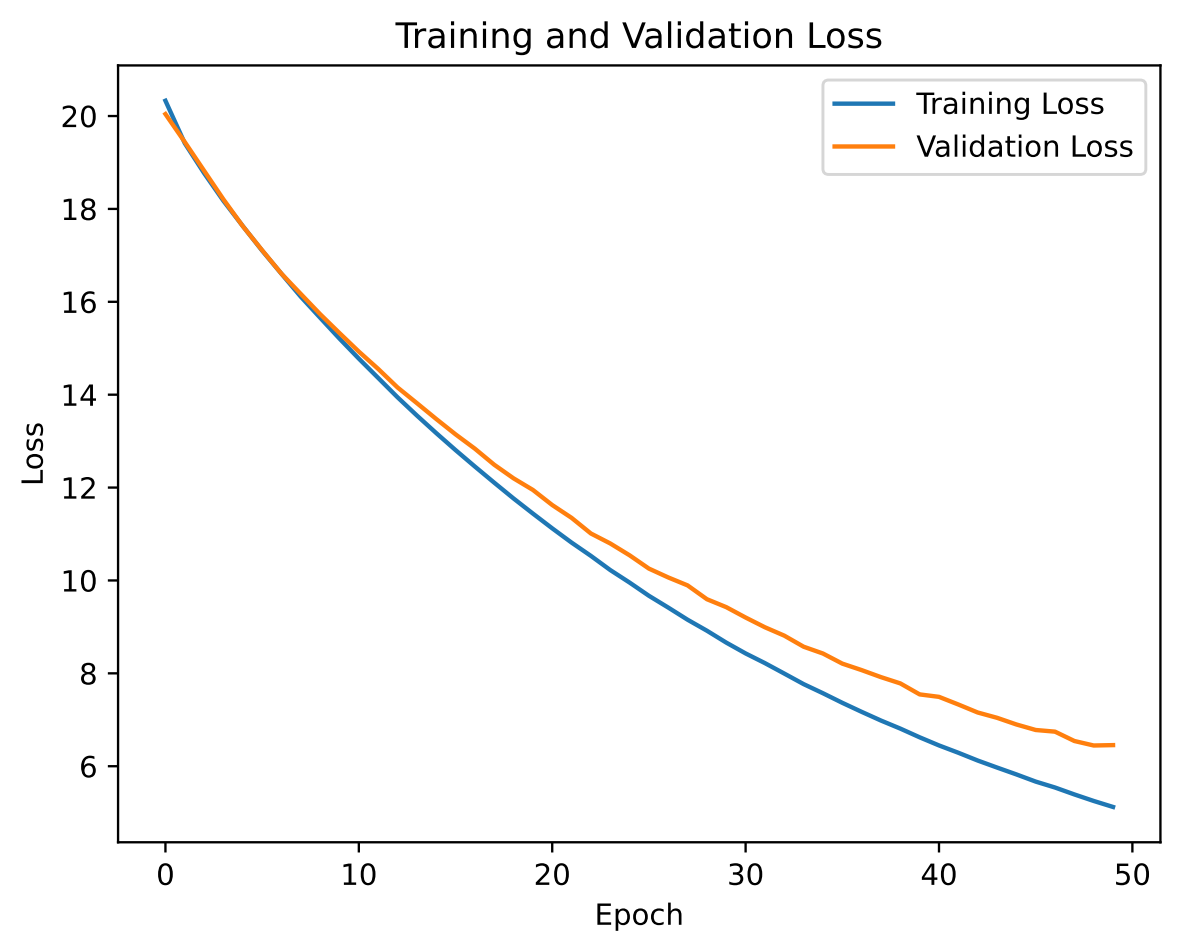
EfficientNet



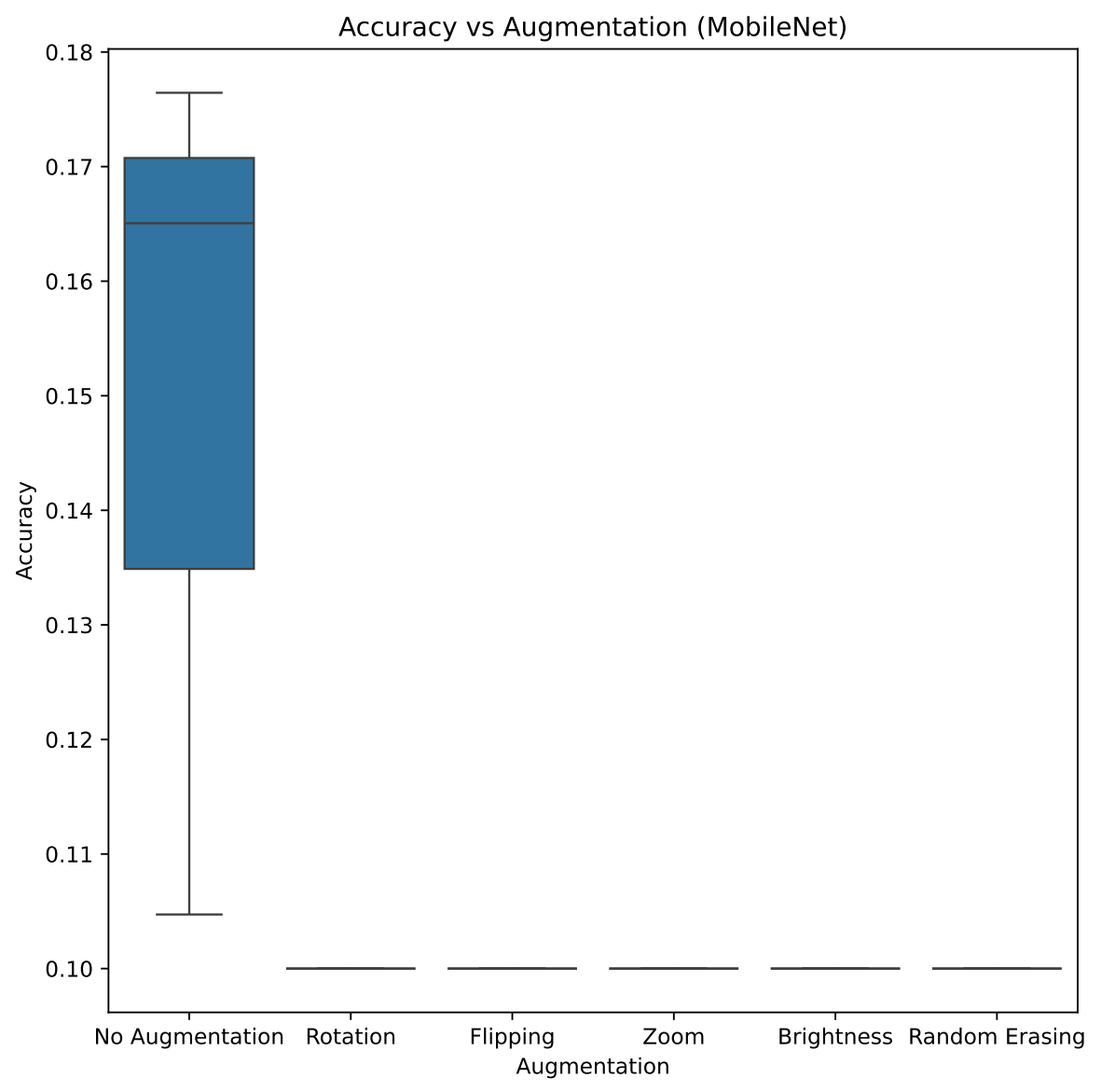
EfficientNet



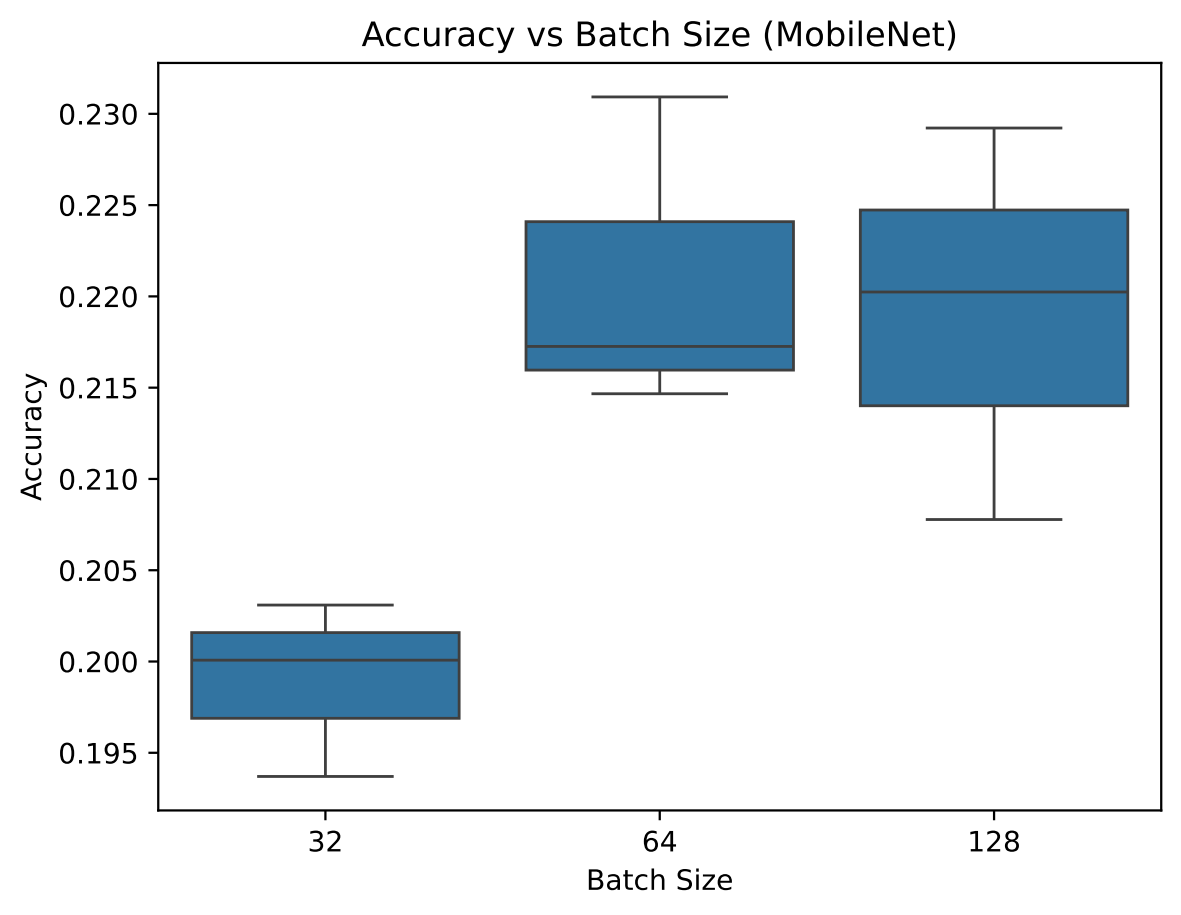
EfficientNet



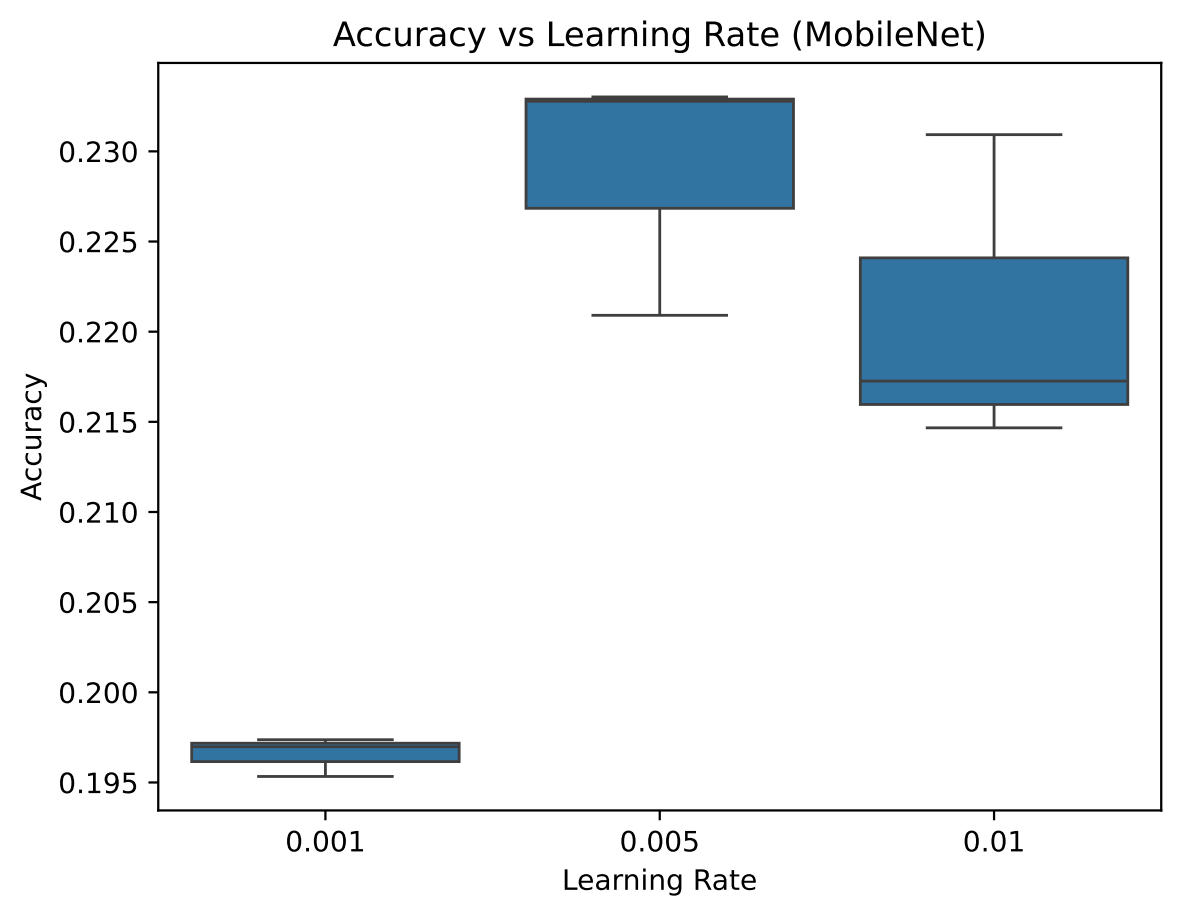
MobileNet


Accuracy vs Augmentation (MobileNet)
Accuracy
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.10
No Augmentation
Rotation
Flipping
Zoom
Brightness
Random Erasing
Augmentation

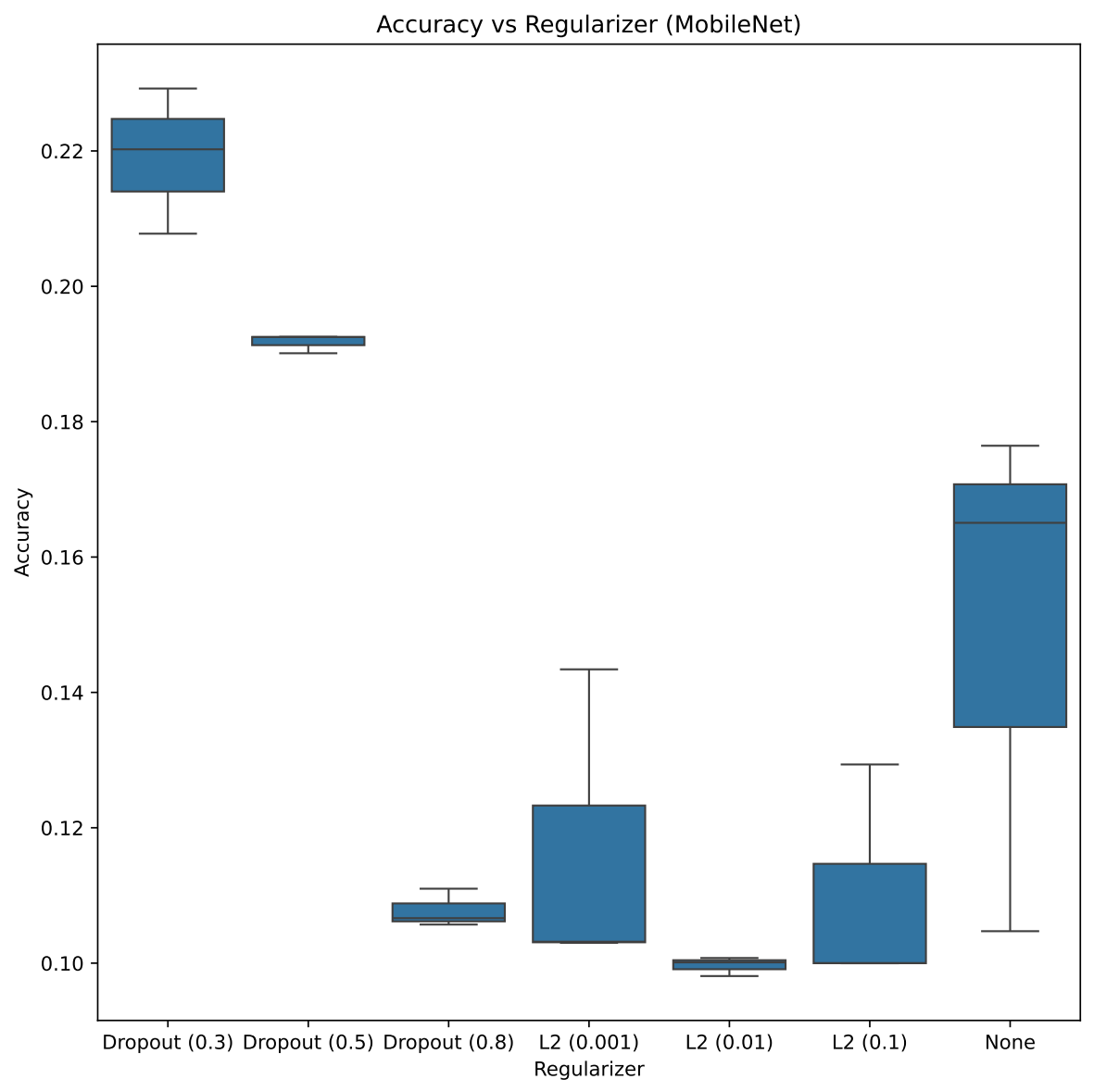
MobileNet


Accuracy vs Batch Size (MobileNet)
Accuracy
0.230
0.225
0.220
0.215
0.210
0.205
0.200
0.195
32
64
128
Batch Size

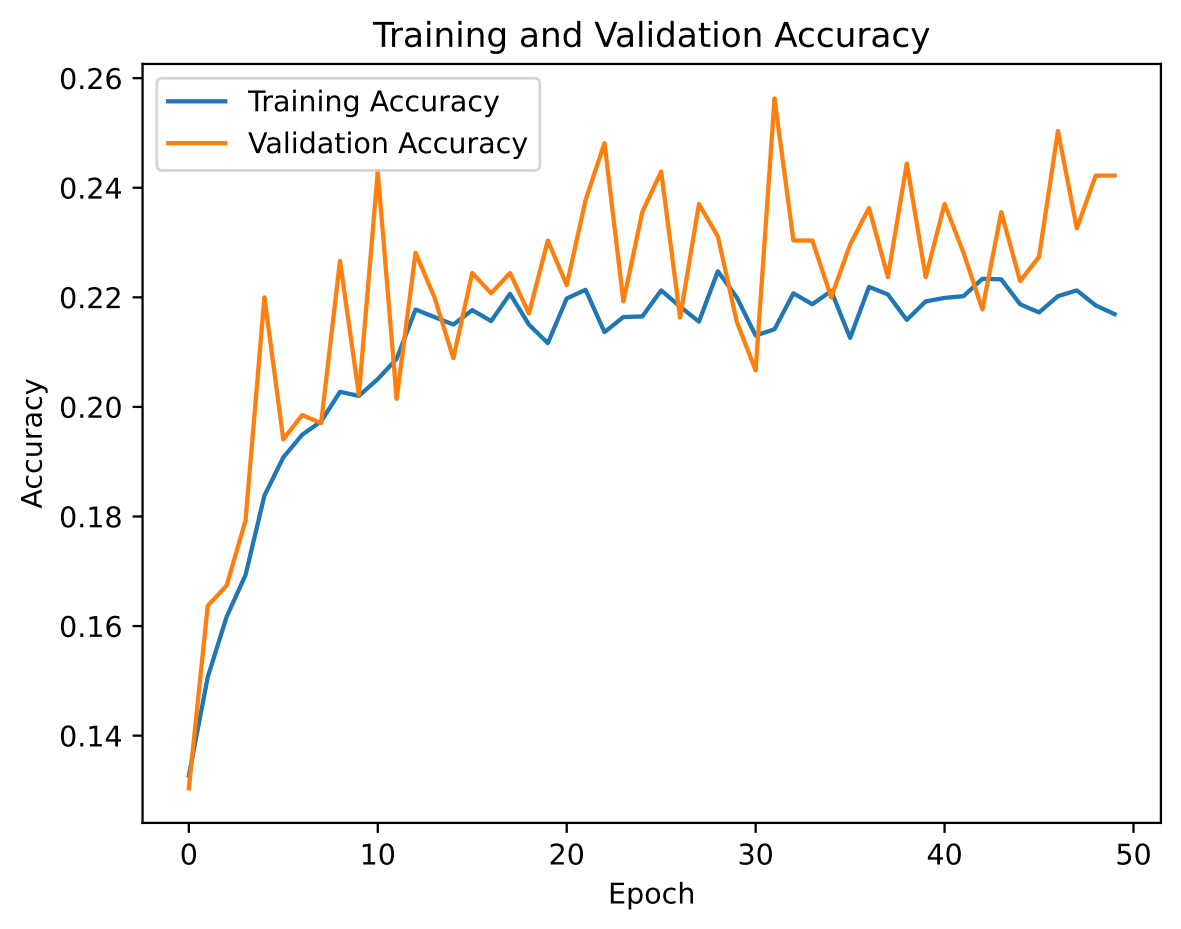
MobileNet


Accuracy vs Learning Rate (MobileNet)
Accuracy
0.230
0.225
0.220
0.215
0.210
0.205
0.200
0.195
0.001
0.005
0.01
Learning Rate

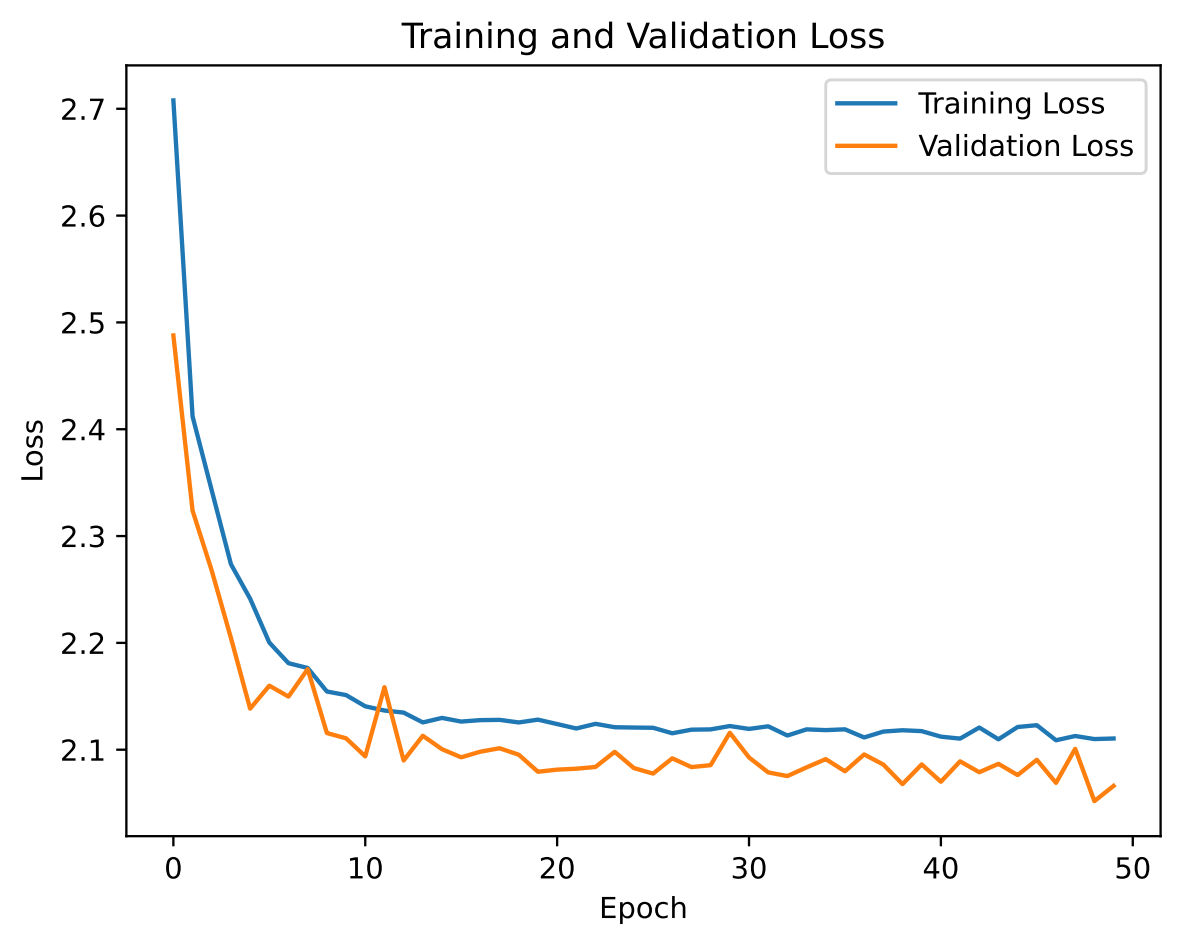
MobileNet


Accuracy vs Regularizer (MobileNet)
Accuracy
0.22
0.20
0.18
0.16
0.14
0.12
0.10
Dropout (0.3)
Dropout (0.5)
Dropout (0.8)
L2 (0.001)
L2 (0.01)
L2 (0.1)
None
Regularizer

MobileNet


Training and Validation Accuracy
Training Accuracy
Validation Accuracy
Accuracy
Epoch
0.26
0.24
0.22
0.20
0.18
0.16
0.14
0
10
20
30
40
50

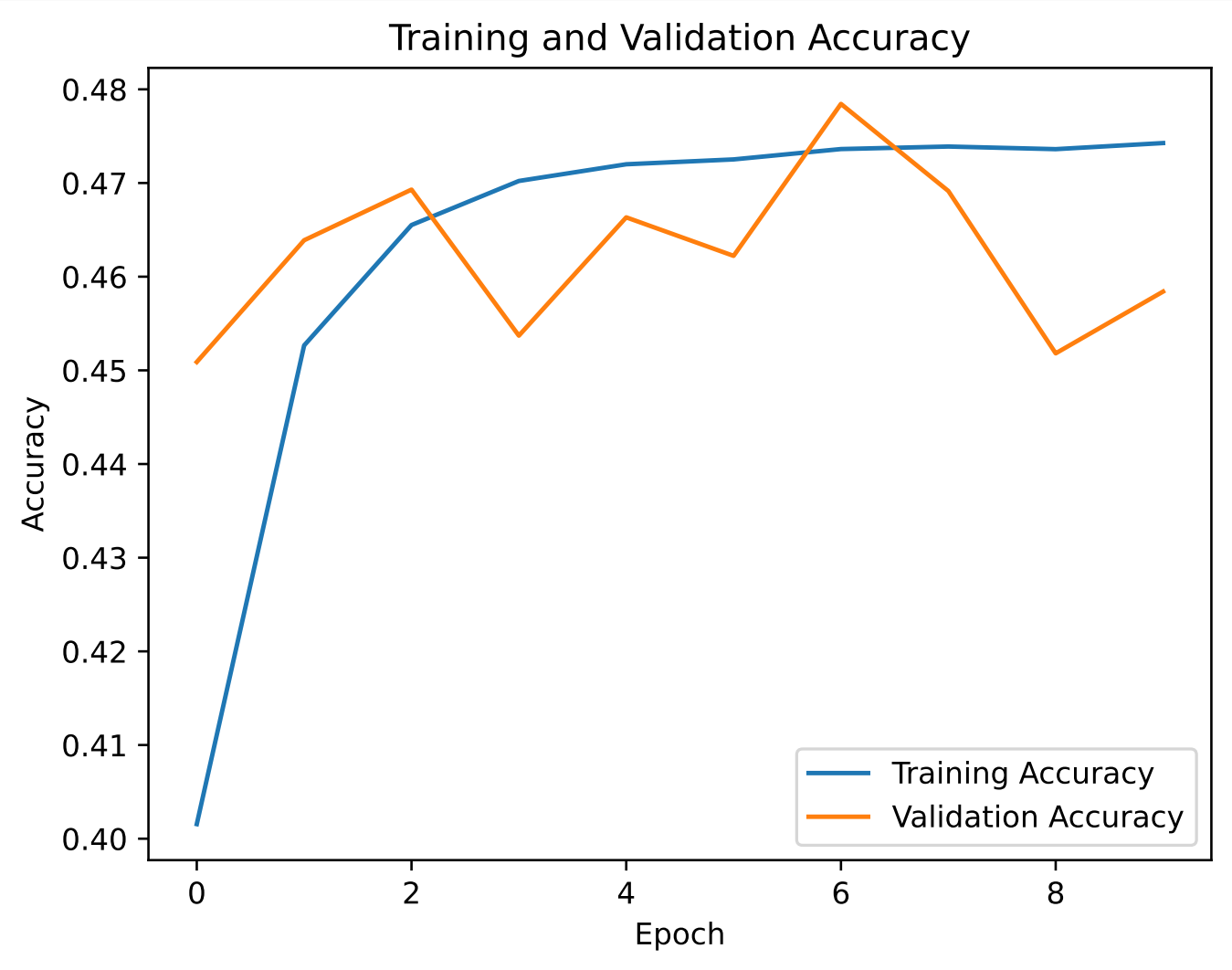
MobileNet


Training and Validation Loss
Training Loss
Validation Loss
Loss
2.7
2.6
2.5
2.4
2.3
2.2
2.1
0
10
20
30
40
50
Epoch

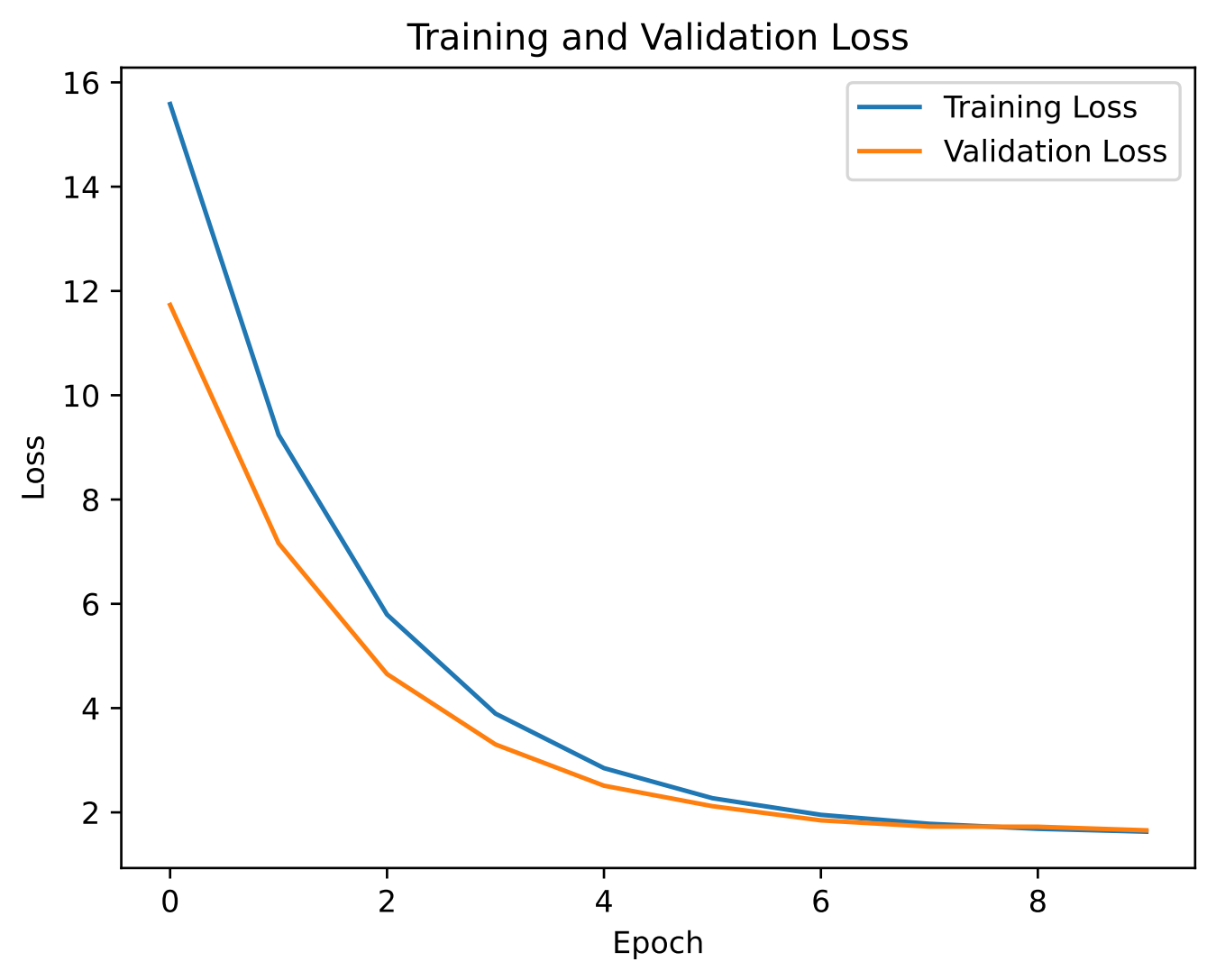
Results

EfficientNet

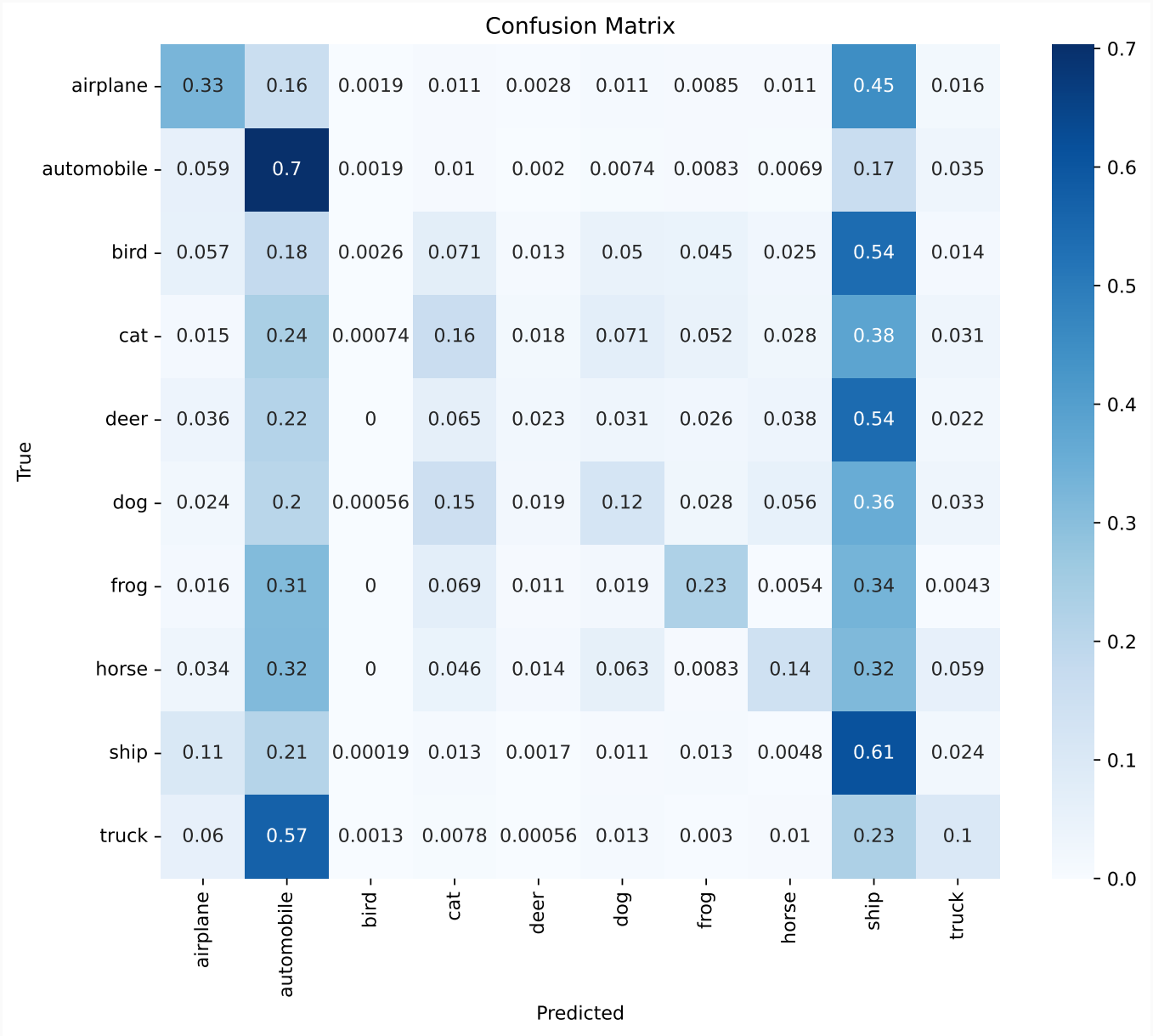
EfficientNet



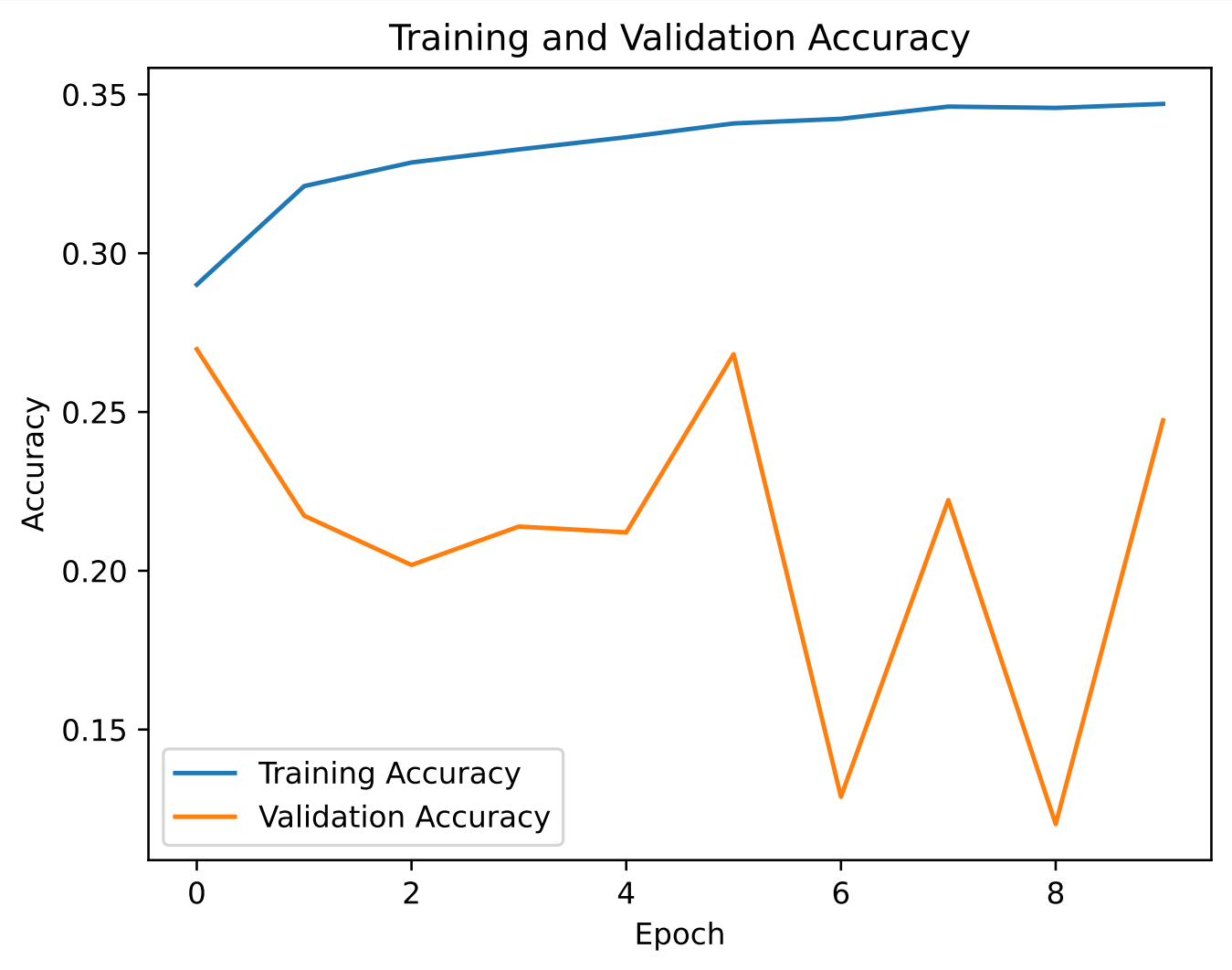
EfficientNet



MobileNet


Confusion Matrix
True
Predicted
airplane
automobile
bird
cat
deer
dog
frog
horse
ship
truck
0.33 0.16 0.0019 0.011 0.0028 0.011 0.0085 0.011 0.45 0.016
0.059 0.7 0.0019 0.01 0.002 0.0074 0.0083 0.0069 0.17 0.035
0.057 0.18 0.0026 0.071 0.013 0.05 0.045 0.025 0.54 0.014
0.015 0.24 0.00074 0.16 0.018 0.071 0.052 0.028 0.38 0.031
0.036 0.22 0 0.065 0.023 0.031 0.026 0.038 0.54 0.022
0.024 0.2 0.00056 0.15 0.019 0.12 0.028 0.056 0.36 0.033
0.016 0.31 0 0.069 0.011 0.019 0.23 0.0054 0.34 0.0043
0.034 0.32 0 0.046 0.014 0.063 0.0083 0.14 0.32 0.059
0.11 0.21 0.00019 0.013 0.0017 0.011 0.013 0.0048 0.61 0.024
0.06 0.57 0.0013 0.0078 0.00056 0.013 0.003 0.01 0.23 0.1
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0

MobileNet


Training and Validation Accuracy
0.35
0.30
0.25
0.20
0.15
Accuracy
0
2
4
6
8
Epoch
Training Accuracy
Validation Accuracy

MobileNet


Training and Validation Loss
Training Loss
Validation Loss
Loss
16
14
12
10
8
6
4
2
0
2
4
6
8
Epoch

Thank You

References


Cinic-10 dataset.