Task 2: Perform the FTA(Fault Tree analysis) and design the fault tree for the model called American Sign Language classification. (You can take the example of Fault Tree from the Lecture 12 PPT)
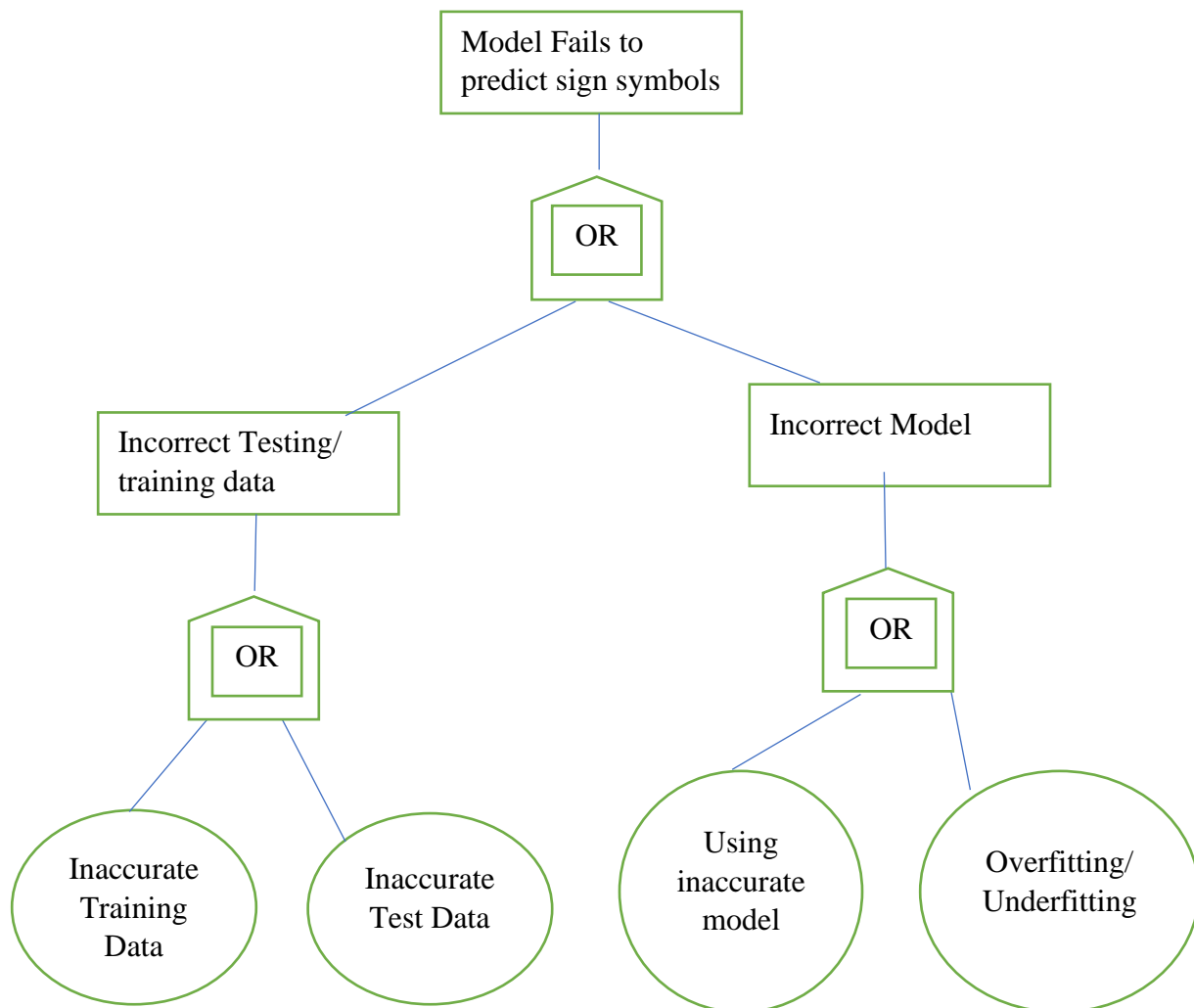
Fault tree Analysis:

REQ: Model fails to detect sign symbols correctly

SPEC: The model is not trained properly; training data is not accurate.
ENV: Incorrect test data is collected for prediction, and incorrect training data is collected.

FTA Analysis for American Sign Language:

## Task 3: Write the analysis of the code and explanation of the fault tree.

Firstly, we are loading ASL classification images for each sign symbol, then we display sample images for each label. Then we process the data for training and testing. We are using the CNN model for training. We use adam optimizer and compile the model. We finally fit the model in 5 epochs. We print the model metrics like accuracy etc, Here the accuracy is around 88%. Once the training is completed, we use the test data to test the model. We finally print the actual and predicted values and print the images as well. All the images were correctly predicted except one. This model can be used to predict sign language symbols accurately.

The fault tree shown above is for the cases when the model cannot predict the symbols accurately. This occurs especially when training or testing data is inaccurate or when the model parameters are not up to the mark.

## Task 4: Perform any machine learning task and make a fault tree analysis for that with an explanation of the fault tree.

Firstly, we are loading minist images from Keras for text recognition, then we display sample images. Then we process the data for training and testing. We are using the K-means model for training with a cluster size of 10. We normalize the data and compile the model. We finally fit the model. We print the model metrics like accuracy etc, Here the accuracy is around 56%. Once the training is completed, we use the test data to test the model. We finally print the actual and predicted values.

The fault tree shown below is for the cases when the model cannot predict the symbols accurately. This occurs especially when training or testing data is inaccurate or when the model parameters are not up to the mark.

Fault tree Analysis:

REQ: Model fails to detect text correctly

SPEC: The model is not trained properly; training data is not accurate.
ENV: Incorrect test data is collected for prediction, and incorrect training data is collected.

FTA Analysis for Text recognition:

```
                        ┌─────────────────────┐
                        │ Model Fails to predict │
                        │ text correctly        │
                        └─────────────────────┘
                                 │
                              ⬠ OR
                            ╱        ╲
                          ╱            ╲
         ┌──────────────────┐      ┌──────────────────┐
         │ Incorrect Testing/ │      │ Incorrect Model  │
         │ training data      │      └──────────────────┘
         └──────────────────┘               │
                 │                        ⬠ OR
              ⬠ OR                      ╱      ╲
            ╱      ╲                  ╱          ╲
          ╱          ╲          ╭────────╮    ╭────────────╮
    ╭──────────╮  ╭──────────╮  │ Using   │    │ Overfitting/ │
    │ Inaccurate │  │ Inaccurate │  │inaccurate│    │ Underfitting │
    │ Training   │  │ Test Data  │  │ model   │    ╰────────────╯
    │ Data       │  ╰──────────╯  ╰────────╯
    ╰──────────╯
```