CHAPTER 1 REVIEW NOTES

Computer Vision - Master IPS

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I Computer Vision

I.1 What is Computer Vision?

Computer vision is a broader field that enables computers to understand, interpret, and make decisions based on visual data (images or videos). It goes beyond image processing by seeking to extract meaningful information and make sense of the visual content, often in a way similar to how humans perceive the world. Some common tasks in computer vision include:

- **Object recognition**: Identifying and classifying objects within an image.
- **Object tracking**: Following the movement of objects across multiple frames (in video).
- **Scene reconstruction**: Creating 3D models from 2D images.
- **Facial recognition**: Identifying faces in images and videos.
- **Action recognition**: Identifying actions or events happening in a sequence of images.

Goal
The goal of computer vision is to enable a machine to ”see” and understand what is happening in the visual environment and make decisions or predictions based on that understanding.

II Image Processing

II.1 What is Image Processing?

Image processing refers to the manipulation of images to enhance or extract useful information from them. The primary focus is on improving the image quality or preparing it for further analysis. Image processing includes tasks such as:

- **Filtering**: Removing noise, blurring, sharpening, etc.
- **Edge detection**: Identifying boundaries of objects.
- **Transformation**: Rotating, resizing, cropping, or changing color space.
- **Enhancement**: Improving the quality, contrast, or brightness of the image.

Goal
The goal of image processing is to make an image more suitable for human perception or other algorithms to work on. It focuses on altering the image itself.

III Difference Between Image Processing and Computer Vision

a. Scope: Image processing focuses mainly on the modification or enhancement of images, while computer vision is about understanding the content in images.

b. End Goal: Image processing aims to make images ready for analysis (like cleaning or extracting features), while computer vision focuses on interpreting and making sense of the visual information, often for decision-making.

IV Which one come first?

In the typical workflow of working with images, image processing comes first. Here's why:

- **Preprocessing Step**: In computer vision tasks, images often need to be preprocessed to remove noise, improve clarity, and make them more suitable for analysis. This is where image processing techniques like filtering, resizing, and edge detection are used.
- **Feature Extraction**: Image processing can extract important features from an image (such as edges or color histograms), which are then used in computer vision algorithms for tasks like object recognition or classification.
- **Accuracy**: Image processing helps ensure the quality of the image is high enough for the more complex tasks of computer vision to be successful.

Summary
In summary, image processing prepares the image for further analysis, and computer vision takes the processed image and interprets it to understand its contents.