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| **Experiment Number** | **Model** | **Result** | **Decision + Explanation** |
| **1** | **Conv3D**    Batch Size - 32  Frames to Sample - 30  Image Size - 160 x 160 | Total params: 1,947,525  Train Accuracy - 98%  Validation Accuracy - 11% | The validation accuracy is not increasing and staying within 20% even though the train accuracy is increasing every epochs. Seems it's not getting trained properly.  In next model let's remove batch normalisation() as its already normalised in generator. |
| **2** | **Conv3D**  Same as Model 1, only batch normalizations have been removed. | Total params: 1,947,525  Train Accuracy - 97%  Validation Accuracy - 78% | Performance across every epoch has improved as per expectation.  The validation accuracy is also increasing with every epoch. However the model is overfitting. |
| **3** | **Conv3D**  Lets' experiment by reducing the image size, and frames per sample (taking alternate frames), and increase batch size. Also to address the issue of over fitting lets remove one layer from the model(1st layer of 16 neurons)  Batch Size - 64  frames per sample - 16  image size - 100 x 100  Removed one hidden layer | Total params: 898,949  Train Accuracy - 87%  Validation Accuracy - 85% | We got model performing good and the gap between train and val accuracy is also lower.  Total parameters also reduced with removal of one hidden layer. |
| **4** | **Conv3D**  Let's try decreasing the image size further and check the performance keeping other configuration same as model 3.  Batch Size - 64  frames per sample – 16  image size - 80 x 80 | Total params: 718,725  Train Accuracy - 80%  Validation Accuracy - 82% | The performance of the model didn’t improve much. |
| **5** | **Conv3D**  Lets now increase the batch size to 128 keeping rest same. | Total params: 718,725  Train Accuracy - 87%  Validation Accuracy - 80% | There is not much improvement in performance. Also the gap between train and val accuracy is more. |
| **6 (Best Model)** | **Conv3D**  As there was not much accuracy improvement with increasing batch size. Let's consider the older model with batch size of 32 only.  In order to reduce parameter's lets lower the dense neurons to 64 from 128 | Total params: 501,189  Train Accuracy - 96%  Validation Accuracy - 95% | The model did really well with high accuracy of 96% train and 95% validation accuracy. Also the parameter count is comparatively low. |
| **7** | **Conv3D**  Let's try to reduce the parameter's further and check if the accuracy still can be maintained. Filter size = (2,2,2) | Total params: 295,989  Train Accuracy - 96%  Validation Accuracy - 86% | Although the parameters reduced, however the validation accuracy dropped. |
| **8** | **Conv3D**  Let's experiment with same configuration as the best model so far(model 6) and only changing the activation function to elu instead of relu. | Total params: 501,189  Train Accuracy - 99%  Validation Accuracy - 92% | There’s not much improvement in accuracy. The training stopped early as there wasn’t improvement. Thank's to early stopping. |
| **9** | **Conv3D**  So far model 6 has been the best. so let's try increasing the batch size for maximum gpu utilisation and see if the performance is still maintained.  Batch size = 64 | Total params: 501,189  Train Accuracy - 83%  Validation Accuracy - 81% | With increase in batch size the training time has reduced but the accuracy has reduced. |
| **10** | **Conv3D**  Although the accuracy is reducing let's check what's the max batch size we can go with.  Batch size = 256 | Total params: 501,189  Train Accuracy - 81%  Validation Accuracy - 80% | The accuracy is still lower. |
| **11** | **Conv3D**  Increasing the batch size to 512, to see if it's supported by GPU.  Batch size = 512 | Total params: 501,189  OOM Error | We get out of memory error. So, we can get batch size of 256, however the accuracy is lower. So lets keep the batch size to 32 so that we get higher accuracy. |
| **12** | **ConvLSTM** | Total params: 1,000,101  Train Accuracy - 87%  Validation Accuracy - 70% | The model is over fitting. |
| **13** | **ConvLSTM**  Reducing the dence layer neurons from 128 to 64. | Total params: 991,525  Train Accuracy - 70%  Validation Accuracy - 71% | The model accuracy is lower. |
| **14** | **ConvGRU** | Total params: 213,845  Train Accuracy - 95%  Validation Accuracy - 66% | The model is highly over fitting. |

**Best Model**

After experimenting on various aspects like

* Image Size,
* Normalization,
* Image index,
* Batch Size,
* Activation Function,
* Filter size,
* Neuron counts and layers,
* Architectures - conv3d, conv2d+lstm, conv2d+gru

The **best model (model 6)** having below configuration.

* Architecture - Conv3D
* Image Size – 80 x 80
* Batch Size - 32
* Image Index - alternate with 16 frames per sample
* Activation function - relu
* Filter size - 3,3,3

**Training Accuracy - 96 %**

**Validation Accuracy - 95 %**

**Total params: 501,189**