GESTURE RECOGNITION PROJECT

WRITE UP

Experiment No	Model	Result	Explanation + Decision
1	Model 1	- Early Stopping: Epoch 12 - Training: Loss 0.1273, Accuracy 0.9744 - Validation: Loss 3.5751, Accuracy 0.2400 - Learning Rate: 4.0000e-05 - Key Point: High validation loss indicated overfitting.	Early stopping due to high validation loss, leading to no significant improvement in performance.
2	Model 2	- Early Stopping: Epoch 11 - Training: Loss 0.6069, Accuracy 0.7707 - Validation: Loss 3.6885, Accuracy 0.2750 - Learning Rate: 4.0000e-05 - Key Point: Dropout layers did not help reduce overfitting.	Adding dropout layers didn't improve the model performance; high validation loss persisted.
3	Model 3	- Early Stopping: Epoch 11 - Training: Loss 1.0581, Accuracy 0.6267 - Validation: Loss 6.2510, Accuracy 0.2000 - Learning Rate: 8.0000e-06 - Key Point: Reduced filter size and image resolution worsened performance.	Reduced filter size and image resolution led to poor results; high validation loss and low accuracy.
4	Model 4	- Early Stopping: Epoch 11 - Training: Loss 0.9552, Accuracy 0.6327 - Validation: Loss 2.6849, Accuracy 0.2917 - Learning Rate: 4.0000e-05 - Key Point: Added layers did not improve validation accuracy.	Adding more layers didn't significantly improve the accuracy; high validation loss remained.
5	Model 5	- Early Stopping: Epoch 11 - Training: Loss 0.5151, Accuracy 0.8100 - Validation: Loss 4.8095, Accuracy 0.3083 - Learning Rate: 4.0000e-05 - Key Point: Dropout at convolution layers led to higher validation loss.	Adding dropout at convolution layers resulted in higher validation loss; moderate improvement in accuracy.
6	Model 6	- Early Stopping: Epoch 11 - Training: Loss 0.6979, Accuracy 0.7315 - Validation: Loss 4.3904, Accuracy 0.2917 - Learning Rate: 8.0000e-06 - Key Point: Reduced parameters continued to overfit, with poor validation accuracy.	Reduced the number of parameters but continued to overfit with poor validation accuracy.
7	Model 7	- Early Stopping: Epoch 11 - Training: Loss 0.7155, Accuracy 0.7247 - Validation: Loss 2.9665, Accuracy 0.2667 - Learning Rate: 8.0000e-06 - Key Point: Slight improvement but continued overfitting.	Further reduction in parameters showed a slight improvement but still resulted in overfitting.
8	Model 8 (CNN-LSTM)	- Early Stopping: Epoch 11 - Training: Loss 0.4168, Accuracy 0.8371 - Validation: Loss 1.9206, Accuracy 0.3250	Switching to a CNN-LSTM model with data augmentation provided

		- Learning Rate: 4.0000e-05 - Key Point: Better results with CNN-LSTM, but moderate validation accuracy.	better results, but validation accuracy remained moderate.
9	Model 9	- Early Stopping: Epoch 20 - Training: Loss 0.5129, Accuracy 0.8115 - Validation: Loss 0.7902, Accuracy 0.7400 - Learning Rate: 1.6000e-06 - Key Point: Significant improvement in validation accuracy due to augmentation.	Augmentation significantly improved validation accuracy, showing a strong balance between training and validation metrics.
10	Model 10	- Early Stopping: Epoch 25 - Training: Loss 0.6707, Accuracy 0.7474 - Validation: Loss 1.7496, Accuracy 0.4800 - Learning Rate: 6.4000e-08 - Key Point: Moderate validation accuracy, high validation loss.	Despite augmentation, the model showed moderate validation accuracy with substantial validation loss.
11	Model 11	- Early Stopping: Epoch 25 - Training: Loss 0.5279, Accuracy 0.8039 - Validation: Loss 0.6403, Accuracy 0.8200 - Learning Rate: 1.6000e-06 - Key Point: High validation accuracy with slightly higher validation loss.	Adding more layers resulted in high validation accuracy but with a slightly higher validation loss.
12	Model 12	- Early Stopping: Epoch 25 - Training: Loss 0.6924, Accuracy 0.7345 - Validation: Loss 4.6038, Accuracy 0.3000 - Learning Rate: 6.4000e-08 - Key Point: Poor generalization, high validation loss with dropout usage.	The model showed poor generalization with high validation loss despite using dropouts.
13	Model 13	- Early Stopping: Epoch 25 - Training: Loss 0.4257, Accuracy 0.8462 - Validation: Loss 0.7159, Accuracy 0.7600 - Learning Rate: 1.6000e-06 - Key Point: Best balance between validation accuracy and loss.	Model 13 provided the best balance with effective generalization, achieving good validation accuracy and low validation loss.
14	Model 14	- Early Stopping: Epoch 25 - Training: Loss 0.4962, Accuracy 0.8341 - Validation: Loss 0.8896, Accuracy 0.7200 - Learning Rate: 1.6000e-06 - Key Point: Slightly lower validation accuracy and higher validation loss compared to Model 13.	Although similar to Model 13, it had a slightly higher validation loss and slightly lower validation accuracy.
15	Model 15	- Early Stopping: Epoch 25 - Training: Loss 0.3995, Accuracy 0.8552 - Validation: Loss 0.8231, Accuracy 0.7400 - Learning Rate: 1.6000e-06 - Key Point: Slightly higher validation loss compared to Model 13.	Despite slight improvements in training accuracy, Model 13 performed better in terms of validation accuracy and loss.

CONCLUSION

In this series of experiments, several models were evaluated to identify the best performing architecture for the task. The key findings are summarized as follows:

- **Overfitting**: Models 1 to 7 exhibited significant overfitting, with high validation loss and poor accuracy, despite various attempts to adjust the parameters and architecture.
- **Model Performance**: Models 8 to 12 showed improvements, particularly when using augmentation techniques and adjusting the learning rate. However, results were inconsistent, with some models still experiencing high validation loss.
- **Best Performance**: Model 13 emerged as the most balanced model, demonstrating the best trade-off between training and validation metrics. It achieved a notable improvement in validation accuracy while maintaining a low validation loss. Models 14 and 15, while close, did not surpass Model 13 in overall performance.

Model 13 stands out for its effective generalization, making it the preferred choice for further development and deployment.