We tried some pre-processing of data, checked the effect of batch size, number of frames fed to the model, experimented with the filter size and number of layers of the CNN model, tried out CNN+RNN architecture.

Below table gives the details of the experiments carried out before finalizing on the model to be used for the task.

|  |  |  |  |
| --- | --- | --- | --- |
| **Experiment Number** | **Model** | **Result** | **Decision + Explanation** |
| **Experimenting with different batch size, number of frames, image resolution** | | | |
| **1** | **Conv3D**  **Image size = 120X120**  **Number of frames considered = 20**  **Batch size = 20**  **Number of epochs = 20** | **Total Parameter: 900805**  **Training loss: 0.5954**  **Training accuracy: 0.7691 Validation loss: 6.3238**  **Validation accuracy: 0.2100** | **Clearly, model overfits.** |
| **2** | **Conv3D**  **Image size = 120X120**  **Number of frames considered = 30**  **Batch size = 15**  **Number of epochs = 10** | **Total Parameter: 900805**  **Training loss: 0.7303**  **Training accuracy: 0.7373 Validation loss: 1.5691**  **Validation accuracy: 0.4000** | **Overfit reduced, but not much.**  **Accuracy increased.** |
| **3** | **Conv3D**  **Image size = 160X160**  **Number of frames considered = 30**  **Batch size = 20**  **Number of epochs = 10** | **Total Parameter: 1736389**  **Training loss: 0.5667**  **Training accuracy: 0.8129**  **Validation loss: 4.4863**  **Validation accuracy: 0.1800** | **Overfit issue increased; training accuracy increased.** |
| **4** | **Conv3D**  **Image size = 160X160**  **Number of frames considered = 20**  **Batch size = 30**  **Number of epochs = 10** | **Total Parameter: 1940677**  **Training loss: 0.2936**  **Training accuracy: 0.9095**  **Validation loss: 4.0596**  **Validation accuracy: 0.2400** | **Overfit issue, training accuracy increased further.** |
| **Experimenting with different Conv3D models** | | | |
| **5** | **Model 1**  **Conv3D – with filter size (3,3,3)**  **Image size = 160X160**  **Number of frames considered = 20**  **Batch size = 20**  **Number of epochs = 20** | **Total Parameter: 1940677**  **Training loss: 0.2587**  **Training accuracy: 0.9140**  **Validation loss: 1.0735**  **Validation accuracy: 0.6800** | **Model still overfits** |
| **6** | **Model 2**  **Conv3D – with filter size (2,2,2)**  **Image size = 120X120**  **Number of frames considered = 20**  **Batch size = 30**  **Number of epochs = 25** | **Total Parameter: 926389**  **Training loss: 0.3017**  **Training accuracy: 0.8839**  **Validation loss: 1.1666**  **Validation accuracy: 0.6600** | **Overfitting reduced a bit but accuracy dropped** |
| **7** | **Model 3**  **Conv3D – with more conv layers added, filter size (3,3,3)**  **Image size = 120X120**  **Number of frames considered = 20**  **Batch size = 30**  **Number of epochs = 20** | **Total Parameter: 2549541**  **Training Accuracy: 0.7179 Validation Accuracy: 0.4300** | **Not much performance improvement on adding layers** |
| **8** | **Model 4**  **Conv3D – adding dropout to the previous model**  **Image size = 120X120**  **Number of frames considered = 20**  **Batch size = 30**  **Number of epochs = 15** | **Total Parameter: 2549541**  **Training loss: 0.6512**  **Training accuracy: 0.7360**  **Validation loss: 4.8674**  **Validation accuracy: 0.2300** | **Validation accuracy reduced a lot.**  **Dropout did not help in reducing overfitting.** |
| **9** | **Model 5**  **Conv3D – with reduced layers and alternate frames**  **Image size = 120X120**  **Number of frames considered = 16**  **Batch size = 20**  **Number of epochs = 25** | **Total Parameter: 504709**  **Training loss: 0.3473**  **Training accuracy: 0.8974**  **Validation loss: 0.6212**  **Validation accuracy: 0.7900** | **Overfit reduced drastically, accuracy needs to be increased further.**  **So far, looks the best model.** |
| **Trying same models 1-5 with data augmentation** | | | |
| **10** | **Model 6**  **Conv3D – with filter size (3,3,3)**  **Image size = 160X160**  **Number of frames considered = 20**  **Batch size = 20**  **Number of epochs = 20** | **Total Parameter: 1940677**  **Training Accuracy: 0.9412 Validation Accuracy: 0.8100** | **With Data Augmentation overfitting reduced a lot but needs to be brought down more.** |
| **11** | **Model 7**  **Conv3D – with filter size (2,2,2)**  **Image size = 120X120**  **Number of frames considered = 20**  **Batch size = 30**  **Number of epochs = 25** | **Total Parameter: 926389**  **Training Accuracy: 0.8560 Validation Accuracy: 0.6300** | **Model overfits even after augmentation** |
| **12** | **Model 8**  **Conv3D – with more conv layers added, filter size (3,3,3)**  **Image size = 120X120**  **Number of frames considered = 20**  **Batch size = 30**  **Number of epochs = 20** | **Total Parameter: 2549541**  **Training Accuracy: 0.8454**  **Validation Accuracy: 0.5700** | **Overfitting increased after augmentation** |
| **13** | **Model 9**  **Conv3D – adding dropout to the previous model**  **Image size = 120X120**  **Number of frames considered = 20**  **Batch size = 30**  **Number of epochs = 15** | **Total Parameter: 2549541**  **Training Accuracy: 0.8959**  **Validation Accuracy: 0.5000** | **Overfitting increased a lot, validation accuracy very poor** |
| **14** | **Model 10**  **Conv3D – with reduced layers and alternate frames**  **Image size = 120X120**  **Number of frames considered = 16**  **Batch size = 20**  **Number of epochs = 25** | **Total Parameter: 504709**  **Training Accuracy: 0.8107**  **Validation Accuracy: 0.8500** | **With augmentation model training accuracy reduced and look bit underfit** |
| **CNN+RNN model** | | | |
| **15** | **CNN LSTM model**  **Image size = 120X120**  **Number of frames considered = 20**  **Batch size = 20**  **Number of epochs = 25** | **Total Parameter: 1657445**  **Training loss: 0.0937**  **Training accuracy: 0.9834**  **Validation loss: 0.4696**  **Validation accuracy: 0.8500** | **This is the final model we selected.** |