# Computer Vision Assignment 1

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March 31, 2024

## Colab link

https://colab.research.google.com/drive/145iYNqURwd5yycEXXAHH5IurkkE0PmLI?usp=sharing

## 1 Question 1

Harris Corner detection is a widely used technique in computer vision for identifying key features in images. This report outlines the implementation and evaluation of the Harris Corner detection algorithm.

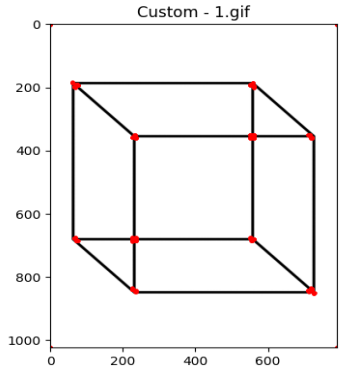
### 1.1 Methodology

- Implement the Harris Corner detection algorithm from scratch.
- Adjust parameters such as window size and threshold value to optimize corner detection performance.

### 1.2 Results

- The implemented Harris Corner detection algorithm successfully identifies corners in images.
- Adjusting parameters like window size and threshold improves the accuracy of corner detection.
- Comparison with OpenCV's corner detection libraries provides insights into the algorithm's performance.

Implementing the Harris Corner detection algorithm from scratch, optimizing parameters, and comparing it with OpenCV's libraries demonstrate its effectiveness in corner detection tasks. Fine-tuning parameters enhance its versatility and applicability in various computer vision applications.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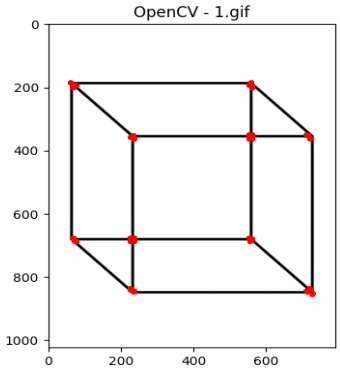
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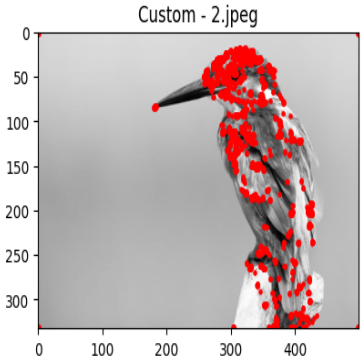
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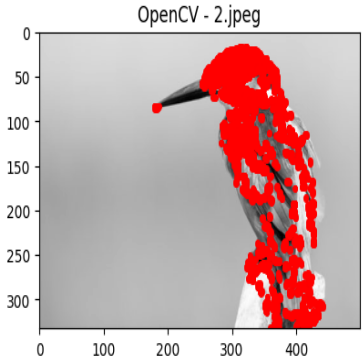
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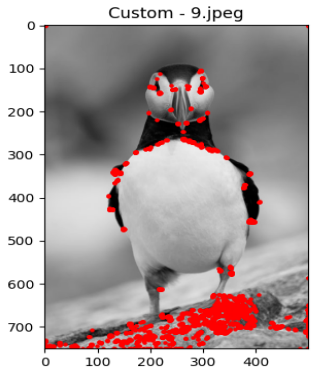
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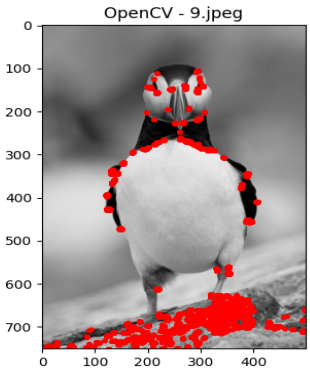
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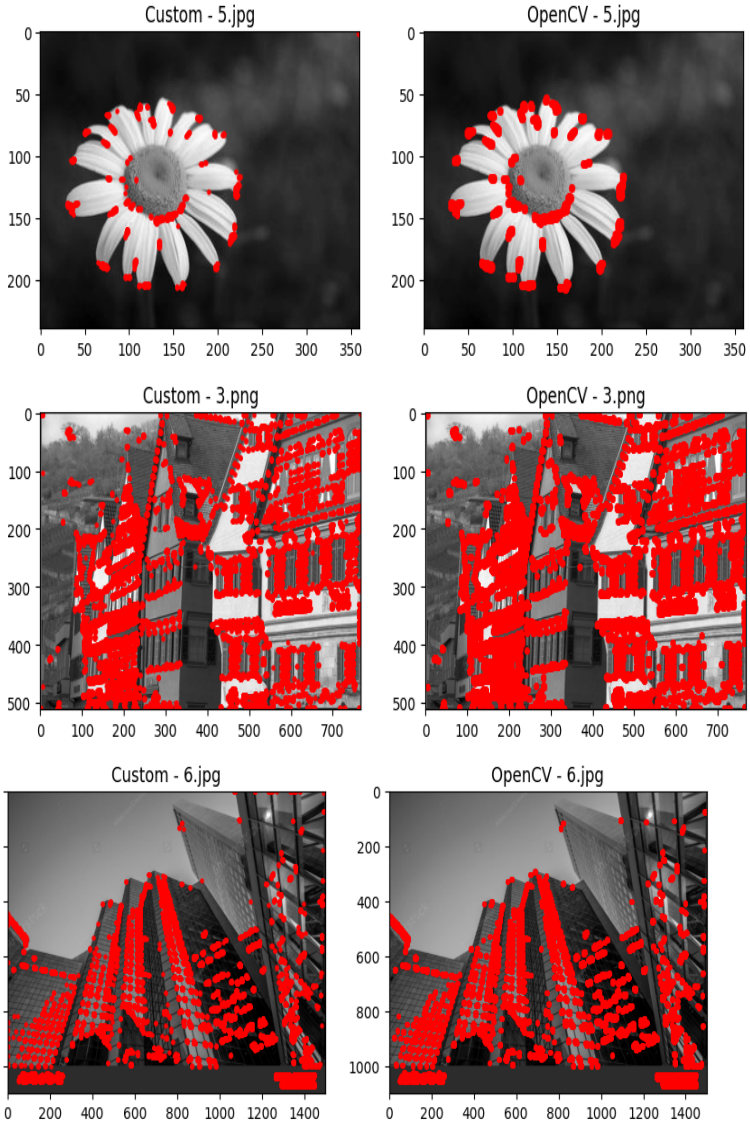
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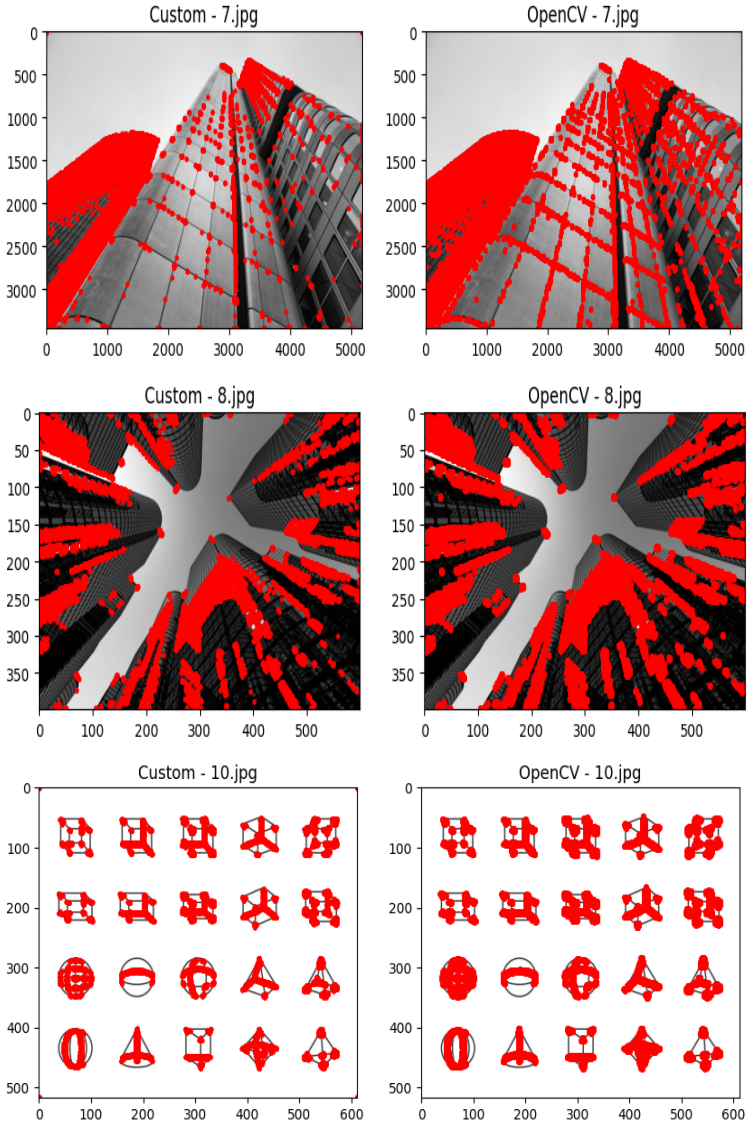
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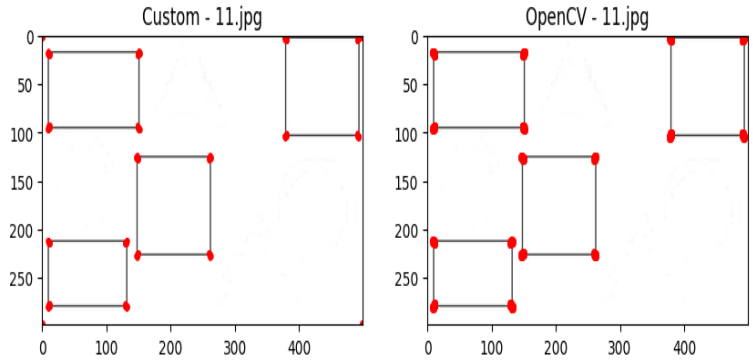



# 2 Question 2

Stereo 3D reconstruction extracts 3D information from stereo images. We analyze stereo images of a scene captured by a stereo camera system with known intrinsic matrices.

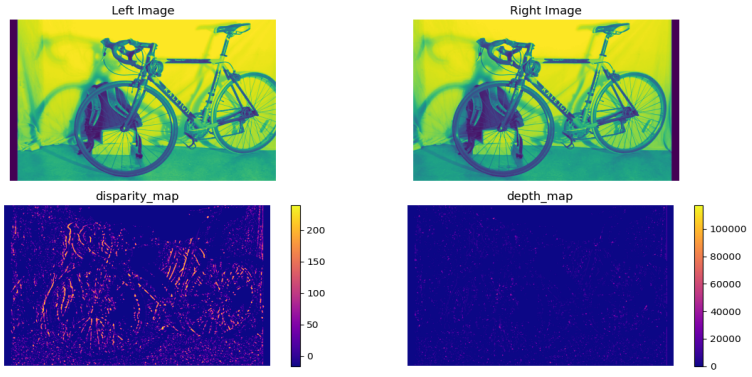
## 2.1 Methodology

- Load stereo images and camera calibration data.
- Compute the disparity map using stereo matching algorithms.
- Convert disparity to depth map using camera parameters.
- Generate 3D point cloud by triangulating corresponding pixels.

## 2.2 Results

- Disparity map reveals depth variations in the scene.
- Depth map provides distance information for each pixel.
- 3D point cloud represents scene geometry in 3D space.

Stereo 3D reconstruction offers valuable insights into scene geometry from stereo images. Precise implementation enables accurate depth estimation and spatial understanding of the scene.




# 3 Question 3

Epipolar geometry analysis involves understanding the relationship between two images of a static scene captured from a single camera using the Fundamental matrix.

## 3.1 Methodology

- Load images I1 and I2 and the Fundamental matrix F.
- Use F to find epipolar lines in both images.
- Draw epipolar lines on both images.
- Sample 10 uniformly spaced pixels on the epipolar line in the first image and find corresponding pixels on the second epipolar line.
- Repeat the process for the epipolar line in the second image.

## 3.2 Results

- Epipolar lines provide visual cues for matching points between images.
- Corresponding pixels on epipolar lines establish point correspondences, aiding in stereo matching.

Epipolar geometry analysis using Fundamental matrix facilitates point correspondence estimation between images captured from a single camera. Implementing this method enables efficient and accurate stereo matching, crucial for various computer vision tasks.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