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| --- | --- | --- | --- | --- |
| **Experiment Number** | **Model** | **Description** | **Result** | **Decision + Explanation** |
| **1** | **Conv3D** | **Epochs:- 10**  **Batch size:-8**  **Image size:-50X50**  **Parameters:-1,803,637**  **Early Stopping**  **Activation:- relu**  **Optimizer:- Adam** | **Val\_acc:- 62%**  **Acc:- 91%** | **Overfitting of train data so decided to add Normalization & reduce some neurons in some layers.** |
| **2** | **Conv3D** | **Epochs:- 29**  **Batch size:- 8**  **Image size:-50x50**  **Parameters:- 1,067,045**  **Early Stopping**  **Activation:- relu**  **Optimizer:- Adam** | **Val\_acc:- 78%**  **Acc:- 99%** | **Overfitting of train data so decided to change the model & accuracy improved but not up to the expected level.** |
| **3** | **Conv2D + LSTM** | **Epochs:- 13**  **Batch size:-8**  **Image size:-50X50**  **Parameters:-** **8,548,341**  **Early Stopping**  **Activation:- tanh**  **Optimizer:- rmsprop** | **Val\_acc:- 70%**  **Acc:- 92%** | **Overfitting of train data so decided to add Normalization & reduce some neurons in some layers.** |
| **4** | **Conv2D + LSTM** | **Epochs:- 18**  **Batch size:-16**  **Image size:-80X80**  **Parameters:- 10,118,645**  **Early Stopping**  **Activation:- tanh**  **Optimizer:- rmsprop** | **Val\_acc:- 77%**  **Acc:- 100%** | **Overfitting of train data so decided to change the model – optimizer algorithm, activation function & accuracy improved but not up to the expected level.** |
| **5** | **Conv2D + LSTM** | **Epochs:- 23**  **Batch size:-16**  **Image size:-100X100**  **Parameters:- 9,663,093**  **Early Stopping**  **Activation:- relu**  **Optimizer:- Adam** | **Val\_acc:- 79%**  **Acc:- 99.76%** | **Overfitting of train data so decided to change the model. Accuracy improved but not up to the expected level.** |
| **6** | **VGG16 + LSTM** | **Epochs:- 16**  **Batch size:-16**  **Image size:-100X100**  **Parameters:- 23,770,181**  **Early Stopping**  **Activation:- relu**  **Optimizer:- adam** | **Val\_acc:- 81%**  **Acc:- 100%** | **Best val\_accuracy still overfitting on train data. Thought of adding Normalization & reducing number of parameters.** |
| **7** | **VGG16 + LSTM** | **Epochs:- 11**  **Batch size:-32**  **Image size:-100X100**  **Parameters:- 15,485,957**  **Early Stopping**  **Activation:- relu**  **Optimizer:- adam** | **Val\_acc:- 80%**  **Acc:- 99.70%** | **Val\_acc degraded and acc is still high – looking like overfit. Now would again change the**  **Model architecture.** |
| **8** | **VGG16 + LSTM** | **Epochs:- 16**  **Batch size:-32**  **Image size:-100X100**  **Parameters:- 15,022,373**  **Early Stopping**  **Activation:- relu**  **Optimizer:- adam** | **Val\_acc:- 85%**  **Acc:- 99.78%** | **Accuracy improved but still model is overfitting the train data. This is the best model. Changed the arch & would try regularization.** |
| **9** | **VGG16 + LSTM** | **Epochs:- 12**  **Batch size:-32**  **Image size:-100X100**  **Parameters:- 15,911,957**  **Early Stopping**  **Activation:- relu**  **Optimizer:- adam** | **Val\_acc:- 35%**  **Acc:- 22%** | **Worst model, added L1 regularization.** |
| **10** | **VGG16 + LSTM** | **Epochs:- 21**  **Batch size:-32**  **Image size:-100X100**  **Parameters:- 15,911,557**  **Early Stopping**  **Activation:- relu**  **Optimizer:- adam** | **Val\_acc:- 73.21%**  **Acc:- 92.96%** | **Added both L1 & L2 regularizaton, still overfit on training data. Now would try only with L2 regularization.** |
| **11** | **VGG16 + LSTM** | **Epochs:- 19**  **Batch size:-32**  **Image size:-100X100**  **Parameters:- 15,911,557**  **Early Stopping**  **Activation:- relu**  **Optimizer:- adam** | **Val\_acc:- 85.57%**  **Acc:- 95.77%** | **Best model till now only with L2 regularize. Still overfit, now would again change the model architecture.** |
| **12** | **VGG16 + LSTM** | **Epochs:- 21**  **Batch size:-32**  **Image size:-100X100**  **Parameters:- 15,911,557**  **Early Stopping**  **Activation:- relu**  **Optimizer:- adam** | **Val\_acc:- 87.50%**  **Acc:- 99.08%** | **Removed L2 regularization, increased Dropout to 0.5.**  **Best result & it is selected.** |

Model with best val\_acc but overfitting on train data, tried multiple regularization L1, L2 & both of them with dropout, Batch Normalization in various runs still no improvement.

loss: 0.0802- categorical\_accuracy: 0.9708- val\_loss: 0.3287- val\_categorical\_accuracy: 0.8750

Early stopping at 21st epoch.

Output link:- <https://drive.google.com/drive/folders/17JVdO1bMeYpXLg62nFTK5hzB_QuG_YGT?usp=sharing>

**Accuracy Scores and loss:**



