MLNS Deep Learning Assignment Part -1 Report

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Dataset Overview

    - The data was split into training and testing sets using an 80:20 ratio.
- Data Preprocessing:
    - Normalised the image pixel values to the range [0, 1]
    - Predictions converted to 37 categorical outputs representing sums from 0 to 36

Model Architecture

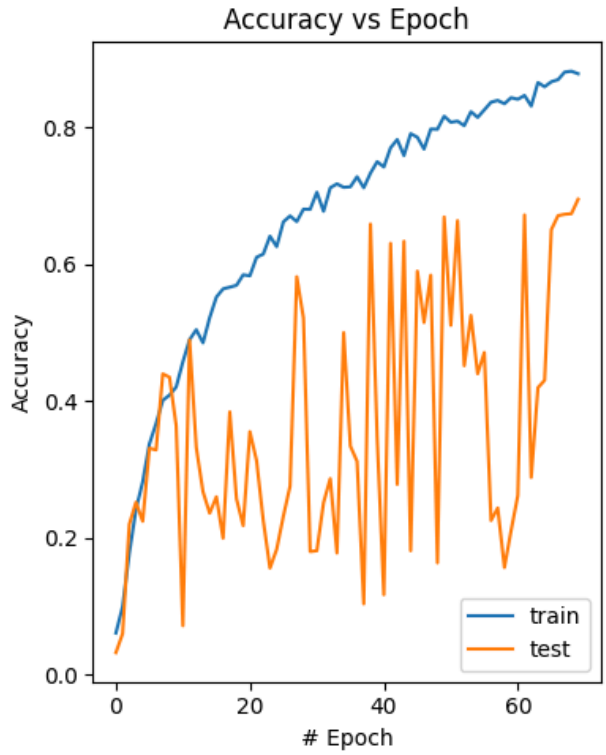
The Convolutional Neural Network (CNN) comprises the following layers:

- Convolutional and Pooling Layers:
    - 3 blocks of convolutional layers, each followed by batch normalization and max-pooling:
        - Block 1: Two Conv2D layers with 32 filters, followed by max-pooling.
        - Block 2: Two Conv2D layers with 64 filters, followed by max-pooling.
        - Block 3: Two Conv2D layers with 128 filters, followed by max-pooling.
- Fully Connected Layers:
    - A Flatten layer to convert feature maps into a vector.
    - A dense layer with 100 neurons and ReLU activation.
    - A dense layer with 2 * num_category neurons and ReLU activation.
    - A dropout layer (20%) to prevent overfitting.
    - A final dense layer with num_category neurons and softmax activation for multi-class classification.
- Total Trainable Parameters: 516,173.

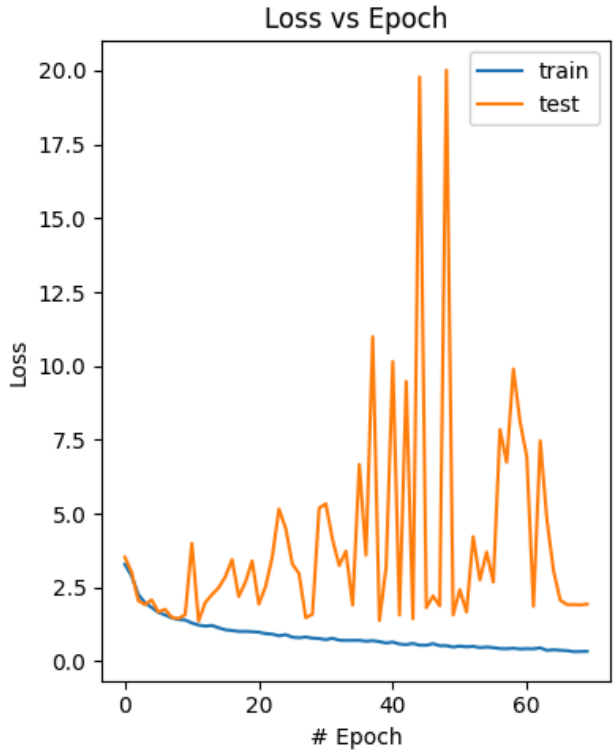
Model Training

1. **Training Settings**:
    - Optimizer: Adam.
    - Loss Function: Categorical cross entropy.
    - Metrics: Accuracy.
    - Batch size: 100.
    - Epochs: 70.
2. **Performance**:
    - The model achieved a training accuracy of **80%** after 70 epochs.
    - The validation accuracy plateaued around **69%**

Graph of Accuracy vs Epochs:



Graph of Training Loss vs Epochs:



Metrics Report:

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Loaded Model Metrics
Accuracy: 69.47%
Loss: 1.93
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accuracy			0.69	6000
macro avg	0.59	0.60	0.59	6000
weighted avg	0.70	0.69	0.69	6000

	precision	recall	f1-score	support
0	0.00	0.00	0.00	1
1	0.00	0.00	0.00	1
2	0.67	0.50	0.57	8
3	0.67	0.80	0.73	15
4	0.69	0.86	0.76	28
5	0.55	0.71	0.62	24
6	0.88	0.61	0.72	59
7	0.76	0.68	0.72	81
8	0.72	0.75	0.73	110
9	0.66	0.79	0.72	132
10	0.77	0.67	0.72	174
11	0.69	0.77	0.73	203
12	0.76	0.74	0.75	272
13	0.77	0.70	0.73	308
14	0.71	0.68	0.70	326
15	0.74	0.60	0.66	381
16	0.61	0.67	0.64	389
17	0.66	0.73	0.70	420
18	0.72	0.68	0.70	355
19	0.74	0.70	0.72	361
20	0.70	0.78	0.74	398
21	0.75	0.65	0.69	374
22	0.68	0.76	0.72	330
23	0.72	0.70	0.71	273
24	0.65	0.59	0.61	246
25	0.59	0.81	0.68	190
26	0.71	0.65	0.68	159
27	0.64	0.68	0.66	127
28	0.68	0.69	0.69	84
29	0.62	0.55	0.58	62
30	0.59	0.56	0.57	48
31	0.55	0.52	0.53	31
32	0.43	0.53	0.47	17
33	0.44	0.50	0.47	8
34	0.40	0.67	0.50	3
35	0.00	0.00	0.00	1
36	0.00	0.00	0.00	1

Predictions: