**Gesture Recognition Experiment Sheet**

The table below gives a summary of all the models tried out.

We have considered all the 30 frames completely for a single video.

Metric value used: categorical\_accuracy.

Transformations like rotations and Flipping the image have not been applied as these will not be logically correct, and the model might get confused with the labels. (The horizontal flipping will reverse the left to right swipes and top down flipping will reverse the thumbs up and thumbs down).

Cropping and Resizing have been done with 120X120 size, where the horizontal part has been taken from the middle of the image to preserve most of the information.

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| **Experiment Number** | **Model** | **Layers** | **Result** | **Decision + Explanation** |
| 1 | Conv3D  Batch Size: 10  Epoch: 10 | Conv3D  Batch Size: 10  Epoch: 10 | Train Accuracy: 10  Validation Accuracy: 7 | Time consumed is less. Model is not trained enough. Accuracy is too low. Trying with higher epochs. |
| 2 | Conv3D  Batch Size: 10  Epoch: 20 | Conv3D  Batch Size: 10  Epoch: 20 | Train Accuracy: 19  Validation Accuracy: 13 | Model accuracy increased significantly. |
| 3 | Conv3D  Batch Size: 10  Epoch: 30 | Conv3D  Batch Size: 10  Epoch: 10 | Train Accuracy: 22  Validation Accuracy: 10 | Time consumed is too high.  Model seems to be overfitted. Not feasible.  We will consider Epoch as 20 going forward. |
| 4 | Conv3D  Batch Size: 10  Epoch: 20 | 2 Conv3D + 2 dense + Softmax | Train Accuracy: 19  Validation Accuracy: 13 | Batch Size is too less. Accuracy is less. |
| 5 | Conv3D  Batch Size: 20  Epoch: 20 | 2 Conv3D + 2 dense + Softmax | Train Accuracy: 16  Validation Accuracy: 11 | Accuracy is lesser than previous. |
| 6 | Conv3D  Batch Size: 25  Epoch: 20 | 2 Conv3D + 2 dense + Softmax | Train Accuracy: 13  Validation Accuracy: 10 | Batch Size is too high. Ran out of space. Not feasible.  Need to check batch size between 10 and 20. |
| 7 | Conv3D  Batch Size: 16  Epoch: 20 | 2 Conv3D + 2 dense + Softmax | Train Accuracy: 21  Validation Accuracy: 16 | Batch Size is optimal. Accuracy is considerably more than previous experiments. We will consider 16 as batch size going forward.  As the no of layers is less, the accuracy is not good. The model did not learn. Decided to add dropouts |
| 8 | Conv3D  Batch Size: 16  Epoch: 20 | 2 Conv3D with dropout + 2 dense + Softmax | Train Accuracy: 25  Validation Accuracy: 18 | Even after adding dropouts, the accuracy did not increase much. Adding more layers |
| 9 | Conv3D  Batch Size: 16  Epoch: 20 | 3 Conv3D + 2 dense + softmax | Train Accuracy: 26  Validation Accuracy: 21 | Model is still not learning. Trying the same with dropouts. |
| 10 | Conv3D  Batch Size: 16  Epoch: 20 | 3 Conv3D + dropout + 2 dense + softmax | Train Accuracy: 17  Validation Accuracy: 25 | The model seems to be underfitting the Train data. But the validation accuracy is still not enough. Adding more Layers |
| 11 | Conv3D  Batch Size: 16  Epoch: 20 | 4Conv3D + 2 dense + softmax | Train Accuracy: 95  Validation Accuracy: 89 | The accuracies skyrocketed to high values. The model doesn’t seem to be completely overfitting, as Accuracies are not far apart. Trying the same with dropouts. |
| 12 | Conv3D  Batch Size: 16  Epoch: 20 | 4 Conv3D + dropout + 2 dense + softmax | Train Accuracy: 23  Validation Accuracy: 42 | The accuracies dropped. But the model now seems to be generalizing well with an accuracy of almost 80% |
| 13 | Conv3D  Batch Size: 16  Epoch: 20 | 5 Conv3D + 2 dense + softmax | Train Accuracy: 90  Validation Accuracy: 70 | The train accuracy is very high. But the validation accuracy has dropped by a lot. It’s a sure case of overfitting. Adding dropout for regularization. |
| 14 | Conv3D  Batch Size: 16  Epoch: 20 | 5 Conv3D + dropout + 2 dense + softmax | Train Accuracy: 82  Validation Accuracy: 65 | The accuracies dropped. But the difference between both is still very high. And the model is still overfitting. |

**Final Model Selected:**

***Experiment #: 11***

Conv3D

Batch Size: 16

Epoch: 20

Model Structure: 4 3D Convolution layers + 2 Dense layers + Softmax layer

Activation function: Relu

Train Accuracy: 95

Validation Accuracy: 89

**Summary:**

The accuracies are the highest for the above model in Experiment #11. The model doesn’t seem to be completely overfitting on the given data, as accuracies are not far apart.