**Types of Architecture tried are,**

* **CNN + RNN architecture -** passing the images of a video through a CNN which extracts a feature vector for each image, and then pass the sequence of these feature vectors through an RNN
* **3D convolutional network -** The convolutional kernel moves in 3-direction (x,y,z) to calculate the convolutional output
* **Transfer learning – MobileNet** is a computer vision model open-sourced by Google and designed for training classifiers. It uses depth wise convolutions to significantly reduce the number of parameters compared to other networks, resulting in a lightweight deep neural network
* **GRU and LSTM designs are explored.**

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| **Experiment Number** | **Model** | **Result** | **Decision + Explanation** |
| **1** | **Conv3D – Base Model**  **Sequential Model with 3 Conv3D , each Conv layer is followed by MaxPooling3D, Batch normalization is added in all the layers, two dropout of 25 %** | **- Total params: 4,050,085**  **- Training Accuracy: 0.83**  **- Validation Accuracy: 0.125** | **Overfitting Model, let’s try to change the Frames and Epochs. Too may layers with may parameters is causing the model overfit** |
| **2** | **Conv3D - 16 Frames with 20 Epochs**  **Same as above, the no of frames is 16 and trained for more EPOCHS** | **- Total params: 2,067,621**  **- Training Accuracy - 0.92**  **- Validation Accuracy - 0.625** | **Reduced the parameters and used 14 frames with 20 Epochs.Score is improved but the model is**  **Overfitting, let’s try to change the Frames and Epochs** |
| **3** | **Conv3D -** **Frames-30, Epocs-30** | **- Total params: 9,006,245**  **- Training Accuracy - 0.97**  **- Validation Accuracy - 100** | **Increased the parameters , 100% validation accuracy is a symptom of model memorized the pattern instead of generalizing, lets reduce the parameters further to see we can achieve the optimal accuracy** |
| **4** | **CONV3D Model (30 Frames with 20 Epochs)**  **Reduced the parameters** | **- Total params: 5,618,245**  **- Training Accuracy - 0.95**  **- Validation Accuracy - 0.5** | **Reduced the parameters compared to previous model, Model is performing well on Training but not validation** |
| **5** | **CONV3D Model (20 Frames with 20 Epochs)**  **Increased the parameters by adding one additional layer** | **- Total params: 1,907,909**  **- Training Accuracy - 0.935**  **- Validation Accuracy - 0.5** | **Added one more Conv3D and Maxpooling3D layer. Model is performing well on Training but not validation.** |
| **6** | **CONV3D Model (Frames:20, Epocs-20, BS-64, reduced kernel to (2,2,2), switching BatchNormalization before MaxPooling)** | - **Total params: 1,301,045**  **- Training Accuracy - 0.99**  **- Validation Accuracy - 0.5** | **reduced kernel to (2,2,2), switching BatchNormalization before MaxPooling. Model is performing well on Training but not validation** |
| **7** | **Conv2D+LSTM** | - Total params: 3,084,133  - Training Accuracy - 0.97  - Validation Accuracy - 0.81 | **Model is comparatively performing well on both training and validation** |
| **8** | **CNN LSTM with GRU** | - Total params: 2,429,285  - Training Accuracy - 0.99  - Validation Accuracy - 0.93 | **Model is performing very well on both training and validation** |
| **9** | **Transfer Learning (MobileNet) with LSTM** | - Total params: 4,611,781  - Training Accuracy - 1.0  - Validation Accuracy - 1.0 | **percentage of error is zero in the accuracy score which is sign of overfitting, 100% in training and validation is not a optimal model** |
| **10** | **Transfer Learning (MobileNet) with GRU** | - Total params: 4,284,613  - Training Accuracy - 1.0  - Validation Accuracy - 1.0 | **percentage of error is zero in the accuracy score which is sign of overfitting, 100% in training and validation is not a optimal model** |
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| **Final Model** | **CNN LSTM with GRU** | - Total params: 2,429,285  - Training Accuracy - 0.99  - Validation Accuracy - 0.93 | **Model is performing very well on both training and validation. The difference between the validation and training score explains the model is not overfitting , hence this model is considered as optimal** |