**Neural Networks Project – Gesture Recognition**

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We have experimented with Conv3D , CNN + RNN, CNN + RNN + GRU & GRU + MobileNet architectures.

So followed the process as below

* Data Generator
* Data Pre-processing
* Model Architectures building
* Testing

Observation as below:

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| **Experiment** | **Model** | **Result** | **Decision + Explanation** |
| 1 | Conv3D | Train. Acc: 0.71  Val. Acc : 0.25 | Model is Overfitting, Lets increase the epochs, to increase the overall accuracy |
| 2 | Conv3D | Train. Acc: 0.91  Val. Acc : 0.0000e+00 | Next increasing the frame count & Image resolution. As we see that the accuracy can be further improved and reduce over fitting |
| 3 | Conv3D | Train. Acc: 0.73  Val. Acc : 0.0000e+00 | Model is still Overfitting. So, increasing the resolution & reducing the batch size resp |
| 4 | Conv3D | Train. Acc: 0.78  Val. Acc : 0.50 | Seen improvement but sill the accuracy can improve with good fit. Next trying ConvLSTM to see if we get better results |
| 5 | ConvLSTM | Train. Acc: 0.78  Val. Acc : 0.71 | Accuracy increased significantly, as we see that the accuracy can be further improved. Increasing the number of epochs |
| 6 | ConvLSTM | Train. Acc: 0.84  Val. Acc : 0.72 | Not much improvement in the validation accuracy, next trying increase with the increase in image resolution and number of epochs |
| 7 | ConvLSTM | Train. Acc: 0.61  Val. Acc : 0.62 | Accuracy decreased, now trying with ConvGRU |
| 8 | ConvGRU | Train. Acc: 0.43  Val. Acc : 0.52 | As we see no good performance in validation accuracy, so increasing number of epochs and decreasing batch size |
| 9 | ConvGRU | Train. Acc: 0.46  Val. Acc : 0.54 | As we see no good performance in validation accuracy switching to GRU+MobileNet |
| 10 | GRUMobNet | Train. Acc: 0.78  Val. Acc : 0.77 | We can improve the accuracy by tweaking the parameters like batch size & Epochs |
| 11 | GRUMobNet | Train. Acc: 0.88  Val. Acc : 0.87 | This seems to be the best fit accuracy so far. |
| Final Model | GRU MobNet | Train. Acc: 0.88  Val. Acc: 0.87 | So far after experimenting across different models this model seems the best model with a good accuracy and fit.  And there is always scope for improvement so by using other combination of other hyper-parameters we can further develop more accurate model |

Observation:

Post running all the experiments we see that Conv3D can be further improved as last model 4 has 0.78 & 0.50 accuracy which is a clear over fitting case. But on using GRU + MobileNet we could handle such over-fitting and get more stable model.