Gesture Recognition Deep Learning Assignment

Problem Statement:-

The problem statement is to develop a smart-tv feature for gesture recognition that can recognise five different gestures performed by the user. The TV will detect the gestures as different control inputs.

The gestures are

Gesture	Control
Thums up	Increase the volume
Thums down	Deacrease the volume
Left swipe	‘Jumps’ backwards 10 seconds
Right swipe	‘Jump’ forward 10 seconds
Stop	Pause the movie

Experiment Number	Model	Result	Comments
1	Conv3D	Epochs: 20 Train accuracy: 0.2 Validation accuracy: 0.41	Adding more layers, as it’s clear that the model cannot learn.
2	Conv3D	Epochs: 20 Train accuracy: 0.61 Validation accuracy: 0.75	While the model the accuracies have increased w.r.t the prior model, the number of parameters have gone up significantly. Reducing the number of parameters.
3	Conv3D	Epochs: 20 Train accuracy: 0.97 Validation accuracy: 0.83	The model seems to be overfitting, reducing the number of parameters even further.
4	Conv3D	Epochs: 20 Train accuracy: 0.17 Validation accuracy: 0.5	Reducing the number of parameters has had an adverse effect and now the model is underfitting, Increasing the number

			of epochs from 20 to 40 and removing the Dropout layers from the model.
5	Conv3D	Epochs: 40 Train accuracy: 1 Validation accuracy: 0.91	The model is clearly overfitting, Reducing the number of parameters and re-introducing Dropout layers.
6	Conv3D	Epochs: 40 Train accuracy: 0.99 Validation accuracy: 1	The model is definitely overfitting. Increasing the number of Dropout layers and replacing Flatten layer with GlobalAveragePooling 3D
7	Conv3D	Epochs: 40 Train accuracy: 0.99 Validation accuracy: 0.91	The model still seems to be overfitting, trying a different architecture
8	TimeDistributed Conv2D + LSTM	Epochs: 20 Train accuracy: 0.5 Validation accuracy: 0.66	The accuracy is sub-par, most likely due to the limited number of epochs, however due to time restraints switching to a different architecture, increasing the number of epochs from 20 to 40
9	TimeDistributed Conv2D + GRU	Epochs: 40 Train accuracy: 0.96 Validation accuracy: 0.81	The model works well, however the difference between the train and validation accuracy is significant, adding some Dropout layers
10	TimeDistributed Conv2D + GRU	Epochs: 40 Train accuracy: 0.86 Validation accuracy: 0.58	Adding Dropout layers has negatively impacted the model. Trying a different model architecture, increasing the number of epochs to 50
11	TimeDistributed Conv2D	Epochs: 50 Train accuracy: 0.99 Validation accuracy: 0.91	The model seems to be overfitting, introducing Dropout layers to deal with overfitting
12	TimeDistributed Conv2D	Epochs: 50 Train accuracy: 0.90	The accuracy scores for the model are

		Validation accuracy: 0.84	great. Selecting model 12 as the final model

Conclusion:-

We selected the Model 12 (TimeDistributed Conv2D) as our final model as it achieved a training accuracy of 0.90 and validation accuracy of 0.84, which suited our requirements.