

What is Computer Vision?

- Computer Vision, often abbreviated as CV, is defined as a field of study that seeks to develop techniques to help computers “see” and understand the content of digital images such as photographs and videos.
- It's a field of Artificial Intelligence and Computer Science. It's concerned with the automatic extraction, analysis, and understanding of useful information from a single image or a sequence of images.

How does it work?

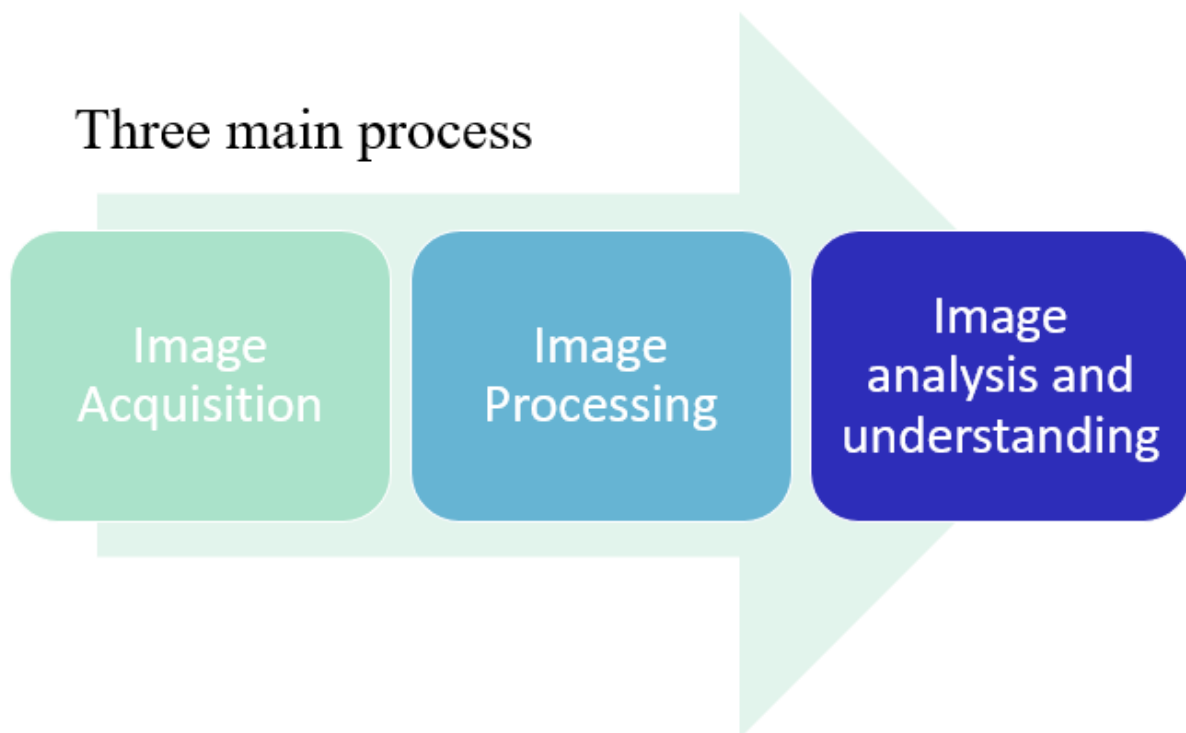


Image acquisition

- Image acquisition is the process of translating the world around us into binary data that composed of zeros and ones, interpreted as digital images.
- A digital image is produced by one or several image sensors, which, besides various types of light-sensitive cameras, include range sensors, tomography devices, radar, ultrasonic cameras, etc.

Image processing

- In this process, algorithms are applied to the binary data acquired in the first step to infer low-level information on parts of the image.
- This type of information is characterized by image edges, point features or segments, for example.
- This second step usually involves advanced applied mathematics algorithms and techniques. These are –Edge detection, Segmentation, Classification, Feature detection, and matching.

Image processing- High-level processing

- At this step, the input is typically a small set of data, for example, a set of points or an image region which is assumed to contain a specific object.
- The remaining processing deals with, for example -
- Verification that the data satisfy model-based and application-specific assumptions.
- Estimation of application specific parameters, such as object pose or object size.
- Image recognition - classifying a detected object into different categories.
- Image registration - comparing and combining two different views of the same object.

Image analysis and understanding

- The last step of the Computer Vision pipeline is the actual analysis of the data, which will allow the decision making. High-level algorithms are applied, using both the image data and the low-level information computed in previous steps.
- Decision making. Making the final decision required for the application.
- Example -
- Pass/fail on automatic inspection applications
- Match / no-match in recognition applications

Computer Vision and Nearby Fields

- Computer Graphics: Models to Images
- Comp. Photography: Images to Images
- Computer Vision: Images to Models

Computer Vision and Image Processing

Computer vision is distinct from image processing.

Image processing is the process of creating a new image from an existing image, typically simplifying or enhancing the content in some way.

It is a type of digital signal processing and is not concerned with understanding the content of an image.

A given computer vision system may require image processing to be applied to raw input, e.g. pre-processing images.

Examples of image processing include:

- Normalizing photometric properties of the image, such as brightness or color.
- Cropping the bounds of the image, such as centering an object in a photograph.
- Removing digital noise from an image, such as digital artifacts from low light levels.