



UNIVERSITÀ
di VERONA

HCI – intelligent *multimodal* interfaces

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Master program in Artificial Intelligence

The Teacher

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- PO of Computer Science Department

University of Verona



VIPS (Vision, Image Processing & Sound)

(<http://vips.sci.univr.it>)

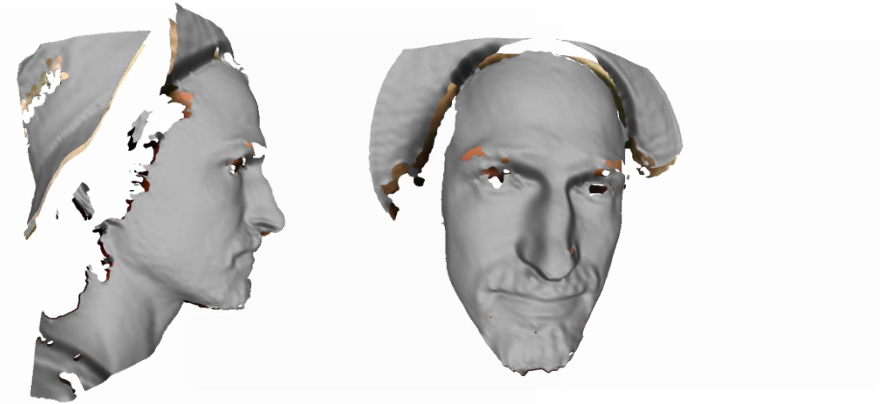


- **Contacts:**

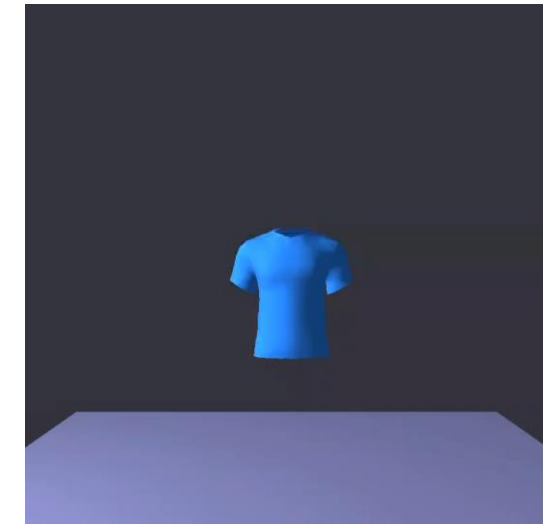
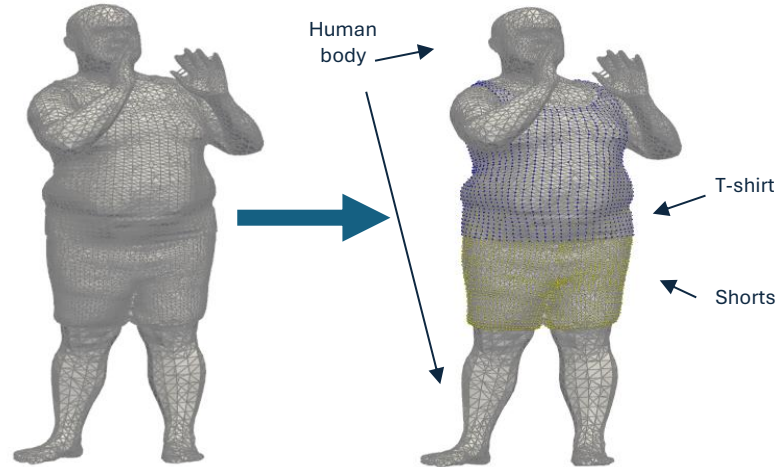
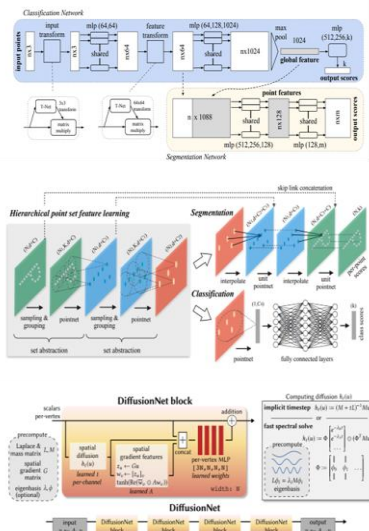
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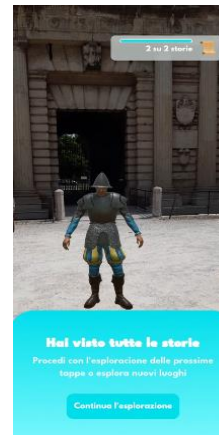
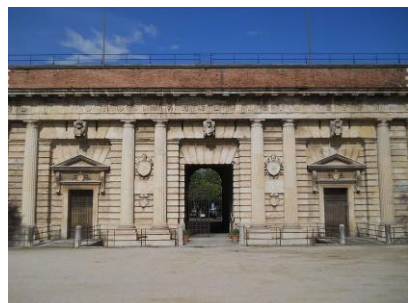


ML&AI for 3D vision and graphics

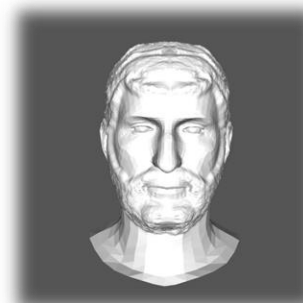
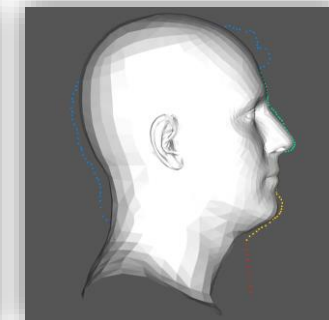


Automatic separation between human body and the different garments

physically-based simulation (PBS)



Model based AR for mobile gamification



3D face reconstruction from ancient coins



MASTER UNIVERSITARIO in COMPUTER GAME DEVELOPMENT



UNIVERSITÀ
di **VERONA**
Dipartimento
di **INFORMATICA**

<http://www.mastergamedev.it/>

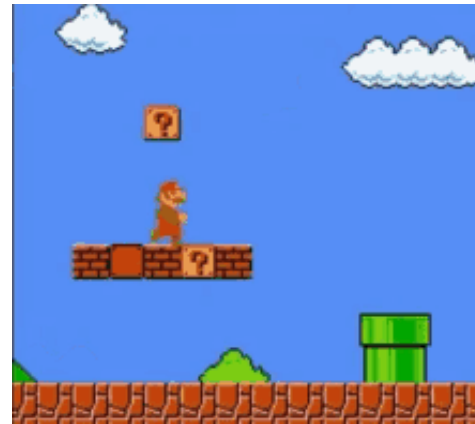


CastleRumble



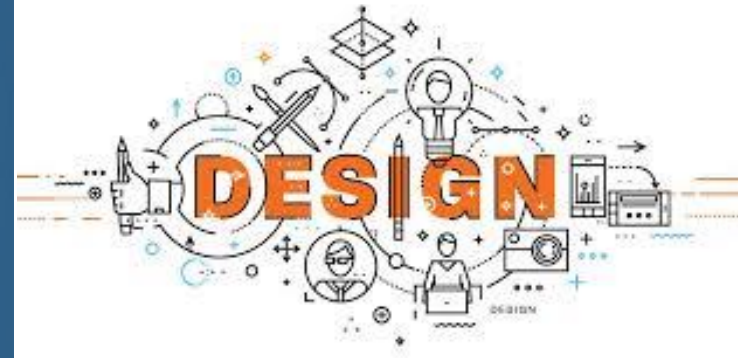
Videogame as intelligent HCI

- Gameplay and game mechanics,
- Artificial intelligence in game,
- Real-time interaction,
- Multimodal interaction



Objectives

Fundamental theories and concepts of human-computer interaction (HCI): interdisciplinary field that draws from cognitive psychology, computer science, and design.



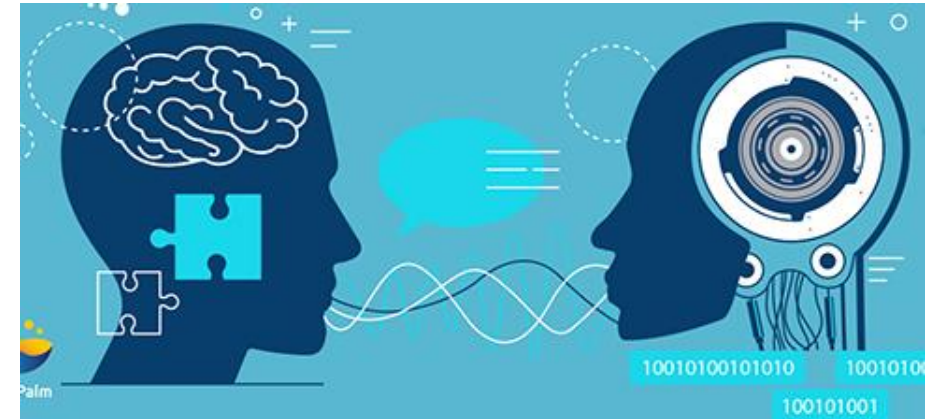
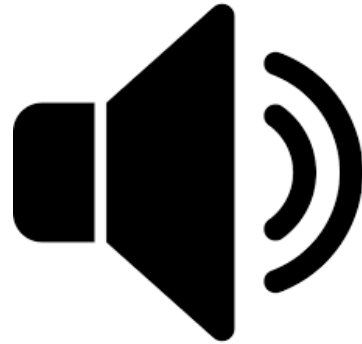
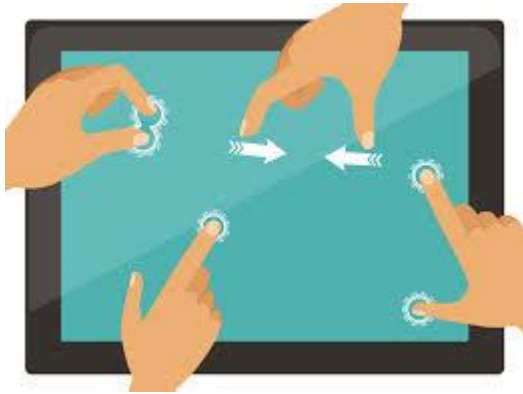
Objectives

Special emphasis will be placed on the development of technological solutions: students will develop computer interfaces by focusing on the underline methodological and implementation aspects.



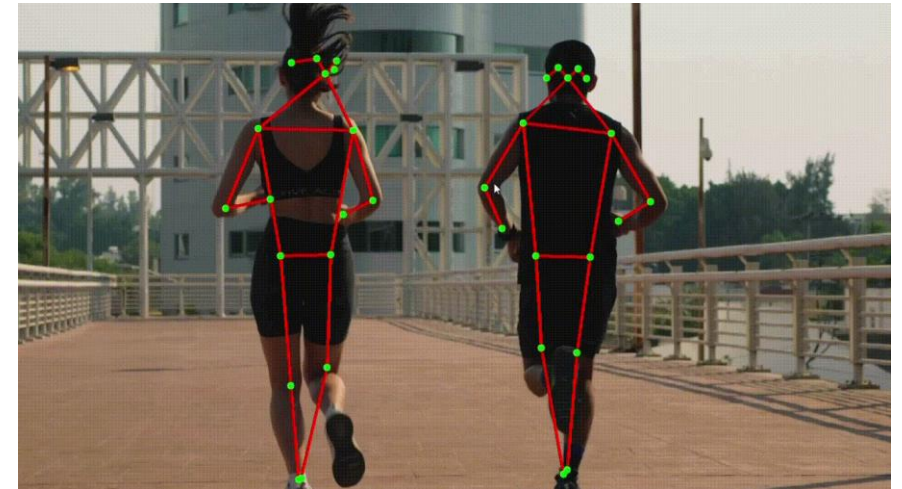
Objectives

Special emphasis will be placed on the multimodal solutions: touch, vision, natural language, audio



Objectives

Special emphasis will be placed on intelligent solutions: how AI techniques can infer the user intentions and propose the expected interaction



Program

Theory

- **Introduction:** motivation, aim of the course, professional perspectives, open issues, description of course program and method of exam
- **Foundation of HCI:** human factors, interaction design, usability, gaming and gamification
- **Visual interaction:** camera calibration, structure and motion
- **Nonverbal behavior in communication:** types of nonverbal behavior (facial expressions, gestures, posture, eye gaze), data collection methods, tools and software for nonverbal behavior analysis, annotation tools, e.g., ELAN

Program

Theory

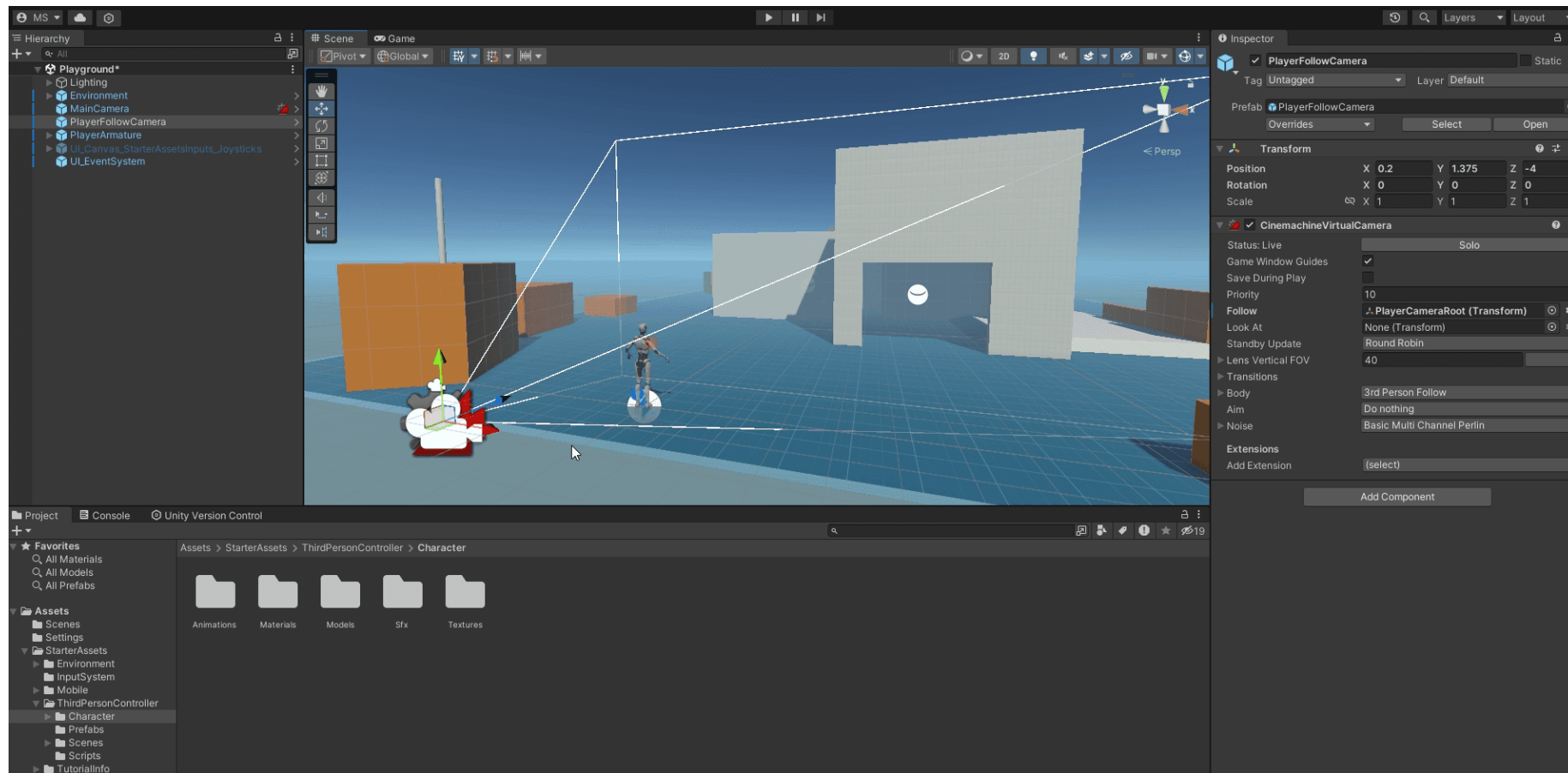
- **Automated analysis of body:** movement, gestures, facial expressions, and speech. Data capturing techniques, extracting features, and automatic analysis
- **Social artificial intelligence:** example applications, social psychology, organizational psychology, and social robotics.
- **Affective computing:** theories of emotion, emotion recognition systems, applications of emotion recognition in HCI.
- **Integration of multimodal nonverbal cues:** fusion techniques, e.g., late and early fusion.

Program

Laboratory

- **Deep Image matching** : Python implementation of feature detection and matching
- **3D Model reconstruction**: Structure and motion with Zephyr
- **Camera pose estimation** : C# implementation of Fiore's method
- **3D graphics**: modelling and rendering in Unity
- **Model-based AR**: implementation of the full AR pipeline integrating python code and Unity
- **Advanced aspects**: deep camera pose estimation, model recognition

Program



<https://unity.com/learn/get-started>

Why HCI?

The frustration of everyday life...

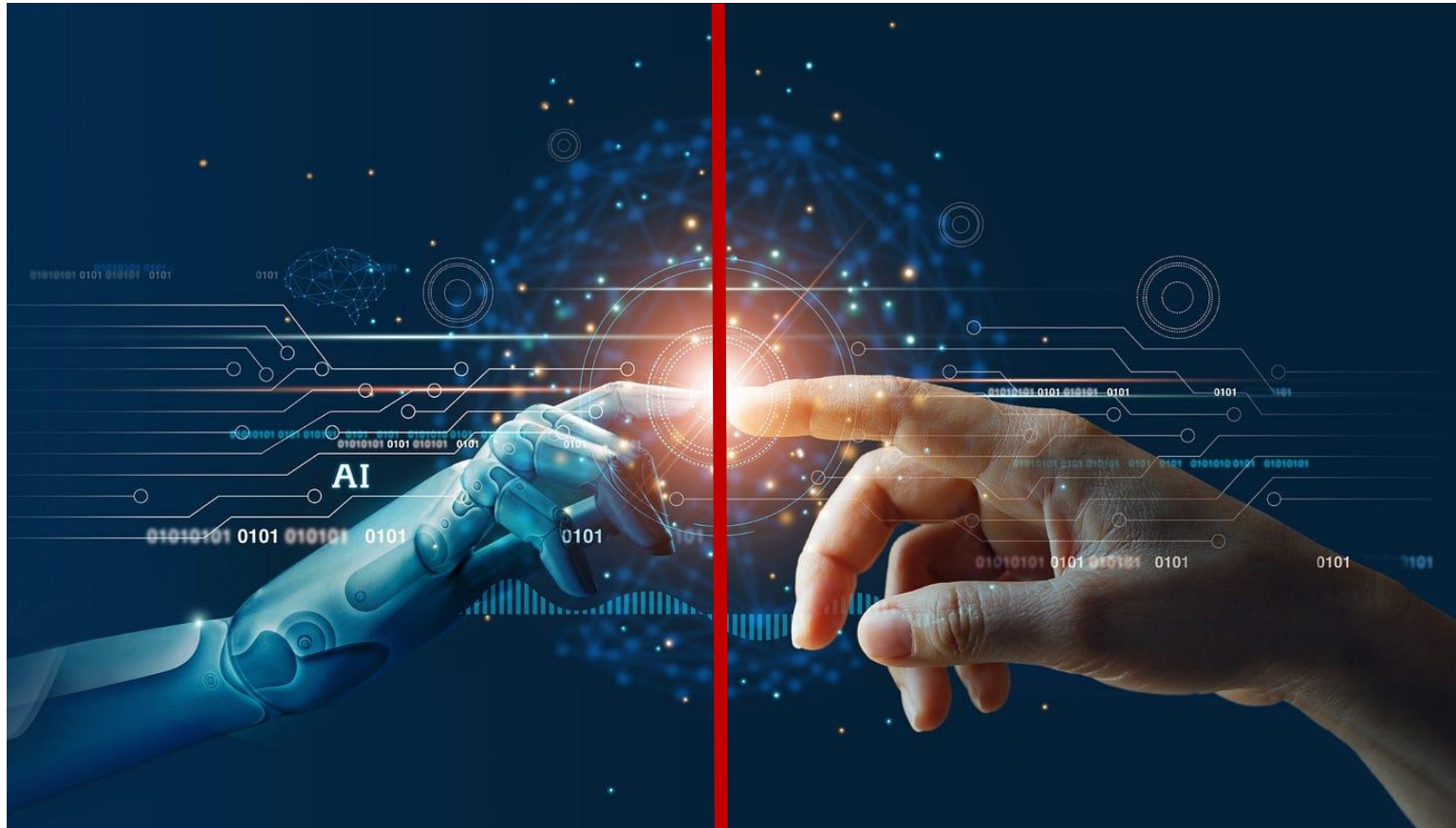


“Kennet Olsen, the engineer who founded Digital Equipment Corp., confessed at the annual meeting that he can’t figure out how to heat a cup of coffee un the company’s microwave oven”



The design of everyday things. Donald A. Norman.

Why HCI?



Computer

Interaction

Human

HCI evolution

```
john@ubuntu: ~/john_directory

john@ubuntu:~$ pwd
/home/john
john@ubuntu:~$ ls
john_directory  john_file
john@ubuntu:~$ cd john_directory
john@ubuntu:~/john_directory$ history
1  pwd
2  ls
3  cd john_directory
4  history
john@ubuntu:~/john_directory$
```

Command line interface

Computer

Human



Interaction

HCI evolution

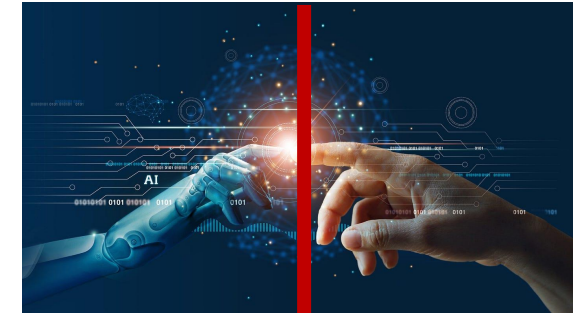


Graphical User interface (GUI)



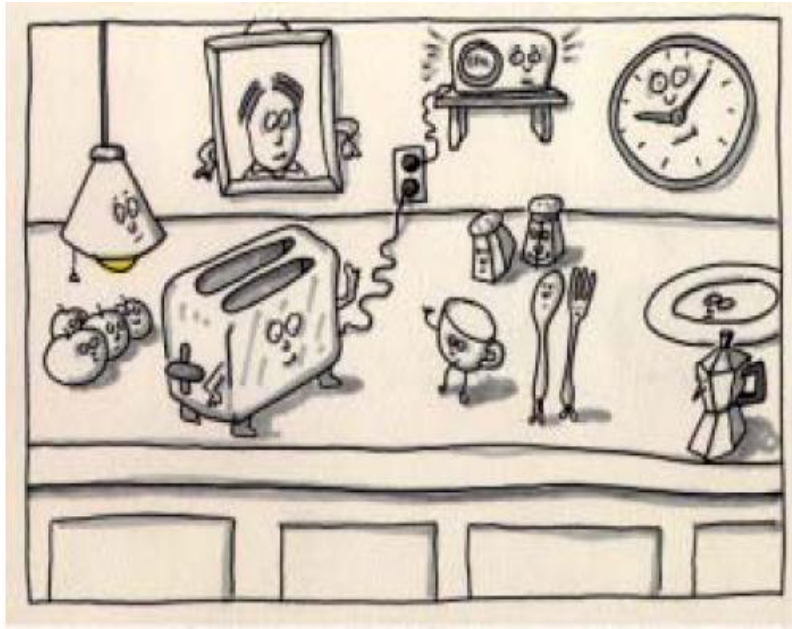
Computer

Human



Interaction

HCI evolution



An Artist's Conception of a Ubiquitous Computing Kitchen

Pervasive interaction



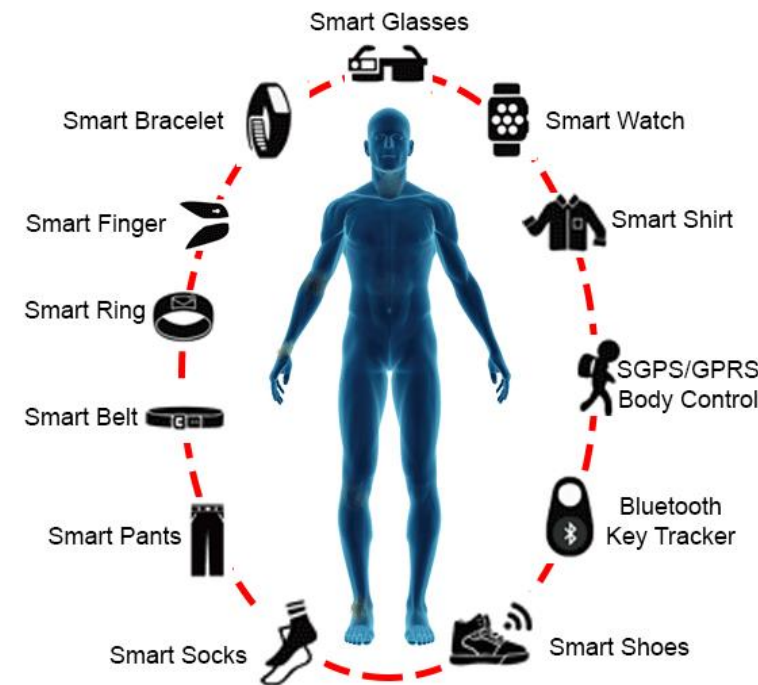
Internet of Things

Computer

Human

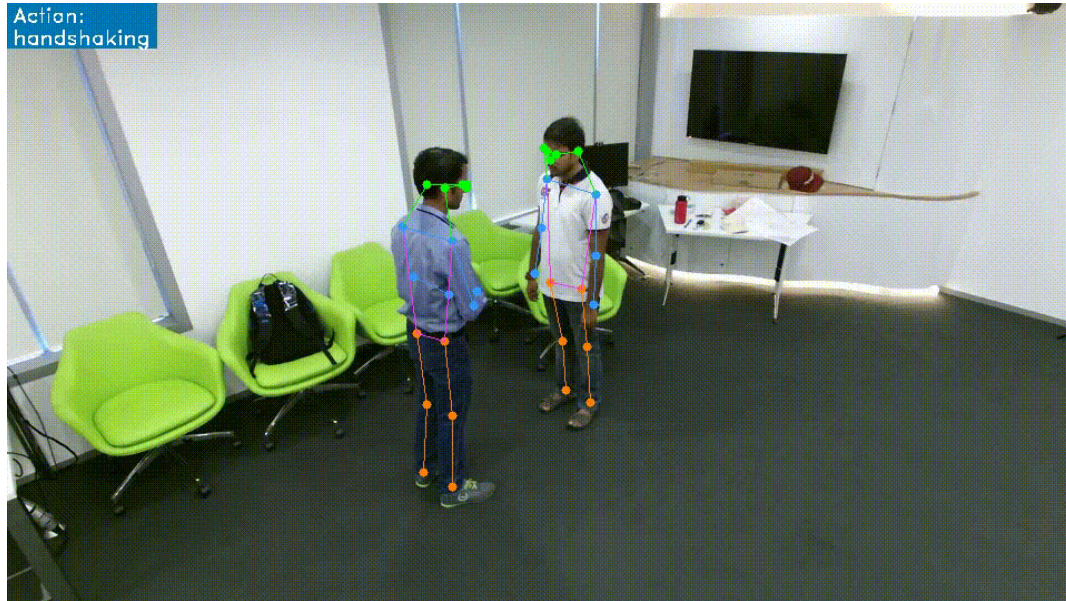


Interaction



Wearable devices

HCI evolution



AI interaction

Computer

Human



Interaction



Involved infrastructures

Hardware infrastructures



Internet



Satellite network



Interaction devices



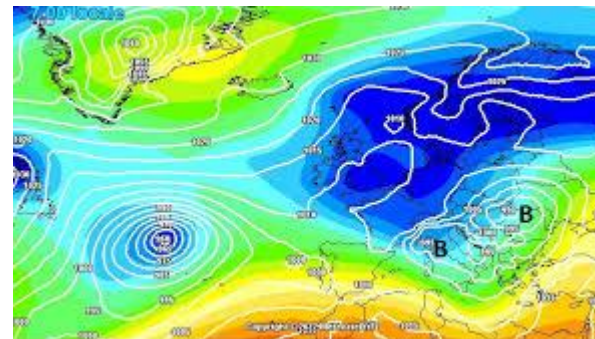
Computational power

Involved infrastructures

Data&Software infrastructures



OpenStreetMaps



Involved infrastructures

Methodological infrastructures

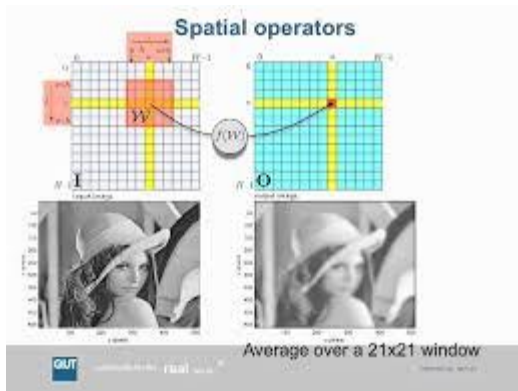
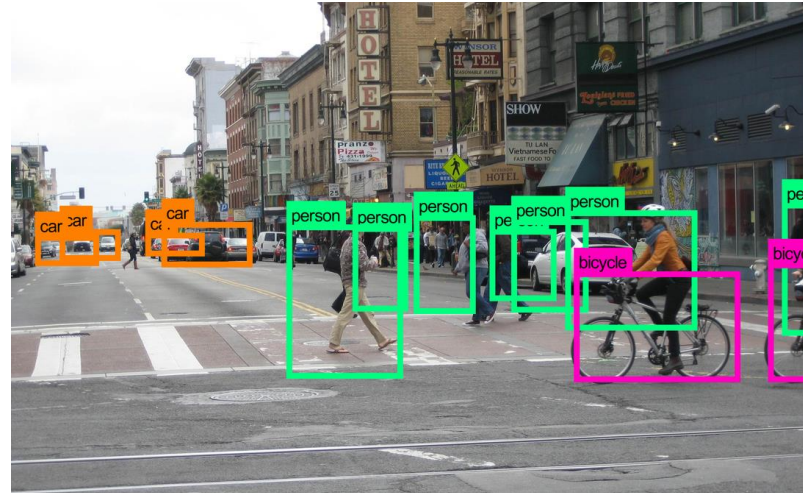
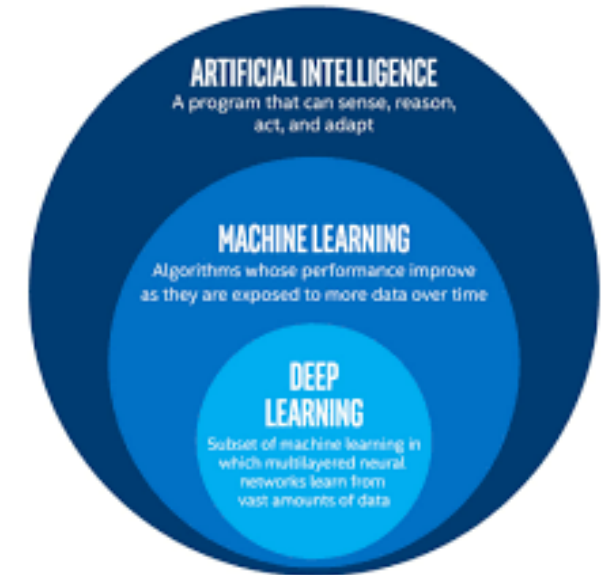


Image processing



Computer Vision



Questions for a person > 50 years

- **In 1995, how did you book a room?**
 - How did I receive suggestions to choose the room?
 - How did I pay it?

...and nowadays? Which infrastructures are involved?

Questions for a person > 50 years

- **In 1995, how did you watch a movie at home?**
 - How and where did you pick the movie?
 - How did I receive suggestions to choose the movie?
 - How did I pay it?

...and nowadays? Which infrastructures are involved?