

Scenario 1: Image Classification Model Overfits Quickly:

You're training a CNN to classify dog breeds. You achieve 98% accuracy on training data within 5 epochs, but validation accuracy stays at 60%, and test performance is poor.

Logical Solution:

Problem: Training accuracy 98% in 5 epochs, but validation only 60% → Poor test results.

Cause: Small dataset or model too complex.

Fixes:

1. Add **Dropout + BatchNorm**
2. Use **Data Augmentation**
3. Apply **Early Stopping**
4. Use **Transfer Learning (VGG16, ResNet)**

Scenario 2: ANN Fails to Learn Non-Linear Patterns

Project: Simple digit classification using **Artificial Neural Network (ANN)**

Problem: Accuracy stuck around 50%; adding more epochs doesn't improve performance.

Logical Solution:

Problem: Accuracy stuck at 50%, even after many epochs.

Cause: ANN cannot extract image features properly.

Fixes:

1. Replace ANN → **Use CNN**
2. Normalize input images
3. Use **ReLU** instead of sigmoid
4. Increase depth (Conv + Pooling layers)

Scenario 3: CNN Model Predicts Same Class for All Images

Project: Face Mask Detection using **CNN**

Problem: Model always predicts "With Mask" for every test image.

Logical Solution:

Problem: Model always predicts "**With Mask**".

Cause: Dataset is imbalanced.

Fixes:

1. Use **class weights**
2. **Oversample** minority class
3. Check **confusion matrix**, not accuracy
4. Balance training data

Scenario 4: Object Detection Model Detects Objects but Bounding Boxes Are Misaligned

Project: YOLOv8 used for Tiger Detection in Forest

Problem: Bounding boxes do not fit objects properly.

Logical Solution:

Problem: Boxes don't fit objects properly.

Cause: Wrong labeling format.

Fixes:

1. Use correct YOLO format:
`(class_id, x_center, y_center, width, height) normalized`
2. Visualize labels (Roboflow, CVAT)
3. Fix wrongly annotated images

Scenario 5: Face Mask Detection Gives High Accuracy but Performs Poorly on Real Faces

Project: Real-time Face Mask Detection using CNN

Problem: High accuracy on test set, but poor real-time performance on webcam feed.

Logical Solution:

Problem: Real-time accuracy is low despite high test accuracy.

Cause: Webcam images differ (lighting, angles, blur).

Fixes:

1. Add **augmentation**: brightness, rotation, flip
2. Collect real webcam samples
3. Fine-tune the model on real-world data

Scenario 6: CNN-Based Object Detector Struggles at Night

Project: YOLOv8-based object detection in CCTV

Problem: Model doesn't detect objects in dark/night images.

Logical Solution:

Problem: Model doesn't detect objects in dark scenes.

Cause: Training data didn't include night images.

Fixes:

1. Add **night/low-light images** to training set
2. Augment brightness/contrast
3. Use **Histogram Equalization / CLAHE**