

Chapter 8: Computer Vision

Grade VII • Notebook Notes

Topics: Artificial Intelligence • Computer Vision • Applications of Computer Vision

Learning Goal: Understand how Artificial Intelligence can work with visual information such as images and videos, and identify common applications of Computer Vision.

1. What is Artificial Intelligence?

Artificial Intelligence (AI) is a field of computer science concerned with creating systems that can perform tasks that involve capabilities associated with human intelligence, such as recognising patterns, understanding language, making predictions and making decisions.

Examples of AI around us: voice assistants, recommendation systems, spam filters, language translation and image-recognition systems.

2. What is Computer Vision?

Computer Vision is a branch of Artificial Intelligence that enables computers to process, analyse and understand information from images and videos.

In simple words, **Computer Vision helps a computer understand what is present in a picture or video.**

Example:

If a camera captures an image containing a cat, a Computer Vision system may analyse the image and identify that an object in it is a cat.

3. Human Vision and Computer Vision

Human Vision	Computer Vision
Eyes receive light and form visual information.	A camera or sensor captures an image or video.
The brain processes visual information.	A computer processes digital visual data.
The brain recognises objects and patterns.	AI models can recognise objects and patterns.

4. How Does Computer Vision Work?

A Computer Vision system generally follows a sequence of steps. The exact process depends on the application and the AI model being used.

- **Capture:** A camera or another sensor captures an image or video.
- **Input:** The visual information is provided to the computer.
- **Processing:** The system prepares and processes the image data.
- **Analysis:** An AI model looks for useful features, patterns or objects.
- **Result:** The system produces an output, such as identifying an object, detecting movement or classifying an image.

5. Important Computer Vision Tasks

Task	Meaning	Example
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Image Classification	Assigns an image to a category.	Cat / dog classification
Object Detection	Finds and identifies objects in an image.	Detecting cars in traffic
Face Detection	Detects the presence and location of faces.	Finding faces in a photograph
Image Segmentation	Divides an image into meaningful regions.	Separating a person from the background
Optical Character Recognition (OCR)	Extracts printed or handwritten text from images.	Reading text from a scanned document

6. Computer Vision in Factories

Factories can use cameras and Computer Vision systems to inspect products and processes.

- Checking products for visible defects.
- Counting objects on a production line.
- Checking whether components are correctly positioned.
- Monitoring machines and work areas.
- Helping robots locate and handle objects.

7. Computer Vision in Healthcare

Computer Vision can assist healthcare professionals by analysing medical images. For example, AI systems can help identify patterns in X-rays, CT scans or other medical images.

Important: Such systems are tools to assist trained professionals; their results should be evaluated appropriately rather than accepted blindly.

8. Computer Vision in Transport

- Detecting vehicles and pedestrians.
- Reading road signs and markings.
- Supporting driver-assistance systems.
- Monitoring traffic conditions.
- Helping autonomous vehicles perceive their surroundings.

9. Computer Vision in Everyday Life

Application	How Computer Vision may be used
Google Lens	Identifying objects, reading text and finding information related to an image.
Face unlock	Detecting and comparing facial features for device access.
Photo applications	Grouping or searching photographs based on visual content.
Document scanning	Recognising text in photographed or scanned documents.
Security cameras	Detecting people, vehicles or other events.

10. Advantages of Computer Vision

- Can process large numbers of images or video frames quickly.
- Can automate repetitive visual inspection tasks.
- Can help humans detect patterns that are difficult to notice manually.

- Can operate continuously when appropriate hardware and software are available.
- Can support applications in many different fields.

11. Limitations and Challenges

- Poor lighting, blur or poor image quality can affect results.
- A system may make incorrect predictions.
- Training data may be incomplete or biased.
- Privacy can be a concern when cameras collect information about people.
- AI results should be checked when mistakes could cause harm.

12. Computer Vision and Robotics

Computer Vision gives robots a way to obtain visual information about their surroundings. A robot can use cameras and Computer Vision to detect objects, estimate their position or identify visual patterns.

Example: A warehouse robot can use vision to locate a package and move towards it.

13. Key Terms

Term	Meaning
Artificial Intelligence	A field of computing concerned with systems that perform tasks involving capabilities associated with intelligence.
Computer Vision	A branch of AI that processes and analyses images and videos.
Image Classification	Assigning an image to a category.
Object Detection	Locating and identifying objects in an image.
OCR	Recognising text from an image or scanned document.
Image Segmentation	Dividing an image into meaningful regions.

14. Quick Revision

- Computer Vision is a branch of Artificial Intelligence.
- It enables computers to process and understand visual information.
- Common tasks include classification, object detection, face detection, segmentation and OCR.
- Computer Vision is used in factories, healthcare, transport, security, education and everyday applications.
- Computer Vision can support robots by helping them perceive objects and surroundings.
- Accuracy, privacy, bias and safety are important when using Computer Vision systems.

15. Practice Questions

1. What is Artificial Intelligence?
2. What is Computer Vision?
3. How is human vision similar to Computer Vision?
4. Name any three tasks performed by Computer Vision systems.
5. How is Computer Vision used in factories?
6. How can Computer Vision be useful in healthcare?

7. Mention two uses of Computer Vision in transport.
8. How can Google Lens be useful in real-life situations?
9. What is OCR?
10. Mention two limitations or challenges of Computer Vision.

Notebook Tip: Draw a simple flow diagram for Computer Vision: **Camera/Image** → **Processing** → **AI Model** → **Analysis** → **Result**.