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Terafac – Hiring Assessment – USAR

CODE - <https://www.kaggle.com/code/vineet77/level-3>

(Completed till level 3)

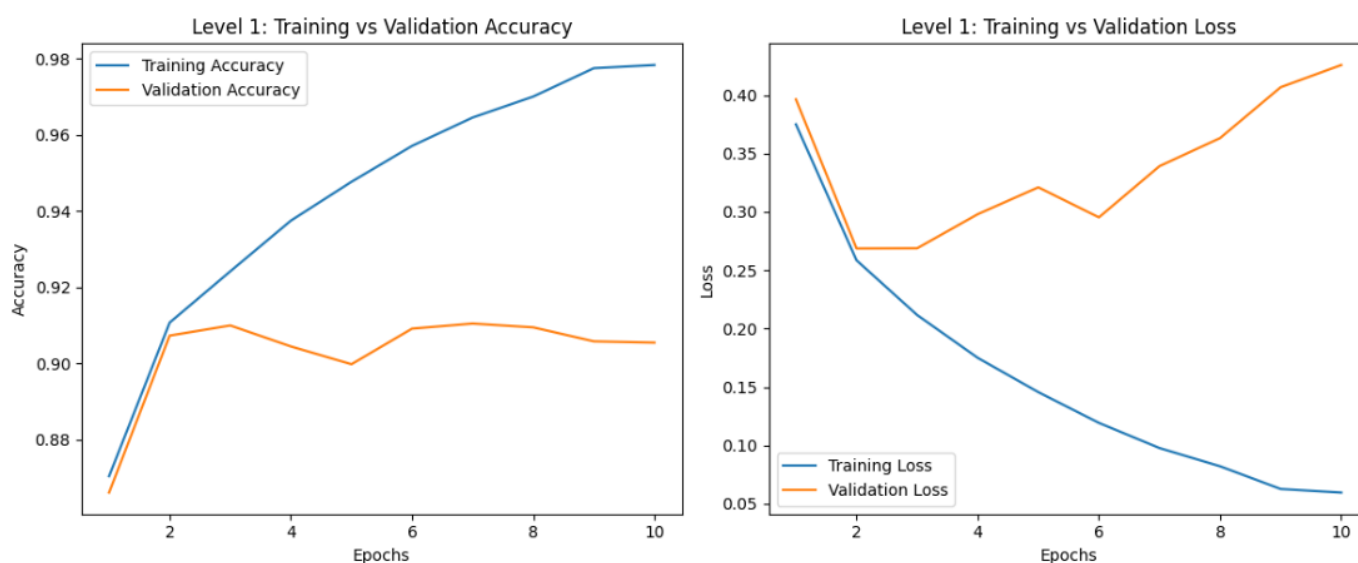
LEVEL 1 - Baseline Model

Used Kaggle notebook

Baseline Validation Accuracy: 91.05%

```
baseline_val_acc = max(history_1.history['val_accuracy'])  
print(f"Baseline Validation Accuracy: {baseline_val_acc * 100:.2f}%")
```

Baseline Validation Accuracy: 91.05%



LEVEL 2 - Intermediate Techniques

```
Level_2_val_acc = max(history_2.history['val_accuracy'])  
print(f"Level 2 Validation Accuracy: {baseline_val_acc * 100:.2f}%")
```

Level 2 Validation Accuracy: 90.92%

Accuracy after augmentation – 90.92%

```
data_augmentation = tf.keras.Sequential([
    tf.keras.layers.RandomFlip("horizontal"),
    tf.keras.layers.RandomRotation(0.1),
    tf.keras.layers.RandomZoom(0.1),
])
```

COMPARISON -

Without Data Augmentation:
Validation Accuracy : 91.05%

With Data Augmentation:
Validation Accuracy : 90.92%

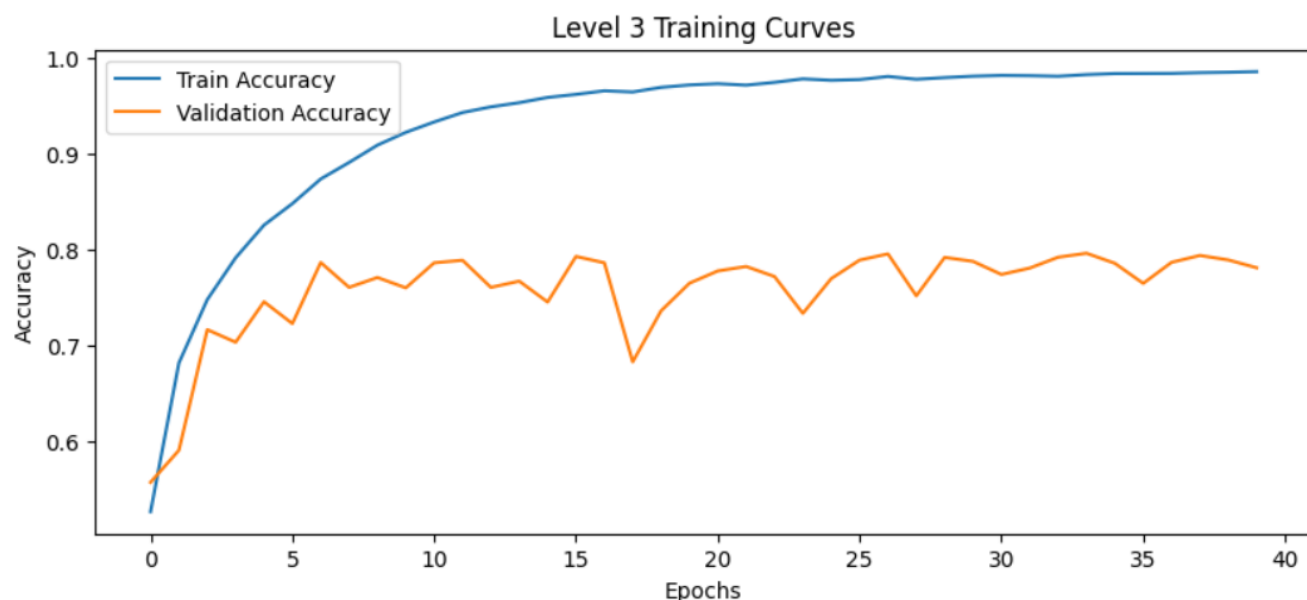
LEVEL 3 - Advanced Architecture Design

A custom CNN enhanced with channel-wise attention was designed to improve feature discrimination. The attention mechanism enables the network to focus on informative channels, leading to improved per-class performance.

```
history_lvl3 = model_lvl3.fit(
    train_ds,
    validation_data=val_ds,
    epochs=40
)
```

```
test_loss, test_acc = model_lvl3.evaluate(test_ds)
print(f"Level 3 Test Accuracy: {test_acc * 100:.2f}%")
```

94/94 [=====] - 0s 4ms/step - loss: 1.1859 - accuracy: 0.7910
Level 3 Test Accuracy: 79.10%



Per class performance -

	precision	recall	f1-score	support
airplane	0.72	0.89	0.79	612
car	0.90	0.88	0.89	644
bird	0.79	0.73	0.76	613
cat	0.69	0.64	0.67	573
deer	0.85	0.64	0.73	589
dog	0.70	0.71	0.70	582
frog	0.82	0.84	0.83	627
horse	0.73	0.87	0.79	535
ship	0.94	0.82	0.87	636
truck	0.81	0.87	0.84	589
accuracy			0.79	6000
macro avg	0.79	0.79	0.79	6000
weighted avg	0.80	0.79	0.79	6000