MICHAEL VS STEFANO: A CIFAR-10 STORY

NYU TANDON

BY STEFANO, MICHAEL, SAM, AND ISAAC

Project Introduction

We created two CNNs to classify images from the CIFAR-10 dataset as airplanes, cars, birds, cats, deer, dogs, frogs, horses, ships, and trucks. One was built from scratch and the other used a pre-trained ResNet152V2 model as a base.

Network Architecture

RESNET MODEL

- Input layer scales images and weights up to fit ResNet
- Data through ResNet
- Global Average Pooling and Batch Normalization
- Single dense layer with ReLU and Dropout
- Output layer with softmax

BUILT-FROM-SCRATCH MODEL

- 3 blocks of 2 convolutional layers each with ReLU separated by Max Pooling and Batch Normalization
- Two dense layers with ReLU and Dropout
- Output layer with softmax

Hyper-parameters

RESNET MODEL

Optimizer: Adam

No learning-rate adjustment

Batch size: 64

Epochs: 10

No data augmentation (negatively affected accuracy)

B.F.S. MODEL

Optimizer: Adam

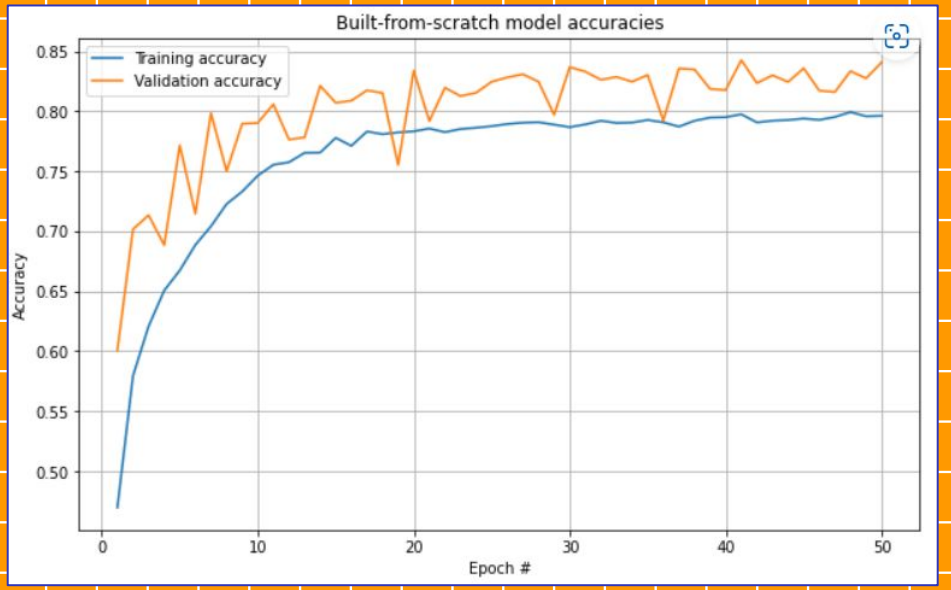
No learning-rate adjustment

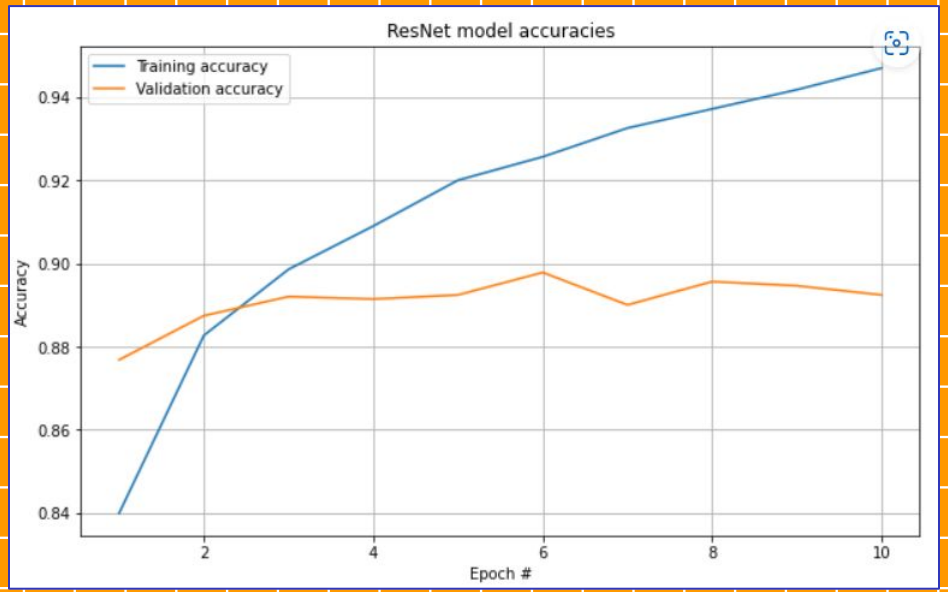
Batch size: 64

Epochs: 50

No data augmentation (negatively affected accuracy)

Performance Graphs





Training and Validation Accuracies

Performance Comparisons

	RESNET MODEL	B.F.S. MODEL
TRAIN / VAL LOSS	.15 / .30 Epoch 10 / Epoch 6	3.20 / .61 Epoch 48 / Epoch 14
TRAIN / VAL ACC.	94.7% / 89.8% Epoch 10 / Epoch 6	79.9% / 84.0% Epoch 48 / Epoch 50
TEST ACC.	89.2%	82.8%

Accuracy by Class

RESNET MODEL

Plane: 91.3%	Dog: 83.2%
Car: 93.2%	Frog: 92.0%
Bird: 84.5%	Horse: 92.3%
Cat: 84.0%	Ship: 92.9%
Deer: 86.6%	Truck: 92.0%

B.F.S. MODEL

Plane: 86.5%	Dog: 76.2%
Car: 92.2%	Frog: 91.0%
Bird: 69.4%	Horse: 87.5%
Cat: 65.2%	Ship: 90.3%
Deer: 79.6%	Truck: 90.3%

Challenges

1. Improving Accuracy w/o Overfitting
2. Computational Demands & Slow Speed
3. Negative Impact of Data Augmentation
4. Editing Conflicts
5. Calculating Accuracy by Class

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Conclusion

- Trial and error
- Multiple ways to solve a problem
- Can build on others, don’t have to reinvent everything