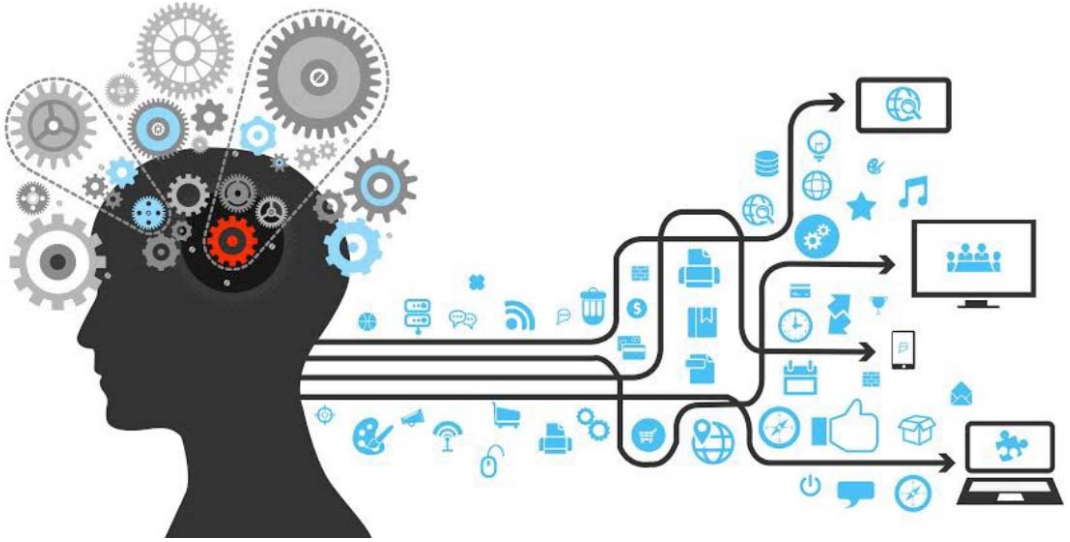
Computer Vision

Introduction



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Education and academic appointments

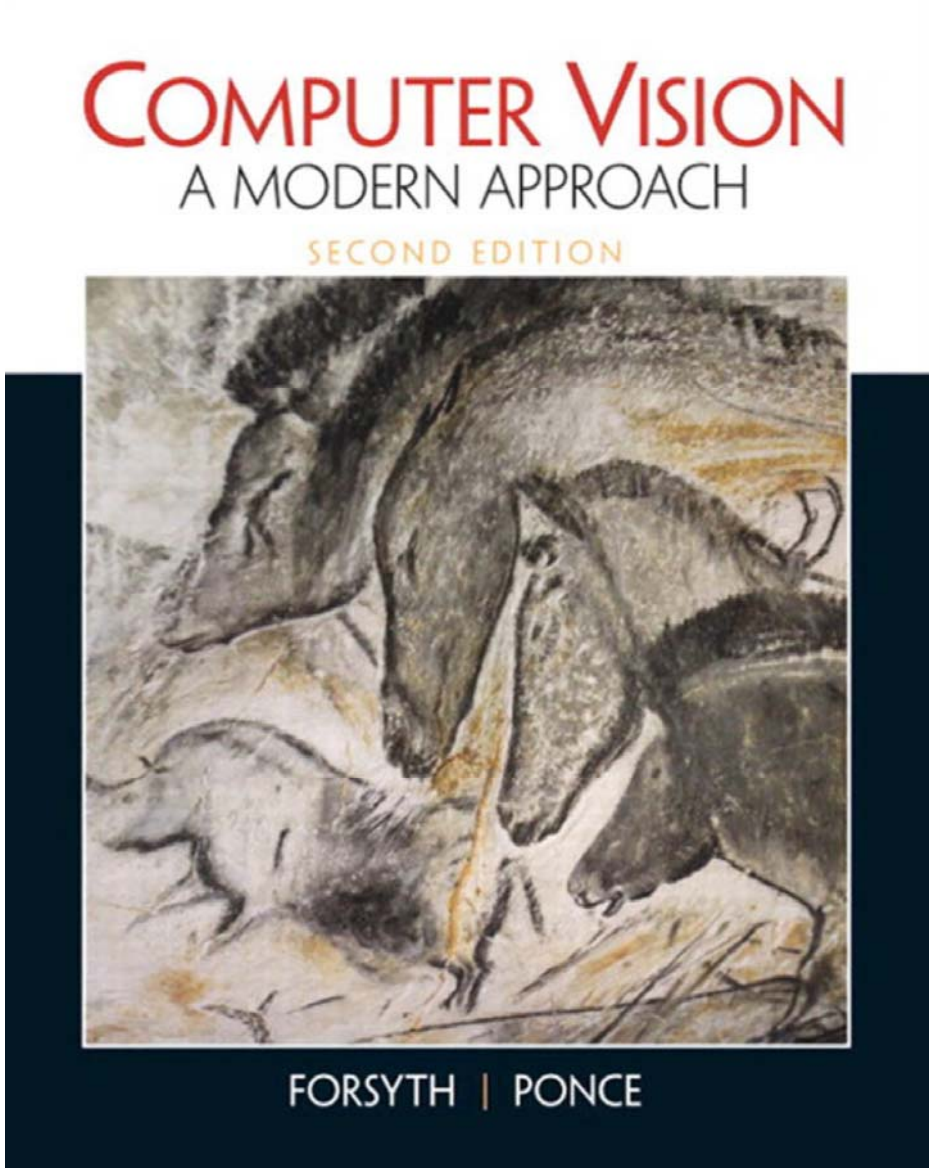
B.S. Electrical Engineering, Seoul National University, Seoul, Korea, 1997
Ph.D. Biomedical Engineering, University of Michigan, Ann Arbor, MI, USA, 2003
Postdoc. Department of Radiology, University of Michigan, Ann Arbor, MI, USA, 2003-2004
Research Investigator. Department of Radiology, University of Michigan, Ann Arbor, MI, USA, 2004-2007
Assistant Professor. Department of Radiology, University of Michigan, Ann Arbor, MI, USA, 2007-2009
Assistant Professor. Biomedical Engineering, Gachon University, Korea, 2009-2012
Associate Professor. Electronic and Electrical Engineering, Sungkyunkwan University, Korea, 2013-2018
Professor. Electronic and Electrical Engineering, Sungkyunkwan University, Korea, 2019-Current

Research area: Image processing methods for medical imagery

Medical image analysis for histological/cancer management
Application of computer vision (including deep learning) algorithms to medical imagery

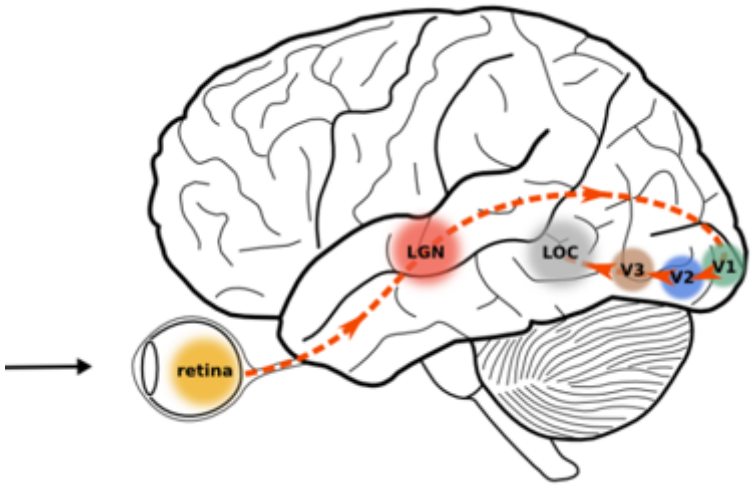
Course schedule

- ***Introduction***
- ***Image formation***
  - Geometric camera models
  - Light and shading
  - Color
- ***Early vision***
  - Linear filters
  - Spatial frequency analysis
  - Image pyramids
  - Local image features
  - Texture
  - Stereopsis
- ***Mid-level vision:*** Segmentation
- ***High-level vision:*** Object recognition
- ***PCA***
- ***Neural network***



What is vision?

- ***Recognize*** objects
  - People we know
  - Things we own
- ***Locate*** objects in space
  - To pick them up
- ***Track*** objects in motion
  - Catching a baseball
- ***Recognize*** actions
  - Walking, running, pushing, …

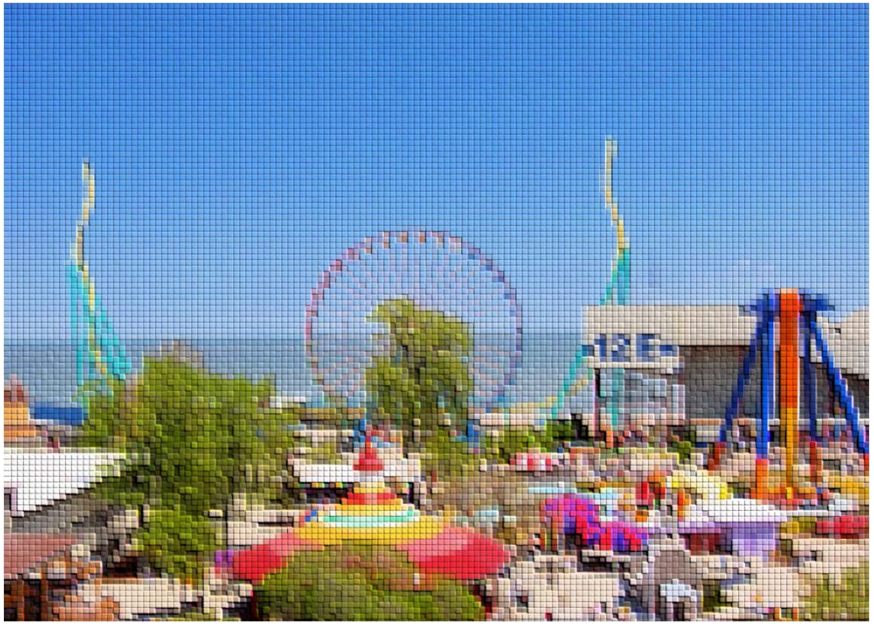


- ***VISION: The most powerful cognitive function among five senses***

What is computer vision?

- ***Technology that develops a machine with visual functions***

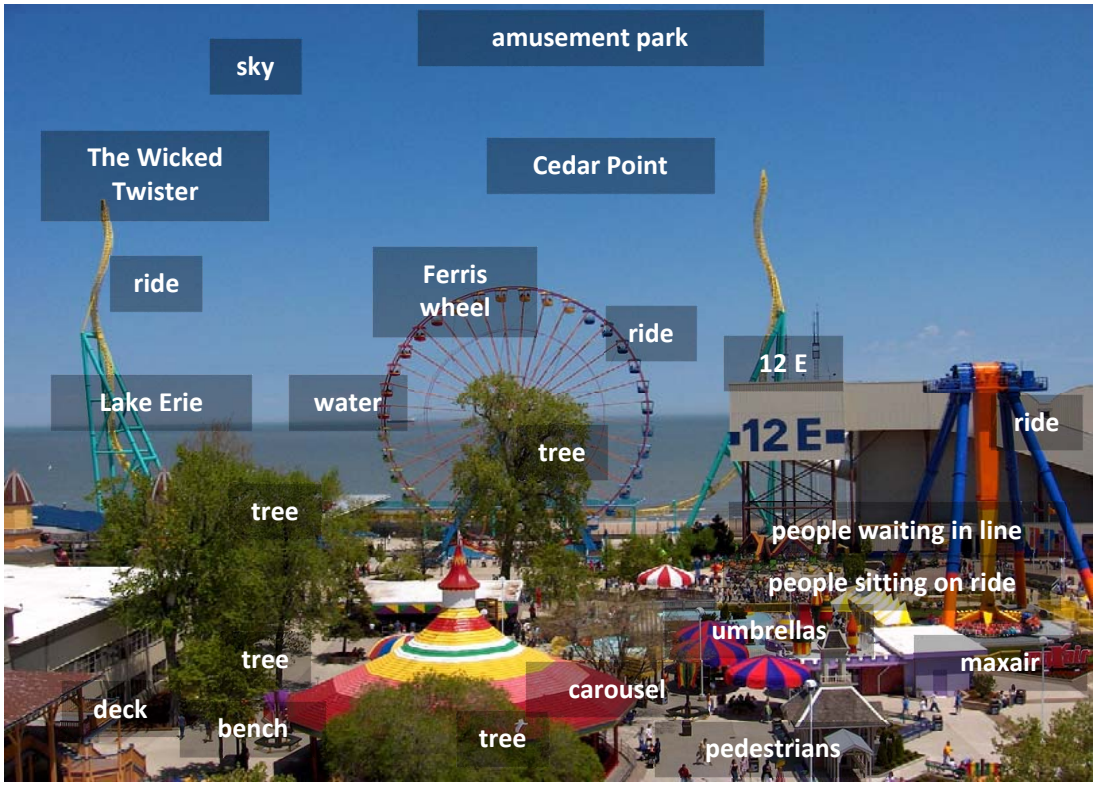
- Visual measurements
  - Computing properties of the 3D world from visual data



What is computer vision?

- ***Technology that develops a machine with visual functions***

- Visual perception and interpretation
  - Algorithms to allow a machine to recognize objects



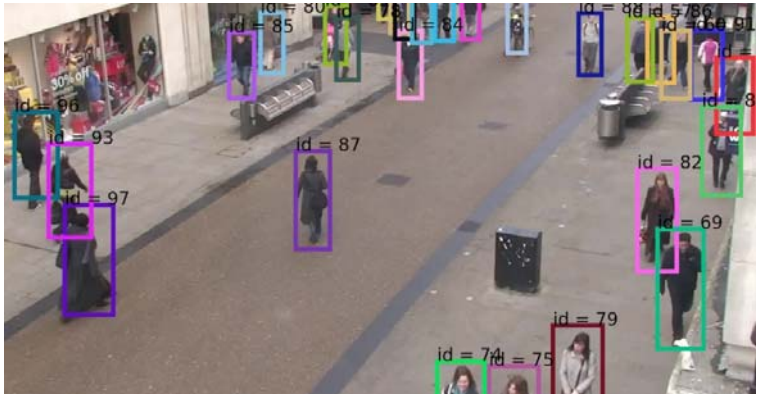
Why we need computer vision?

- Relieve humans of boring and easy tasks
- Enhance human abilities
- Perception for robotics
- Organize and give access to visual content

Applications

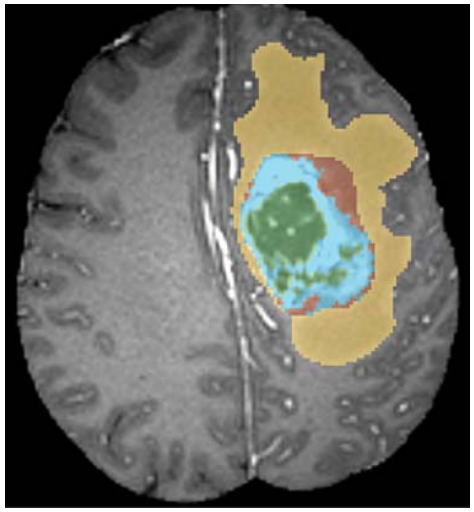
Autonomous navigation

People tracking for security



Earth viewer

Automated diagnosis



Goal of computer vision

- Develop an artificial vision comparable to human vision



- Develop an artificial vision that achieves a specific mission