Computer Vision Project

Build and train a model with CIFAR-10 dataset

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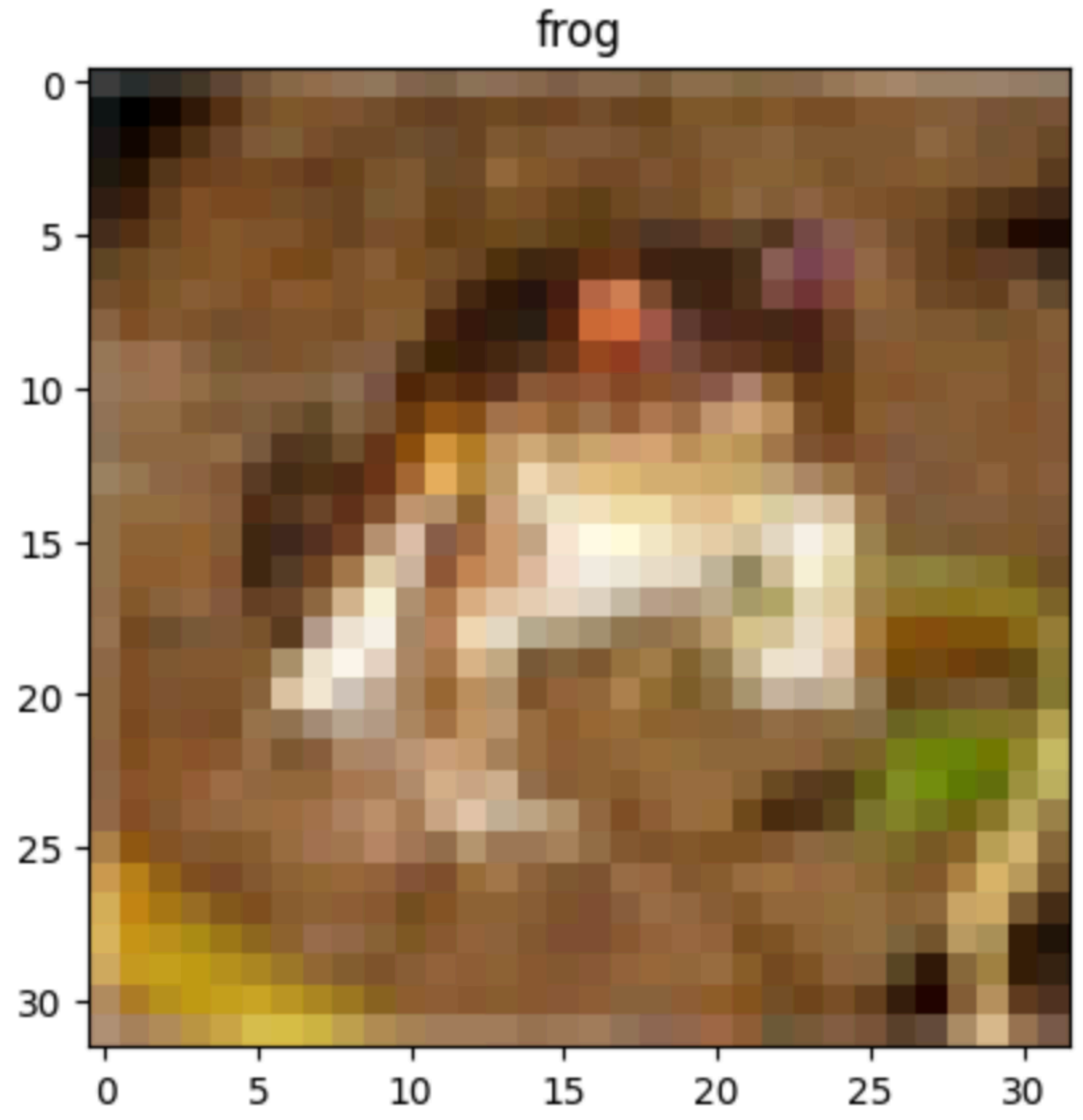
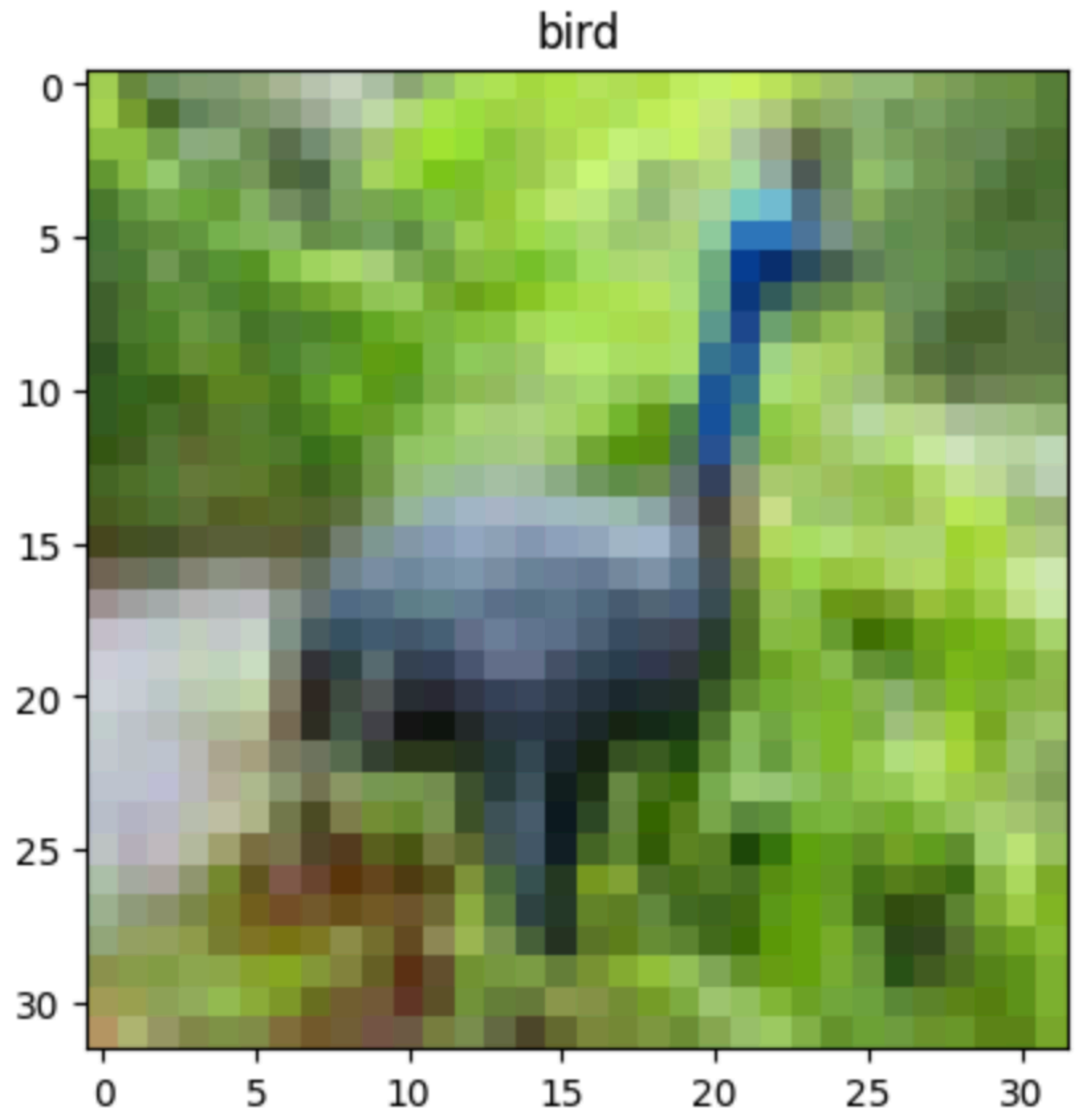
Project Goal

Image classification using deep learning and transfer learning

- Image classification with CIFAR-10
- Focus on deep learning workflow
- Training and fine-tuning a CNN model

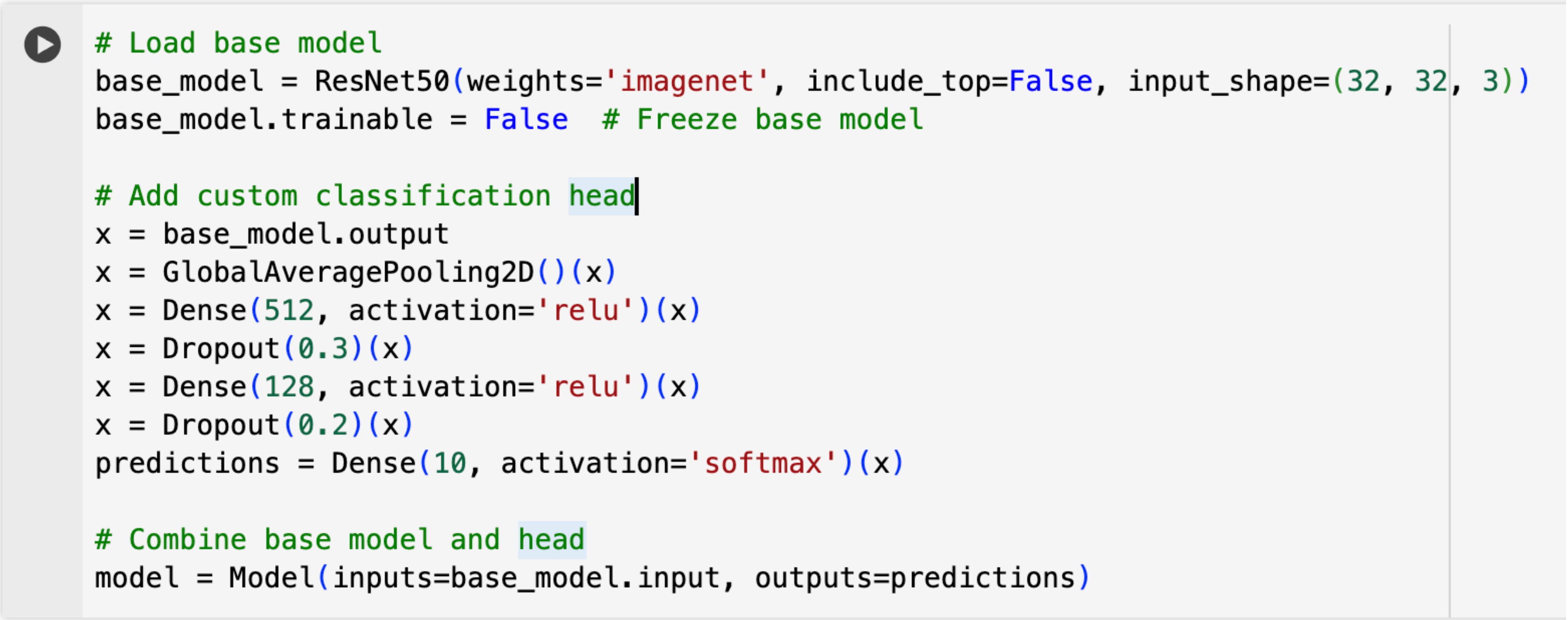




Model Architecture

Combining ResNet50 with a custom classification head

- Base model: ResNet50 (retrained on ImageNet, top removed)
- Added layers: GlobalAveragePooling + Dense (512 → 128)
- Output: Softmax layer with 10 classes
- Used ReLu and Dropout for regularization

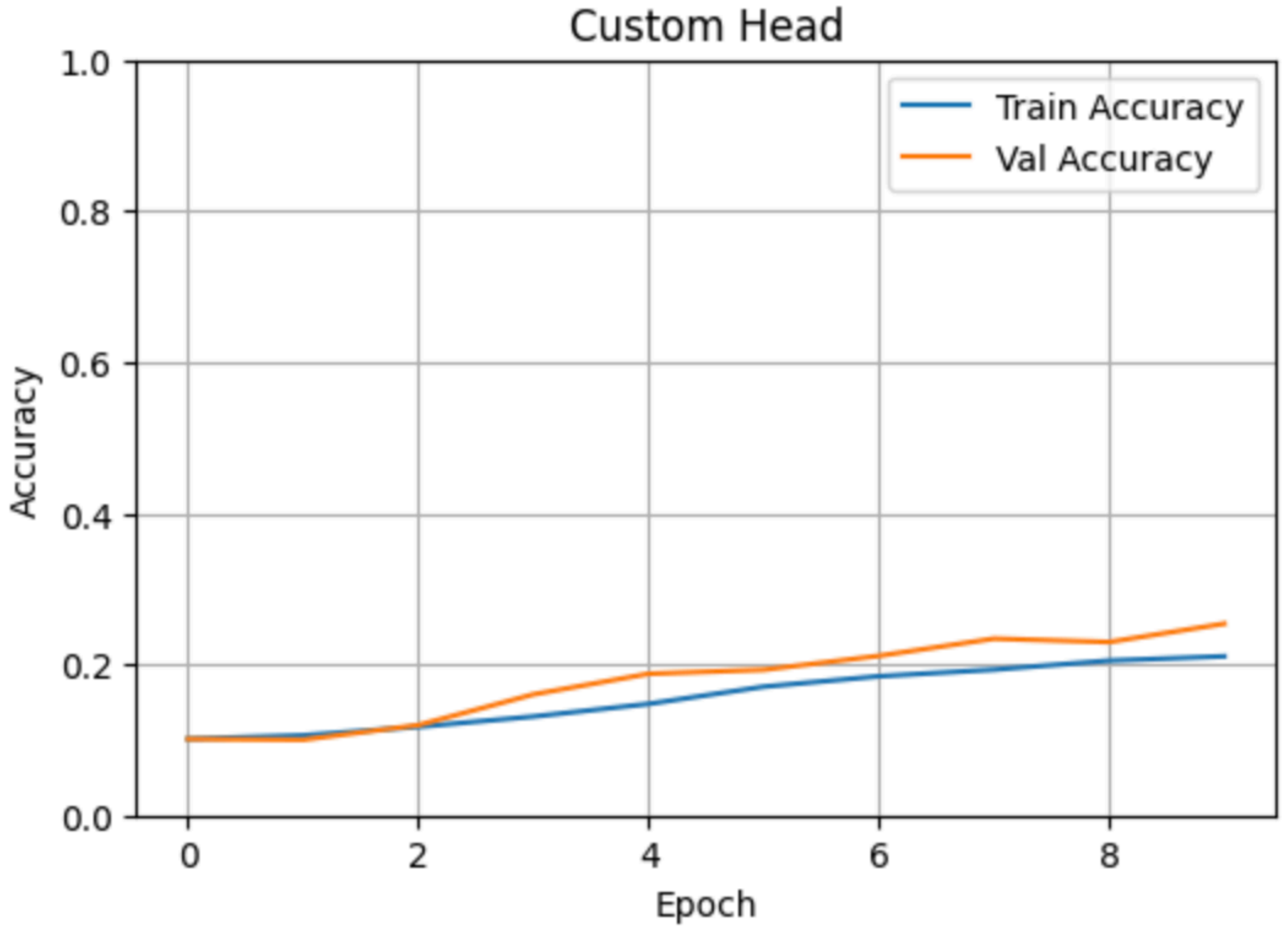


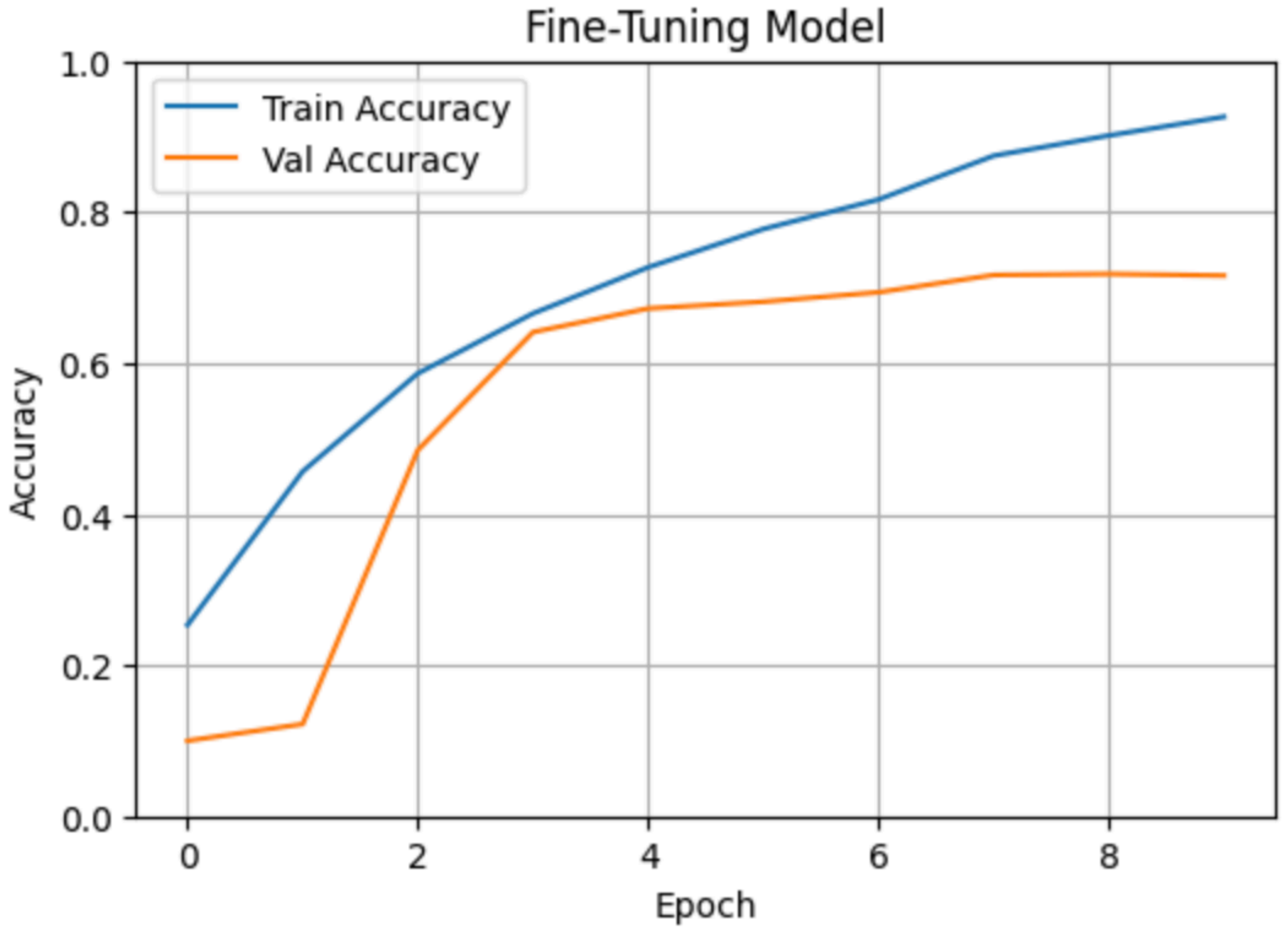
```
# Load base model
base_model = ResNet50(weights='imagenet', include_top=False, input_shape=(32, 32, 3))
base_model.trainable = False  # Freeze base model

# Add custom classification head
x = base_model.output
x = GlobalAveragePooling2D()(x)
x = Dense(512, activation='relu')(x)
x = Dropout(0.3)(x)
x = Dense(128, activation='relu')(x)
x = Dropout(0.2)(x)
predictions = Dense(10, activation='softmax')(x)

# Combine base model and head
model = Model(inputs=base_model.input, outputs=predictions)
```

Training Strategy

From initial training to fine-tuning with callbacks and augmentation

- Phase 1: Train classification head with frozen base model
- Phase 2: Fine-tune entire model with low learning rate
- Used Adam optimiser, learning rate scheduler & early stopping
- Optional: image augmentation (rotation, shift, flips)

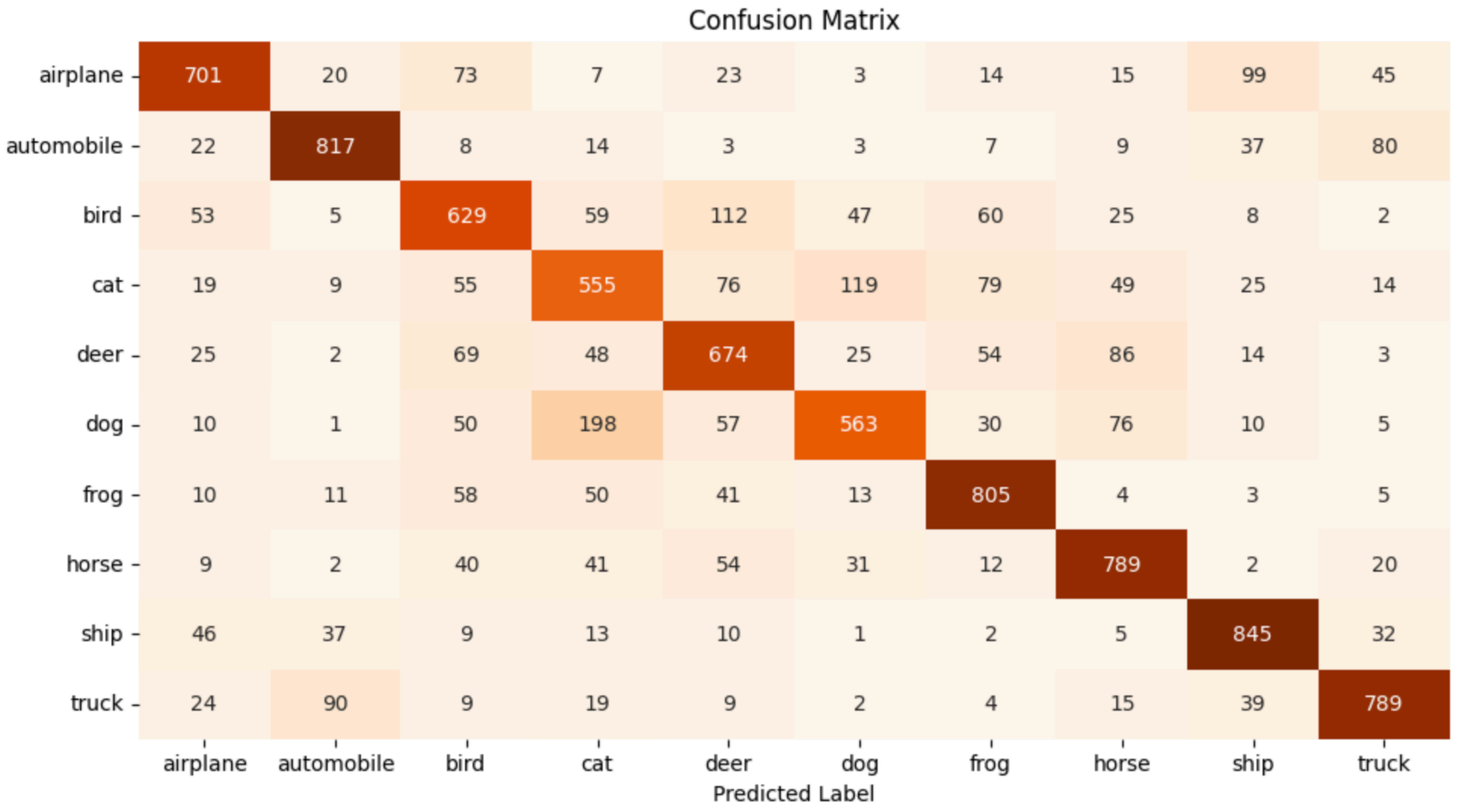




Results & Evaluation

Visualizing performance and assessing predictions

- Final validation accuracy: ~ 73%
- Confusion matrix shows where the model struggles
- Sample predictions show incorrect classifications



Confusion Matrix

	airplane	automobile	bird	cat	deer	dog	frog	horse	ship	truck
airplane	701	20	73	7	23	3	14	15	99	45
automobile	22	817	8	14	3	3	7	9	37	80
bird	53	5	629	59	112	47	60	25	8	2
cat	19	9	55	555	76	119	79	49	25	14
deer	25	2	69	48	674	25	54	86	14	3
dog	10	1	50	198	57	563	30	76	10	5
frog	10	11	58	50	41	13	805	4	3	5
horse	9	2	40	41	54	31	12	789	2	20
ship	46	37	9	13	10	1	2	5	845	32
truck	24	90	9	19	9	2	4	15	39	789

Predicted Label

True: automobile
Pred: truck

True: dog
Pred: cat

True: dog
Pred: deer

True: bird
Pred: cat

True: deer
Pred: airplane

True: horse
Pred: deer

Conclusion & Next Steps

Reflections on building and future improvements

- I learned to build, train and evaluate a CNN with transfer learning
- I explored model optimization with different layers and callbacks
- For further improvements:
    - Try other architectures (e.g., EfficientNet)
    - Use more data or advanced augmentation
    - Optimize hyperparameters

Thank You!

Questions, feedback, ideas?

- Thank you for your attention.
- Feel free to ask questions or share feedback.
- I’m happy to discuss challenges or improvements in image classification.
- Let me know if you want access to to the notebook or code.

- Connect with me on LinkedIn