**Write Up Document and Conclusion**

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| **Experiment Number** | **Model** | **Result** | **Decision + Explanation** |
| **1** | **Conv2D + LSTM** | **Training Accuracy=88%**  **Validation Accuracy=77%** | **Used LSTM because it is gives better accuracy but it also takes more parameters.**  **Let us use GRU and see how the model performs** |
| **2** | **Conv2D + GRU** | **Training Accuracy=90%**  **Validation Accuracy=68%** | **Accuracy is on par with LSTM**  **Let us try to decrease more parameters and train for more epochs as parameters reduced** |
| **3** | **Conv2D + GRU (Epochs = 40)** | **Training Accuracy=80%**  **Validation Accuracy=75%** | **Parameters are reduced to 1/4th.**  **Accuracy decreased a little.**  **Increased epochs as the model parameters has reduced.**  **Let us increase batch size and see how it impacts the model training.** |
| **4** | **Conv2D + GRU (Epochs = 40, Batch Size = 60)** | **Training Accuracy=59%**  **Validation Accuracy=67%** | **Accuracy reduced significantly.**  **Maybe due to batching of gradients.**  **Batch=30 seems to the better.**  **Let us try data augmentation to see if the model underfit rectifies.** |
| **5** | **Conv2D + GRU (Epochs = 40, Batch Size = 60) + Data Augmentation** | **Training Accuracy=61%**  **Validation Accuracy=66%** | **Data Augmentation did not help accuracy significantly.**  **Model is underfitting.**  **Let us try to increase the image size and see if the model captures features better.** |
| **6** | **Conv2D + GRU (Epochs = 40, Batch Size = 60, Img=(160,160)) + Data Augmentation** | **Training Accuracy=55%**  **Validation Accuracy=58%** | **Improving image size improved accuracy slightly.**  **Let us try a different architecture and see how it fares.** |
| **7** | **Conv3D + SGD** | **Training Accuracy=33%**  **Validation Accuracy=50%** | **Model Learning is having a lot of flucations.**  **This might be due to optimizer.**  **But let us do a few more experiments before changing optimizer.**  **Model is underfitting so let us try data augmentation** |
| **8** | **Conv3D + SGD + Data Augmentation** | **Training Accuracy=37%**  **Validation Accuracy=49%** | **Model Learning is having a lot of flucations.**  **Data Augmentation did not help much.**  **Model is underfitting.**  **Let us increase image size and see if we can capture more features.** |
| **9** | **Conv3D + SGD + Data Augmentation + Imagesize 160** | **Training Accuracy=46%**  **Validation Accuracy=33%** | **Model is still underfitting**  **Learning is fluctuating**  **Let us change the optimizer to ADAM and run the same experiments** |
| **10** | **Conv3D + ADAM Optimizer** | **Training Accuracy=79%**  **Validation Accuracy=73%** | **Fluctuation decreased**  **Accuracy improved significantly**  **let us add data augmentation and see how the model behaves** |
| **11** | **Conv3D + ADAM + Data Augmentation** | **Training Accuracy=82%**  **Validation Accuracy=66%** | **Model is training properly**  **Let us increase image size and try to furthur improve accuracy** |
| **12** | **Conv3D + ADAM + Data Augmentation (ImageSize=160)** | **Training Accuracy=73%**  **Validation Accuracy=70%** | **Model is still converging.**  **Let us try for few more epochs** |
| **13** | **Conv3D + ADAM + Data Augmentation (ImageSize=160, Epochs=50)** | **Training Accuracy=81%**  **Validation Accuracy=68%** | **Best Model**  **Similar accuracy as of 5 Million parameter Model** |