Image Processing

Image Variation

Occlusion happens when parts of an object in an image are hidden or covered by other objects, making it harder for algorithms to detect or recognize them.

For example, in a photo of overlapping objects, some parts may be invisible due to occlusion.

Natural Occlusion

Illumination/ Exposure

Illumination

- Refers to the amount and quality of light falling on a scene or object.
- Affects how clearly and brightly an object is visible.
- Types include:
    - Natural illumination: Sunlight or moonlight.
    - Artificial illumination: Light from bulbs, LEDs, etc.

- Plays a key role in image clarity, shadows, and color perception.

Exposure

- Refers to the amount of light that reaches the camera sensor or film.
- Controlled by three settings in photography:
    1. Shutter Speed: Duration the camera's shutter is open.
    2. Aperture: Size of the lens opening.
    3. ISO: Sensitivity of the camera sensor.
- Proper exposure ensures the image is neither too bright **(overexposed)** nor too dark **(underexposed)**.

At night the camera, stops taking RGB image, whereas it turns into Greyscale image by using infrared rays mode.

Scale Variation

Scale variation refers to the difference in the apparent size of objects in an image or scene due to changes in their distance from the camera or observer

Camera angle is far

Camera angle is too close

Examples of Scale Variation:

1. Real-world Objects:
    - A car far away from the camera appears smaller, while the same car closer to the camera looks larger.
2. Image Datasets:

- In object detection or recognition tasks, objects of the same class (e.g., faces, animals) may appear at different scales depending on their position in the image or scene.

Background Variation

Background variation refers to changes in the background of an image or scene that can affect the performance of image processing or machine learning algorithms.

Pose Variation

Pose variation refers to changes in the orientation or position of an object or subject within an image or scene.

Noise

Noise in an image refers to random variations in pixel values, typically caused by factors like sensor imperfections, environmental conditions, or transmission errors.