deti universidade de aveiro
departamento de eletrónica, telecomunicações e informática

Visão Artificial numa estratégia de transformação digital

Computer Vision Group - Univ. Aveiro

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Human vision

- Vision is a complex physical and intellectual human task that stands as a primary interaction tool with the world - it involves an almost simultaneous interaction of the eyes and the brain
- It is a complex process not completely understood, even after hundreds of years of research and it can do amazing things like:
  - Recognize people and objects
  - Navigate through obstacles
  - Understand mood in the scene Imagine stories
- But:
  - Suffers from illusions
  - Ignores many details
  - Ambiguous description of the world
  - Doesn’t care about accuracy of world

Computer vision

Objects | Labels | Text | Properties | Safe Search

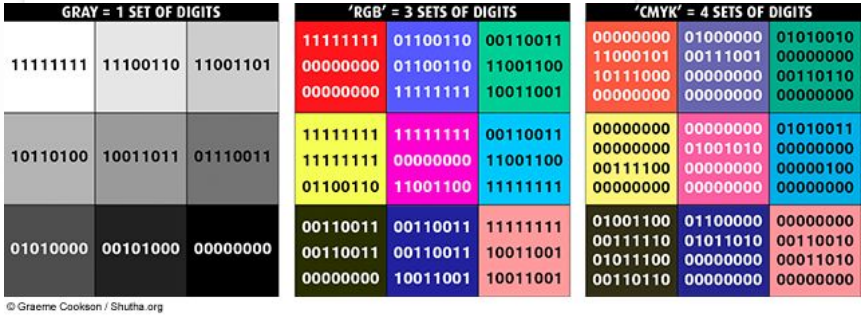
objetos.jpg

Tableware 70%

Hammer 61%

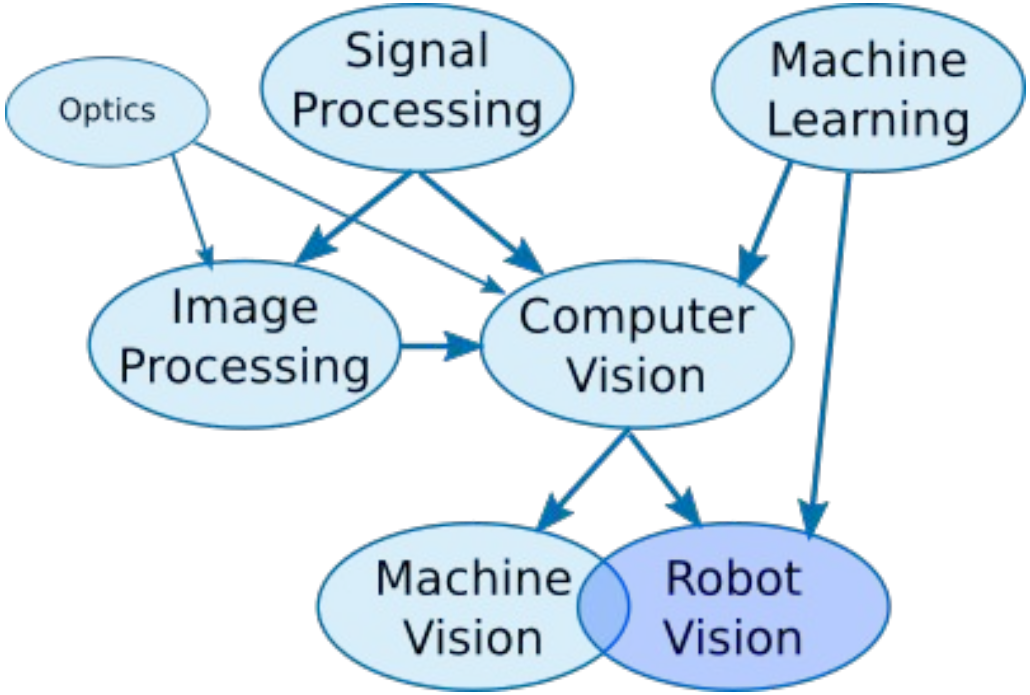
Clock 56%

How a computer sees the images?



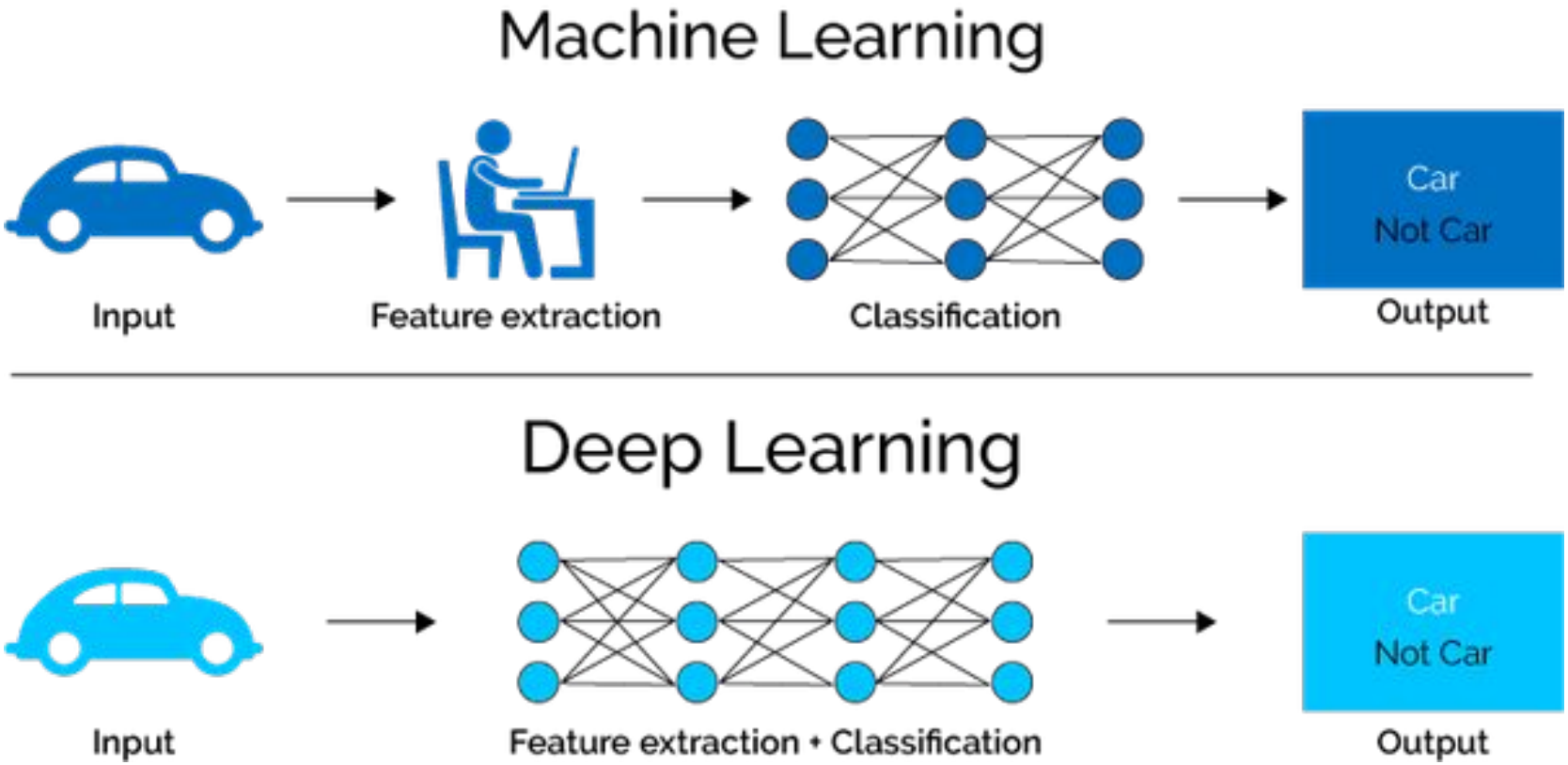
Computer Vision

- Signal Processing involves processing electronic signals…
- Image Processing is primarily pixel manipulation
- Computer Vision is more about extracting information from images



- Computer vision is a field that includes methods for acquiring, processing, analyzing, and understanding images
- The main goal: make computer vision converge towards human vision. **Can we ever accomplish that?**

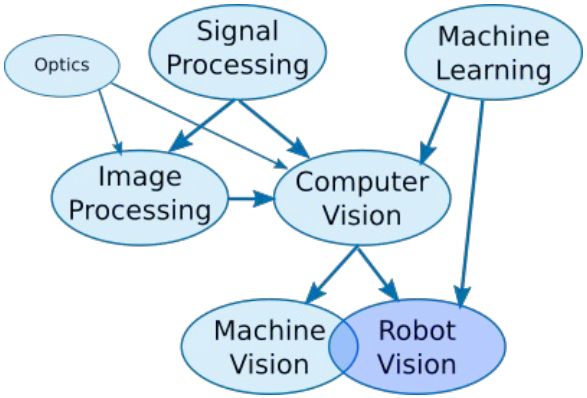
Deep learning



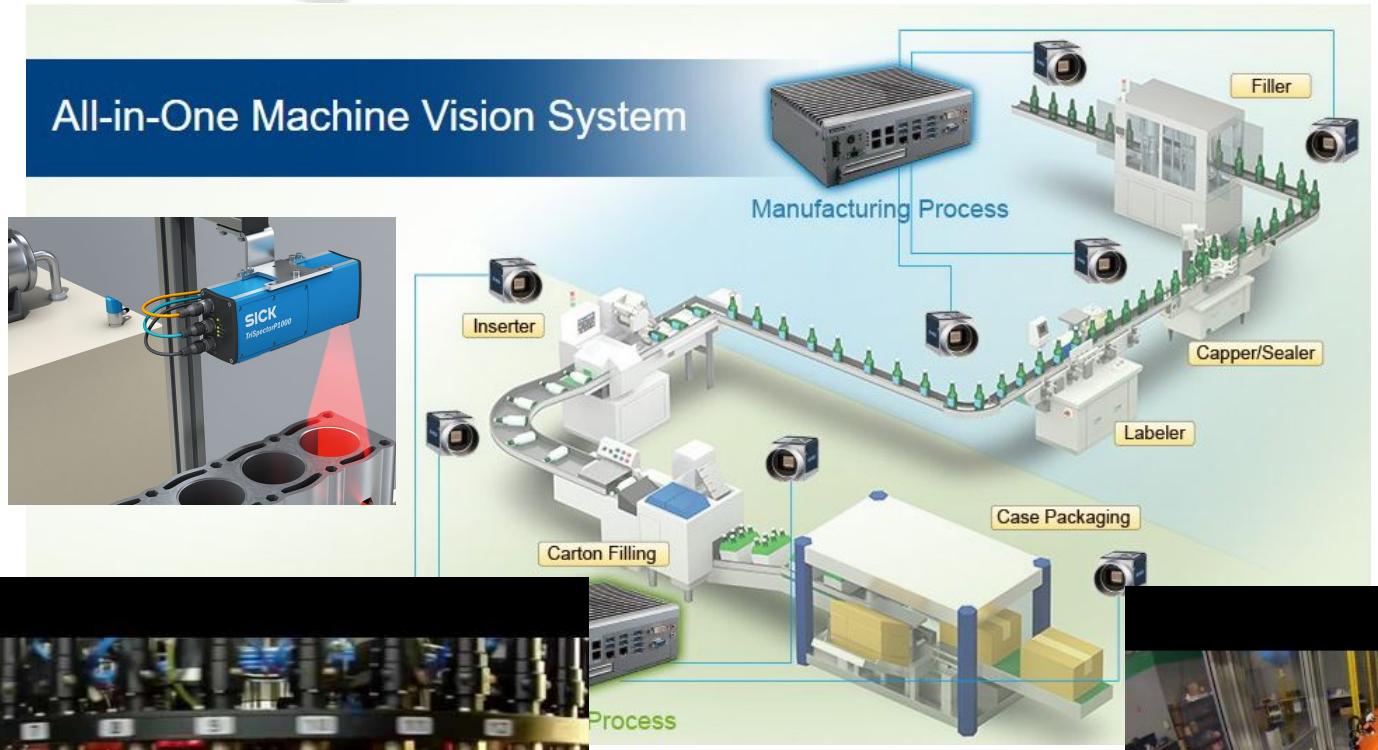
AlexNet won the ImageNet competition in 2012 by a large margin using a technique called deep learning...

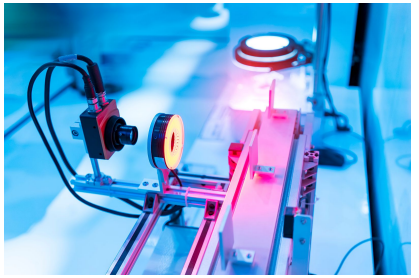
Machine/Robot Vision

- Machine Vision refers to the industrial use of vision for specific applications
- Robot Vision incorporates aspects of robotics into its techniques and algorithms, due to robot's ability to physically affect the environment
- Robot Vision involves using a combination of camera hardware and computer algorithms to allow robots to process visual data from the world.

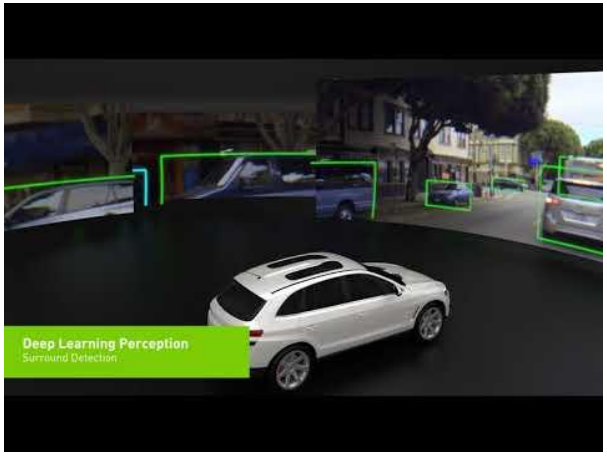


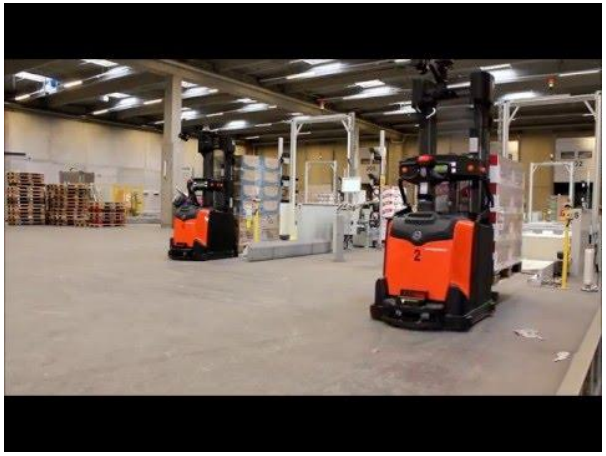
Machine Vision

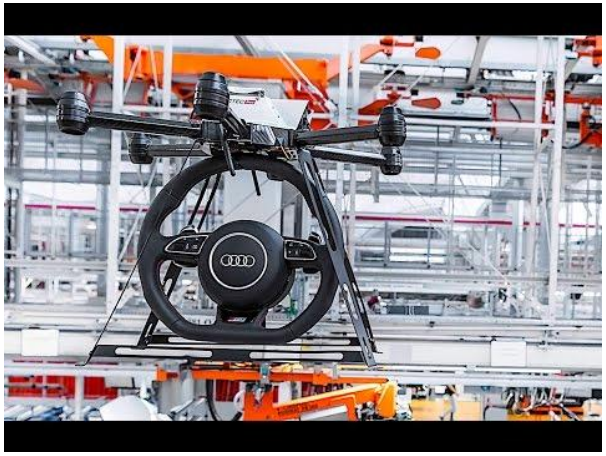




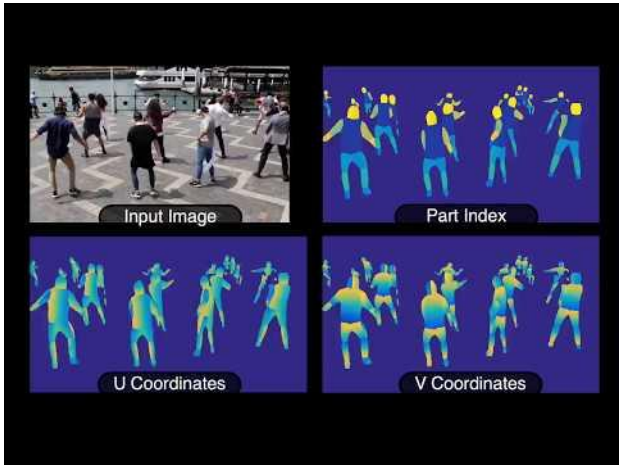
Robotic Vision



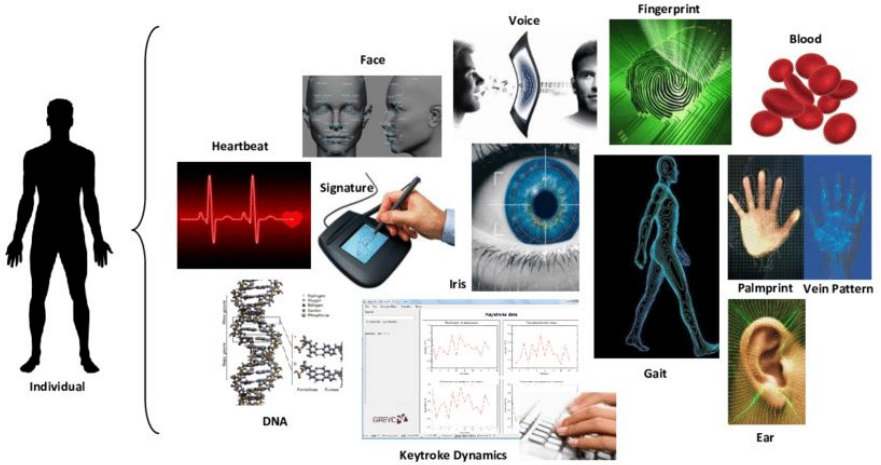




- **Motion capture**
- **Posture estimation**



- **Biometrics**



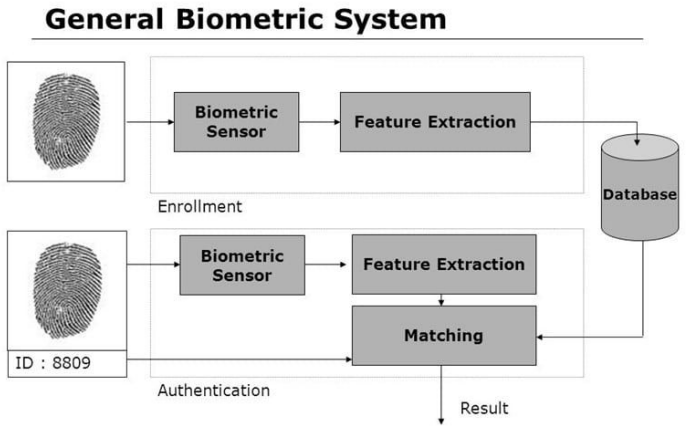
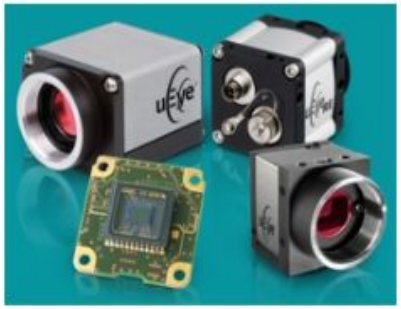
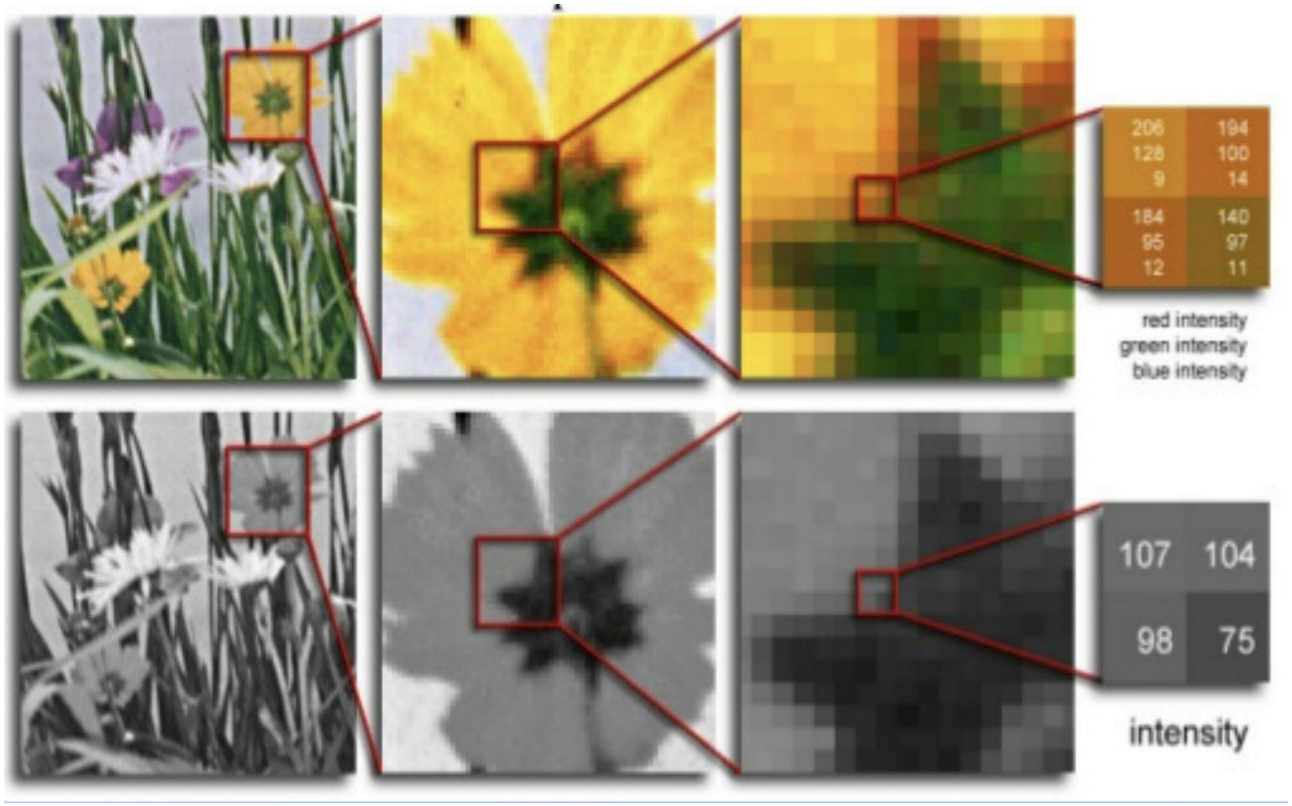


Image Sensors

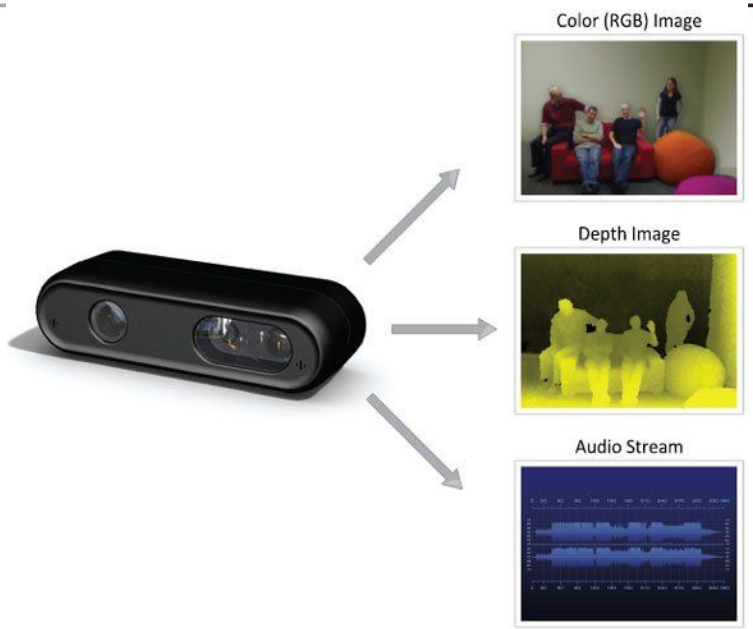


Visible spectrum images

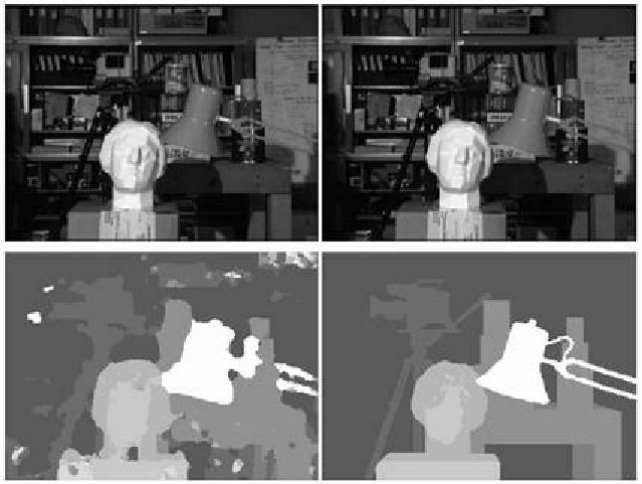


Depth images

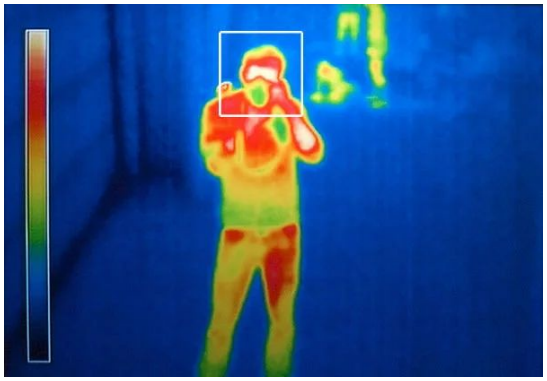
Active



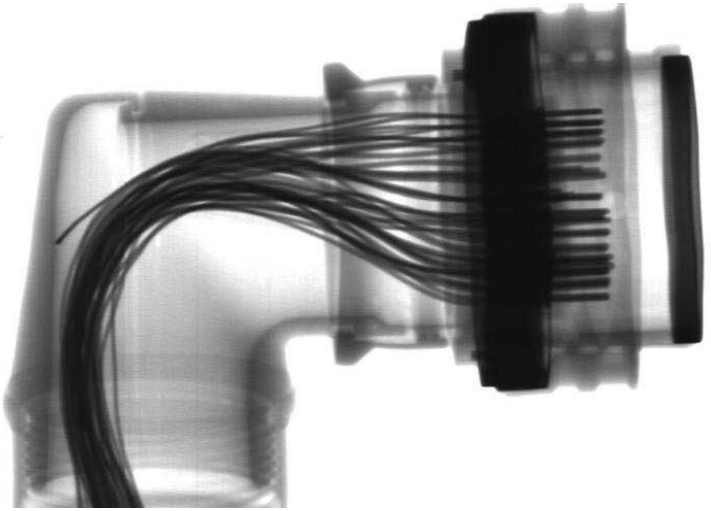
Stereo

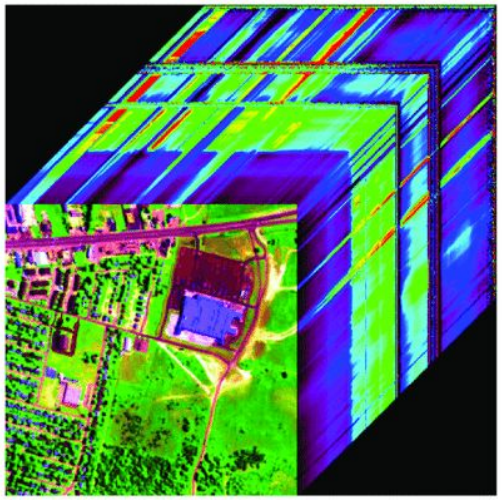


Thermal images

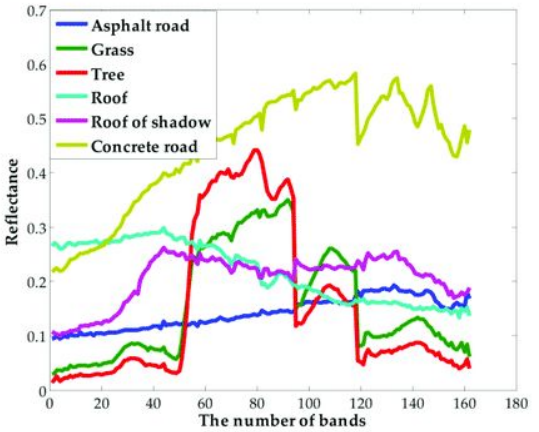


Other types of cameras



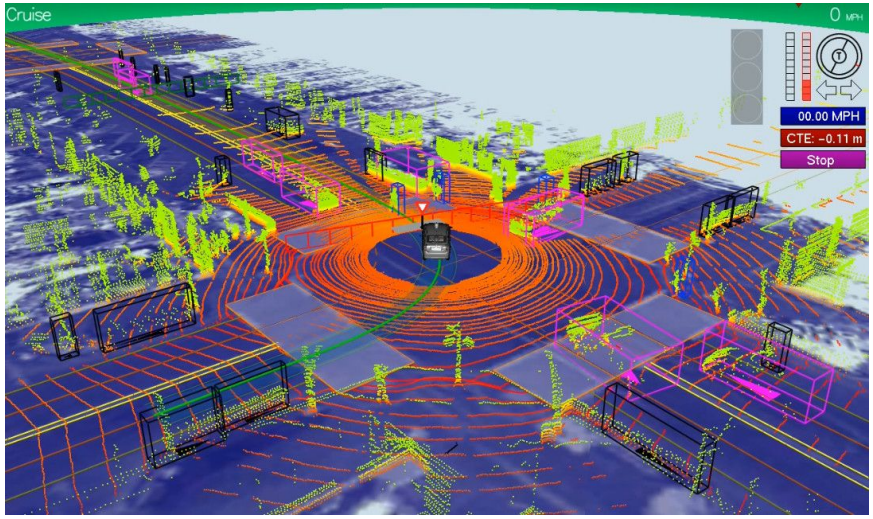


(a)



(b)

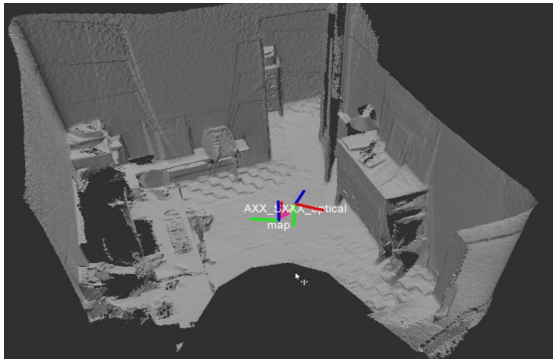
Other sensors

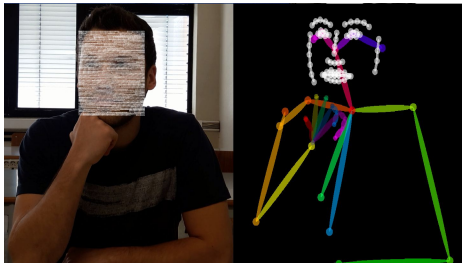


- LIDAR
- LRF
- SONAR
- RADAR
- GPS

CV Research @UA

- Image compression
- Robotic vision
- Machine Vision
- Digital camera calibration
- Real-time vision systems
- 3D data processing
- Machine learning
- Face recognition
- Emotions recognition
- Object detection
- Medical Imaging





Convidados

- **Vitor Medeiros**, Gestão de negócios e consultoria em Visão Artificial na **INFAIMON Portugal** desde Janeiro de 2004, dando resposta ao mercado industrial, científico e tecnologias de informação até 2014, com especialização nos mercados da ciência e tecnologias de informação até ao presente dia. Anteriormente desempenhou funções de desenvolvimento de software de gestão em ferramentas Oracle, administração e manutenção de base de dados Oracle. Bacharelato em Informática de Gestão pelo ISVOUGA.
- **Tiago Carvalho**, Mestre em Engenharia Eletrónica e Telecomunicações pela Universidade de Aveiro. Gestor e formador especialista em Visão Artificial. Gestor de Produto das áreas de Segurança, Medição e Identificação Automática na **F.Fonseca**.