Problem statement:

A home electronics company which manufactures state of the art smart televisions. It wants to develop a cool feature in the smart-TV that can recognise five different gestures performed by the user which will help users to control the TV. The gestures are continuously monitored by the webcam mounted on the TV. Each gesture corresponds to a specific command:

* Thumbs up: Increase the volume
* Thumbs down: Decrease the volume
* Left swipe: 'Jump' backwards 10 seconds
* Right swipe: 'Jump' forward 10 seconds
* Stop: Pause the movie

Each video is a sequence of 30 frames (or images).

Approach:

To identify the gesture, a number of experiments were conducted. Models were trained with different image sizes (for ex: 120x120, 150x150) with different number of epochs and varying batch sizes. Common architectures used during training the model were:

1. Conv3d architecture
2. LSTM architecture
3. GPU architecture.

A number of models were built by using the above architectures. Results and outcomes are listed below with Decision and explanation.

Output:

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| --- | --- | --- | --- |
| Exp. Nb. | Model | Result | Decision/Explanation |
| **Approach:**   * In initial 3 runs, model was trained with varying number of batch sizes, epochs to see the better fit of hyperparameters. | | | |
| 1 | Conv3D  Image size: 120  Batch size: 40  epochs: 15 | Accuracy:  Training: 87.89  Validation: 28.83  Validation loss: 5.5734 | Initial run to see if architecture works. In initial run model should overfit. |
| **2** | Conv3D:  Image size: 120  Batch size: 40  epochs: 25 | Accuracy:  Training: 88.93  Validation: 50.00  Validation loss: 2.33 | As the model was trained with more number of epochs model performed better. Training, validation accuracy went up and validation loss improved as well. |
| **3** | Conv3D:  Image size: 120  Batch size: 30  epochs: 25 | Accuracy:  Training: 66.67  Validation: 67.50  Validation loss: 1.12 |  |
| **5** | Conv3D:  Image size: 120  Batch size: 50  epochs: 25 | Accuracy:  Training: 74.18  Validation: 21.33  Validation loss: 3.6693 |  |
| Approach:   * Model was trained with image size: 150 and different | | | |
| **4** | Conv3D:  Image size: 150  Batch size: 40  epochs: 25 | Accuracy:  Training: 87.54  Validation: 1.98  Validation loss: 55.00 |  |
| **6** | Conv3D:  Image size: 150  Batch size: 50  epochs: 25 | Resource exhaustion (OOM) |  |
| **7** | Conv3D:  Image size: 120  Batch size: 40  epochs: 50 | Accuracy:  Training: 88.58  Validation: 85.00  Validation loss: 0.5372 |  |
| **8** | Conv3D:  Image size: 150  Batch size: 40  epochs: 50 | Accuracy/Loss:  Training: 84.43  Validation: 0.3772  Validation loss: 85.00 |  |
| **9** | Conv3D:  Image size: 120  Batch size: 40  epochs: 25 | Accuracy/Loss:  Training: 70.93  Validation: 35.00  Validation loss:11.48 |  |
| **10** | Conv3D:  Image size: 120  Batch size: 40  epochs: 25 | Accuracy/Loss:  Training: 89.97  Validation: 35.00  Validation loss: 2.0271 |  |
| **11** | Conv3D: (SGD)  Image size: 120  Batch size: 40  epochs: 50 | Accuracy/Loss:  Training: 81.31  Validation: 0.5227  Validation loss: 85.00 |  |
| **12** | Conv2D & LSTM:  Image size: 120  Batch size: 40  epochs: 50 | Accuracy/Loss:  Training: 88.93  Validation: 75.00  Validation loss: 0.6490 |  |
| **13** | Conv3D:  Image size: 120  Batch size: 40  epochs: 50 | Accuracy/Loss:  Training: 97.58  Validation: 81.67  Validation loss: 0.5572 |  |
| **14** | Conv3D: (Data augmentation)  Image size: 120  Batch size: 40  epochs: 50 | Accuracy/Loss:  Training. : 80.97  Validation: 81.67  Validation loss: 0.4966 |  |