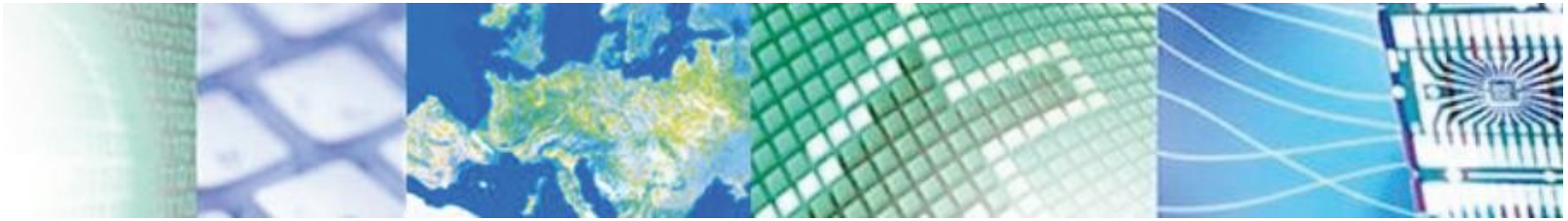

# CHIST-ERA Projects Seminar
## *Topic AMCE*

*Fabio M. Carlucci*

**Brussels, March 22-23, 2017**

FUNDING OPPORTUNITIES from the FUTURE & EMERGING TECHNOLOGIES scheme

# Presentation - Adaptive Machines in Complex Environments (AMCE)

- Complex environments
  - AdaLab, COACHES, ALOOF
- Autonomy
  - AdaLab, COACHES, ALOOF
- Project overlap
- Major outcomes and achievements
  - AdaLab, COACHES, ALOOF
- Remaining challenges and needs

# Projects

- **AdaLab: Adaptive Automated Scientific Laboratory**
  - **http://www.chistera.eu/projects/adalab**
  - Brunel University, University of Manchester, University Paris-Nord, University of Evry-Val-d-Essonne, KU Leuven
- **COACHES: Cooperative Autonomous Robots in Complex and Humans Environments**
  - http://www.chistera.eu/projects/coaches
  - University of Caen Basse-Normandie, Sapienza University of Rome, Vrije Universiteit Brussel, Sabanci Universitesi
- **ALOOF : Autonomous Learning of the Meaning of Objects**
  - http://project.inria.fr/aloof
  - Sapienza University of Rome, University of Birmingham, TU Wien, Inria

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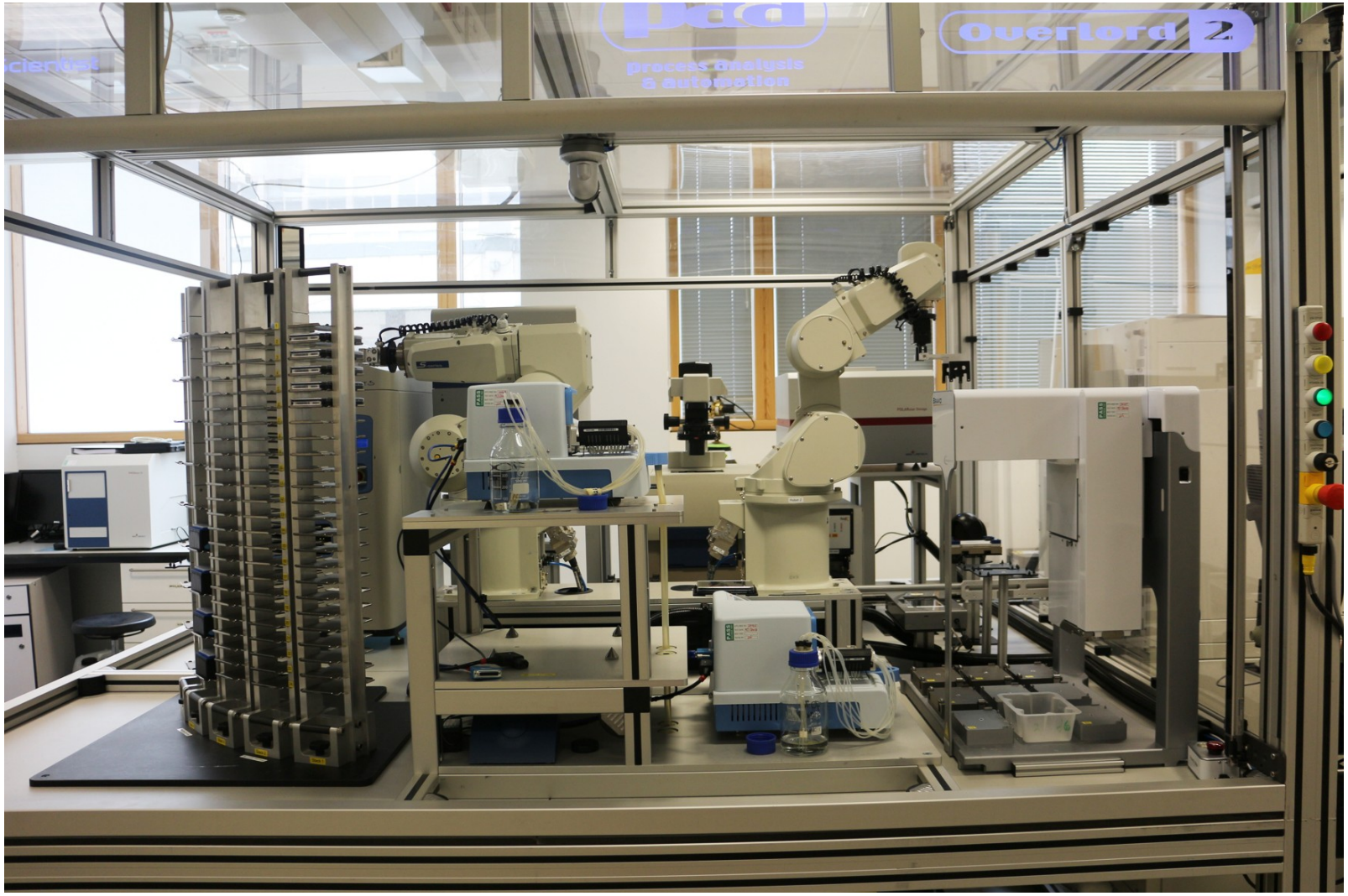
# Environment - AdaLab



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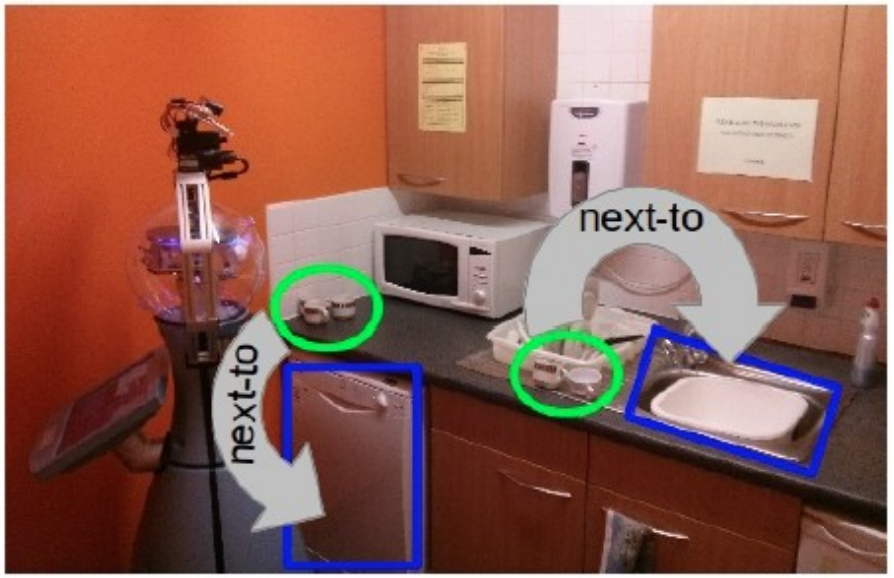
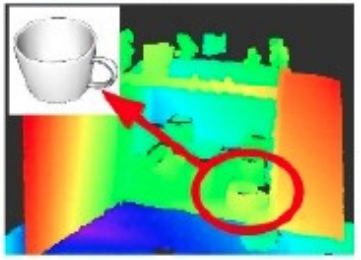
# Environment - COACHES

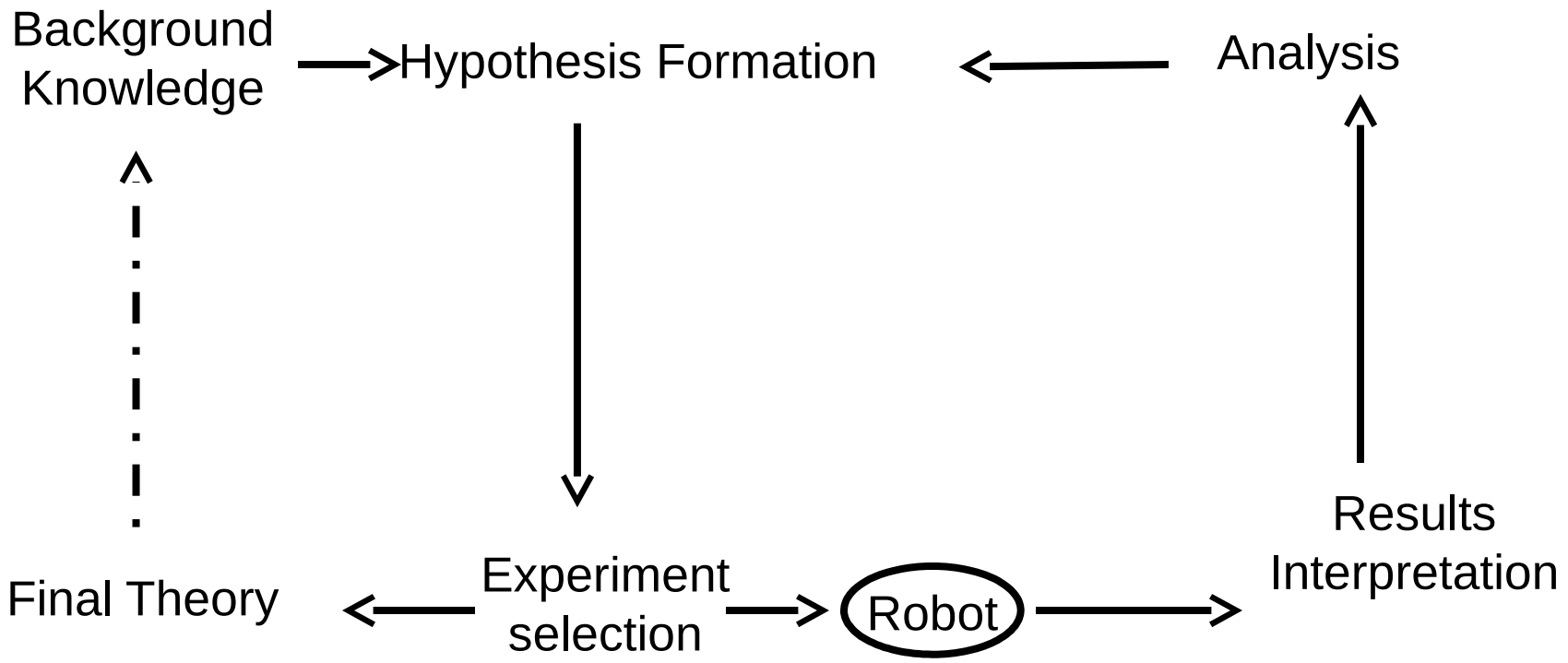
# Environment - ALOOF





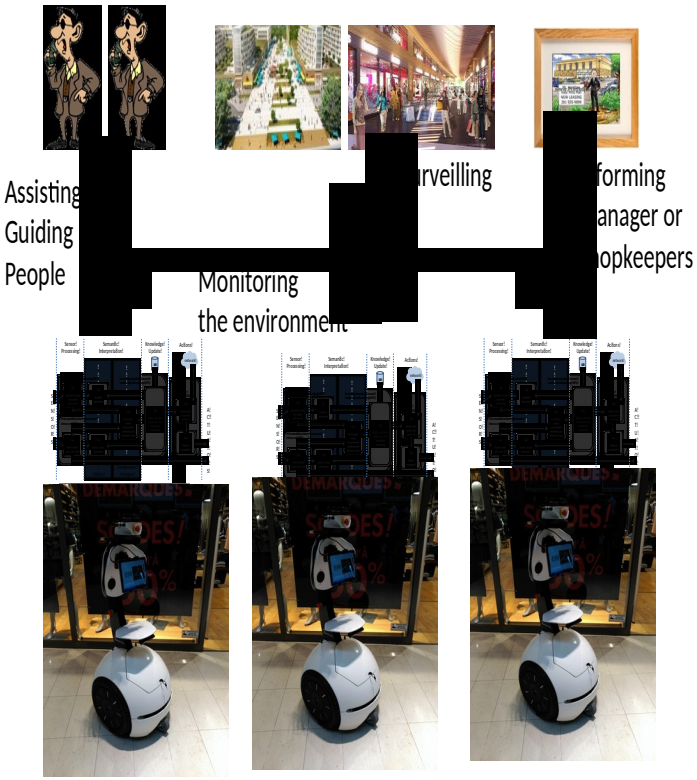
# Autonomy - AdaLab

Computer systems capable of originating their own experiments, physically executing them, interpreting the results, and then repeating the cycle.



# Autonomy - COACHES

- **Monitoring the environments**
- **Interacting with people**
- **Distributed planning for**
  - ✓ Accomplishing tasks : assistance, escort and support security units
- **Robust navigation in crowded environments**




**SERVICES**

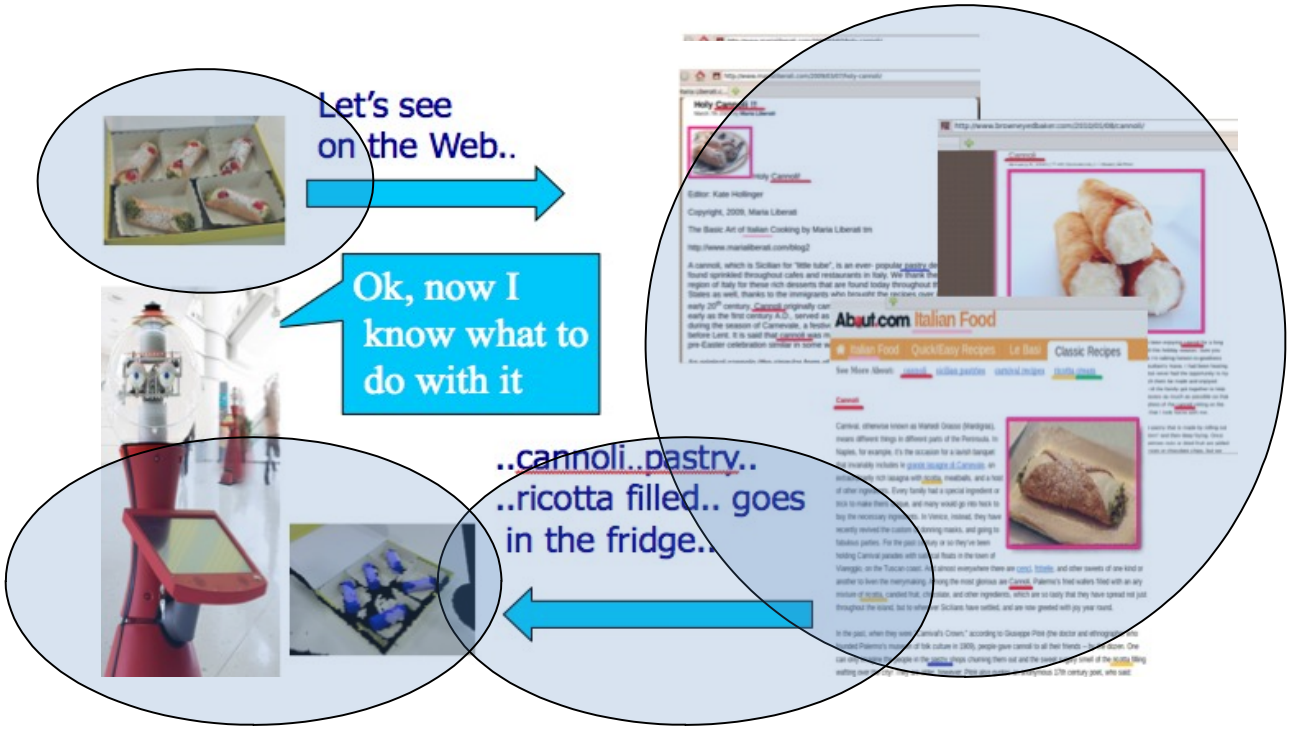
**SOFTWARE**

**ROBOTS**

# Autonomy - ALOOF

*How does a robot knows it doesn't know?*

*How to extract from the Web information useful for a robot, from a robot query?*




*How to use such information to build a semantic object map?*

*How to bridge between the Web representations and the own robot representation?*

# Project Overlap

- Knowledge representation
- Probabilistic reasoning about an uncertain environment
- Human computer interactions
- Planning – partial information, constraints

# Major outcomes and achievements - ALOOF

- Automatic creation of a perceptual and semantic knowledge base for robots on demand, from the Web
- Large-scale, long term autonomous semantic mapping of space

# Major outcomes and achievements - COACHES

- Knowledge-based environment modeling
- Distributed decision making and reasoning techniques for joint and collaborative activities
- Multi-modal human-robot interaction
- Face detection and body tracking
- Physical implementations in real and different environments

# Major outcomes and achievements - AdaLab

- Integrated Autonomous System for Scientific Research
- Three novel machine learning systems for generating scientific hypotheses.
- Two novel AI systems for deciding on scientific experiments.
- Novel biological knowledge about cancer and ageing.

# Remaining challenges and needs

- **Planning – partial information, constraints**
  - Representation of default knowledge
  - Unplanned and conflicting situation
  - Collaborative, multi-agent planning with partial information

- **Human-robot knowledge building and sharing**
  - Collaborative Knowledge discovery
  - Fusion of heterogeneous sources of information
  - Adjustable autonomy

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# Questions ?