PROBLEM STATEMENT 09:

Detect Pixelated Image and Correct It

Category: Artificial Intelligence, Machine Learning, Deep Learning, Autonomous Driving

Participants: 1st-4th Semester Students

Prerequisites:

- Concepts in Machine Learning
- Programming Skills (Python)
- Deep Learning - Train/Validate/Test with Data

Description:

The problem has two parts – one is image classification and the other is image generation.

1. Given an Image, check if it is blocky or pixelated. Pixilation means blurry, blocky squares you see when an image is zoomed too much. Design an algorithm that can detect whether the image is pixelated or not. The challenge is to design an algorithm or ML/AI model, which is extremely lightweight or computationally efficient such that we can run this algorithm at 60 Hz or 60 frames per sec (FPS) and must be minimum 90% accurate. The pixelated images are rare and hence the algorithm should not create too many false positives. Algorithm / model quality will be measured by F1-score, precision recall curve etc. Also, the algorithm should be able to work on 1080p resolution input with same performance. It is ok to downscale the large image to any desired input size to work on large images.

    a. Input Image Size: 1920x1080 (it's ok to downscale and feed into the algorithm/model).

    b. Inference Speed Target: Min 30Hz, better to have 60 Hz.

    c. Accuracy Metric: F1 Score/Precision Recall.

    d. Should work in rare class scenario: if only one in 1000 images are pixelated then the algorithm must predict at most 10% False Positives.

2. Given a pixelated image, design an algorithm to improve the quality of the image i.e., restore the lost information. This problem is also known as jpeg restoration. Here also the challenge is to design a highly efficient algorithm that can run at least at 20 FPS. The quality of restoration can be examined by comparing with ground truth image using any metric like LPIPS, PSNR etc. If a non-pixelated image is given then the algorithm should not enhance it and leave it intact. Algorithm should work on 1080p resolution images.

Outcomes:

- Create a report citing data sources, detailed algorithm description and working source code. If mentor can give an image as a reference then it will be good.