

AUTONOMUS
LEARNING
OF THE MEANING
OF OBJECTS

ALOOF



SAPIENZA
UNIVERSITÀ DI ROMA



UNIVERSITY OF
BIRMINGHAM



Inria

ALOOF - Autonomous Learning of the Meaning of Objects

Markus Vincze, Barbara Caputo, Nick Hawes, Elena Cabrio, Markus Suchi, Tatiana Tommasi, Jay Young, Roque Lopez, Valerio Basile, Lars Kunze, Daniel Wolf

CHIST-ERA Annual Meeting, Paris, 11.-12. April 2018

What is the vision behind ALOOF?

What is this on the table??



What is the vision behind ALOOF?

What is this on the table??
Let me take a snapshot and
search on the Web...




*..if the robot could learn
from the Web like us...*



What is the vision behind ALOOF?

Let's see
on the Web..




http://www.marialiberati.com/2009/03/07/holy-cannoli/

maria Liberati.c... +

Holy Cannoli !!

March 7th 2009 by Maria Liberati



Holy Cannoli!

Editor: Kate Hollinger

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The Basic Art of Italian Cooking by Maria Liberati tm

<http://www.marialiberati.com/blog2>

A cannoli, which is Sicilian for "little tube", is an ever- popular pastry des found sprinkled throughout cafes and restaurants in Italy. We thank the region of Italy for these rich desserts that are found today throughout the States as well, thanks to the immigrants who brought the recipes over in the early 20th century. Cannoli originally came from the Palermo region of Sicily as early as the first century A.D., served as a treat and given to friends in the during the season of Carnevale, a festive European celebration held rig

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Holy Cannoli !!
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Cannoli
January 8, 2010 | 49 Comments | Email | Print

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Cannoli

Carnival, otherwise known as Martedì Grasso (Mardi Gras), means different things in different parts of the Peninsula. In Naples, for example, it's the occasion for a lavish banquet that invariably includes le [grande lasagne di Carnevale](#), an extraordinarily rich lasagna with [ricotta](#), meatballs, and a host of other ingredients. Every family had a special ingredient or trick to make theirs unique, and many would go into hock to buy the necessary ingredients. In Venice, instead, they have recently revived the custom of donning masks, and going to fabulous parties. For the past century or so they've been holding Carnival parades with satirical floats in the town of Viareggio, on the Tuscan coast. And almost everywhere there are [cenci](#), [frittelle](#), and other sweets of one kind or another to liven the merrymaking. Among the most glorious are Cannoli. Palermo's fried wafers filled with an airy mixture of [ricotta](#), candied fruit, chocolate, and other ingredients, which are so tasty that they have spread not just throughout the island, but to wherever Sicilians have settled, and are now greeted with joy year round.



In the past, when they were "Carnival's Crown," according to Giuseppe Pitirè (the doctor and ethnographer who founded Palermo's museum of folk culture in 1909), people gave cannoli to all their friends -- by the dozen. One can only imagine the people in the [pastry](#) shops churning them out and the sweet sugary smell of the [ricotta](#) filling wafting over the city! They are older, however. Pitirè also quotes an anonymous 17th century poet, who said:

been enjoying [cannoli](#) for a long if this holiday season. Sure you I'm talking honest-to-goodness sultan's Nana. I had been hearing but never had the opportunity to try th them be made and enjoyed of the family got together to help ocess as much as possible so that photo of the [cannoli](#), sitting on the that I took home with me.

pastry that is made by rolling out om" and then deep frying. Once etimes nuts or dried fruit are added nuts or chocolate chips, but we

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..cannoli..pastry..
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I've been enjoying cannoli for a long time this holiday season. Sure you know I'm talking honest-to-goodness Sicilian's Nana. I had been hearing about them but never had the opportunity to try them. I had been hearing about them for a long time and I'm talking honest-to-goodness Sicilian's Nana. I had been hearing about them but never had the opportunity to try them. I had been hearing about them for a long time and I'm talking honest-to-goodness Sicilian's Nana. I had been hearing about them but never had the opportunity to try them.

A cannoli is a pastry that is made by rolling out the dough and then deep frying. Once it's fried, it's filled with a mixture of ricotta, candied fruit, chocolate, or other ingredients, and then dusted with powdered sugar or chocolate chips, but we

What is the vision behind ALOOF?

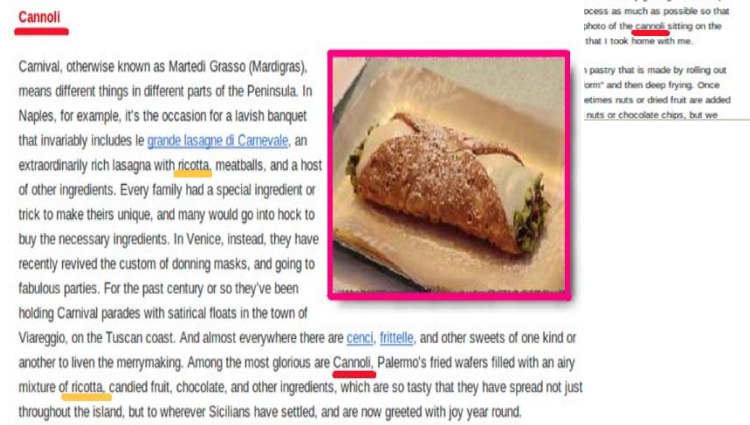
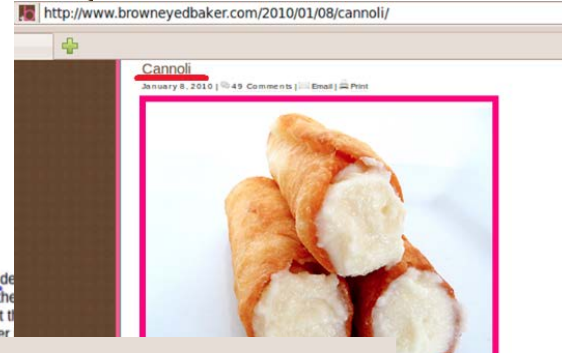
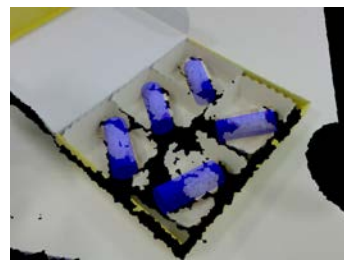
Let's see on the Web..



Ok, now I know what to do with it



..cannoli..pastry..
..ricotta filled.. goes in the fridge..



In the past, when they were "Carnival's Crown," according to Giuseppe Pitrè (the doctor and ethnographer who founded Palermo's museum of folk culture in 1909), people gave cannoli to all their friends -- by the dozen. One can only imagine the people in the pastry shops churning them out and the sweet sugary smell of the ricotta filling wafting over the city! They are older, however. Pitrè also quotes an anonymous 17th century poet, who said:

Why this is difficult?



Let's see on the Web..



Ok, now I know what to do with it

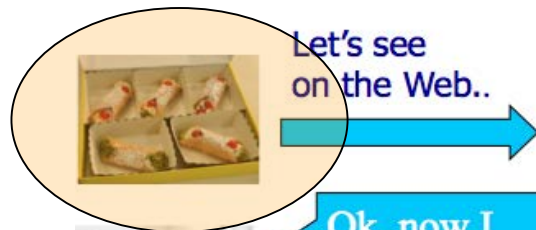


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Why this is difficult?

How does a robot know it doesn't know?



Let's see on the Web..



Ok, now I know what to do with it



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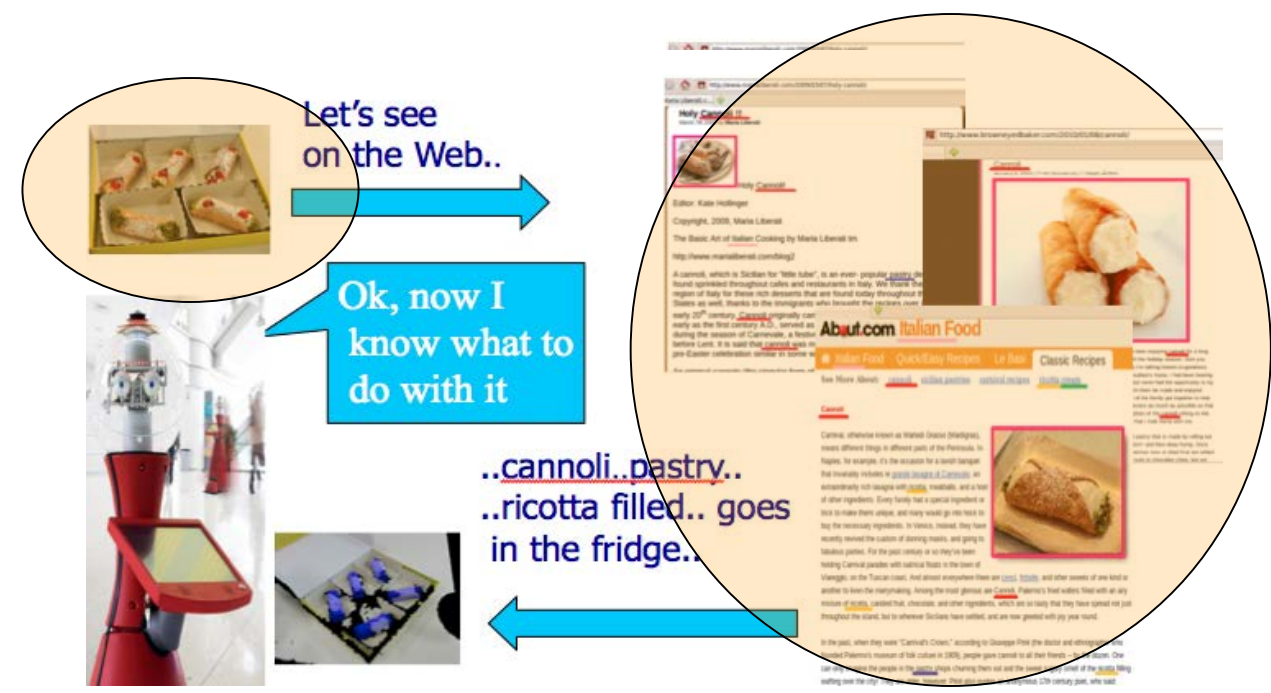


The collage includes several browser windows. One window shows a page titled "Holy Cannoli It" with an image of cannoli. Another window shows a page with a large image of cannoli. The bottom part of the collage shows an "About.com Italian Food" page with a search bar and a small image of a cannoli.

Why this is difficult?

How does a robot know it doesn't know?

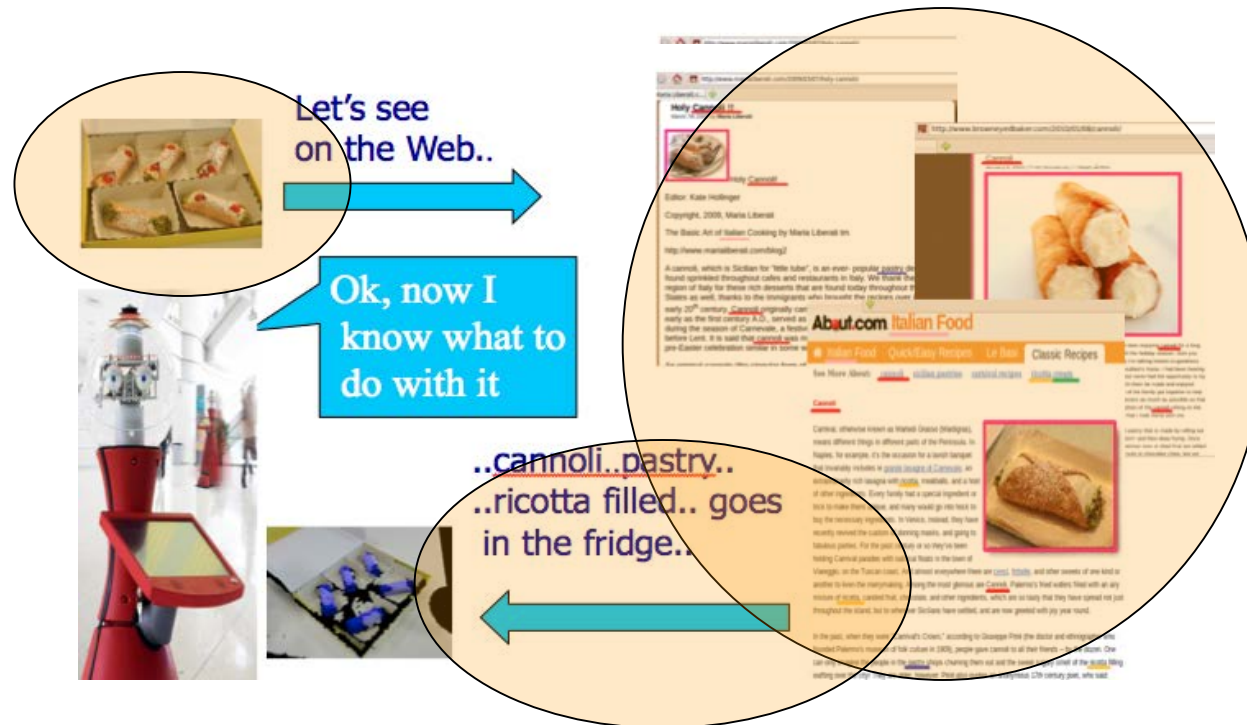
How to extract from the Web information useful for a robot, from a robot query?



Why this is difficult?

How does a robot know it doesn't know?

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

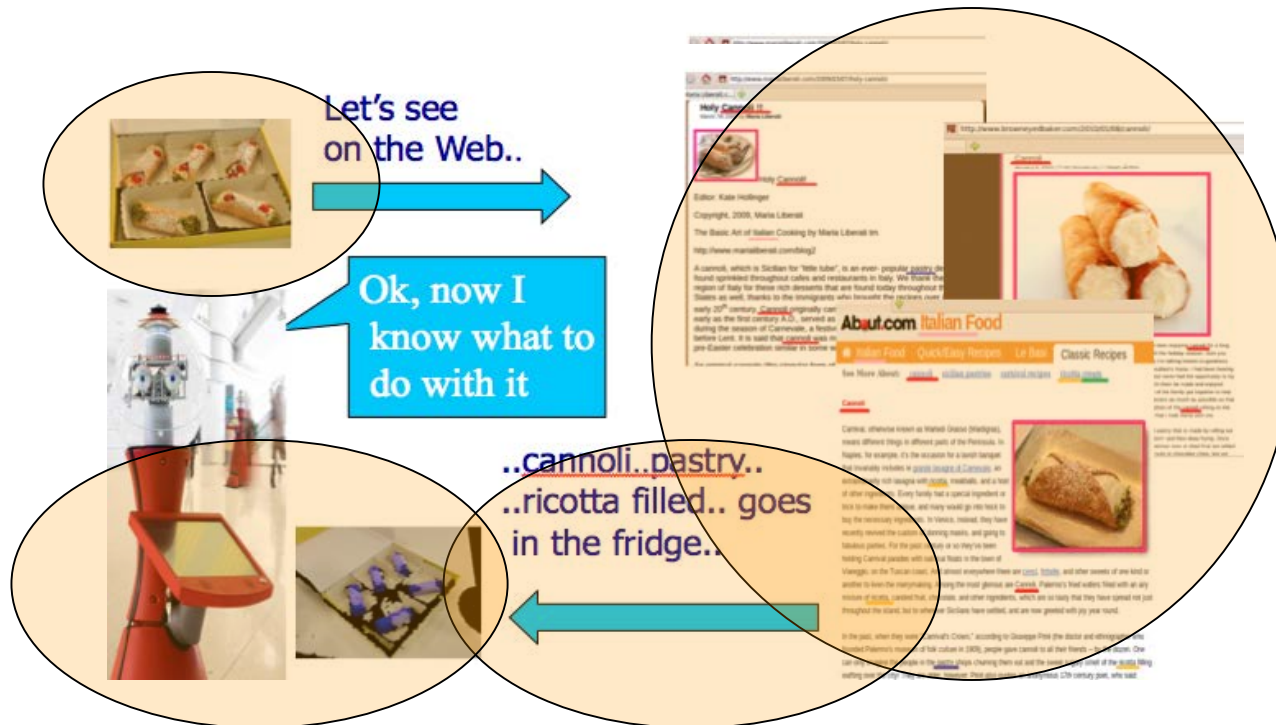


How to bridge between the Web representations and the own robot representation?

Why this is difficult?

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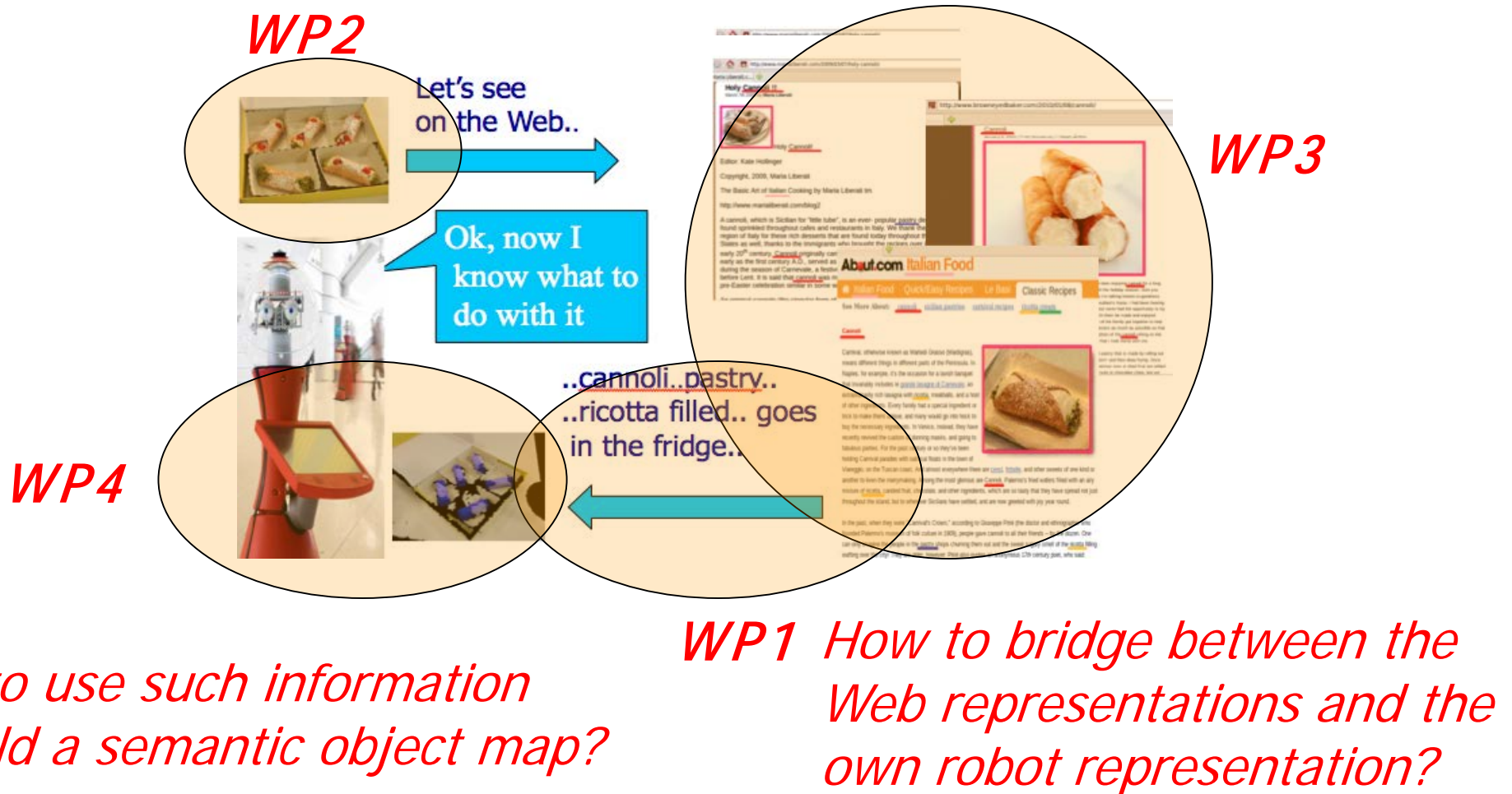
How to use such information to build a semantic object map?

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

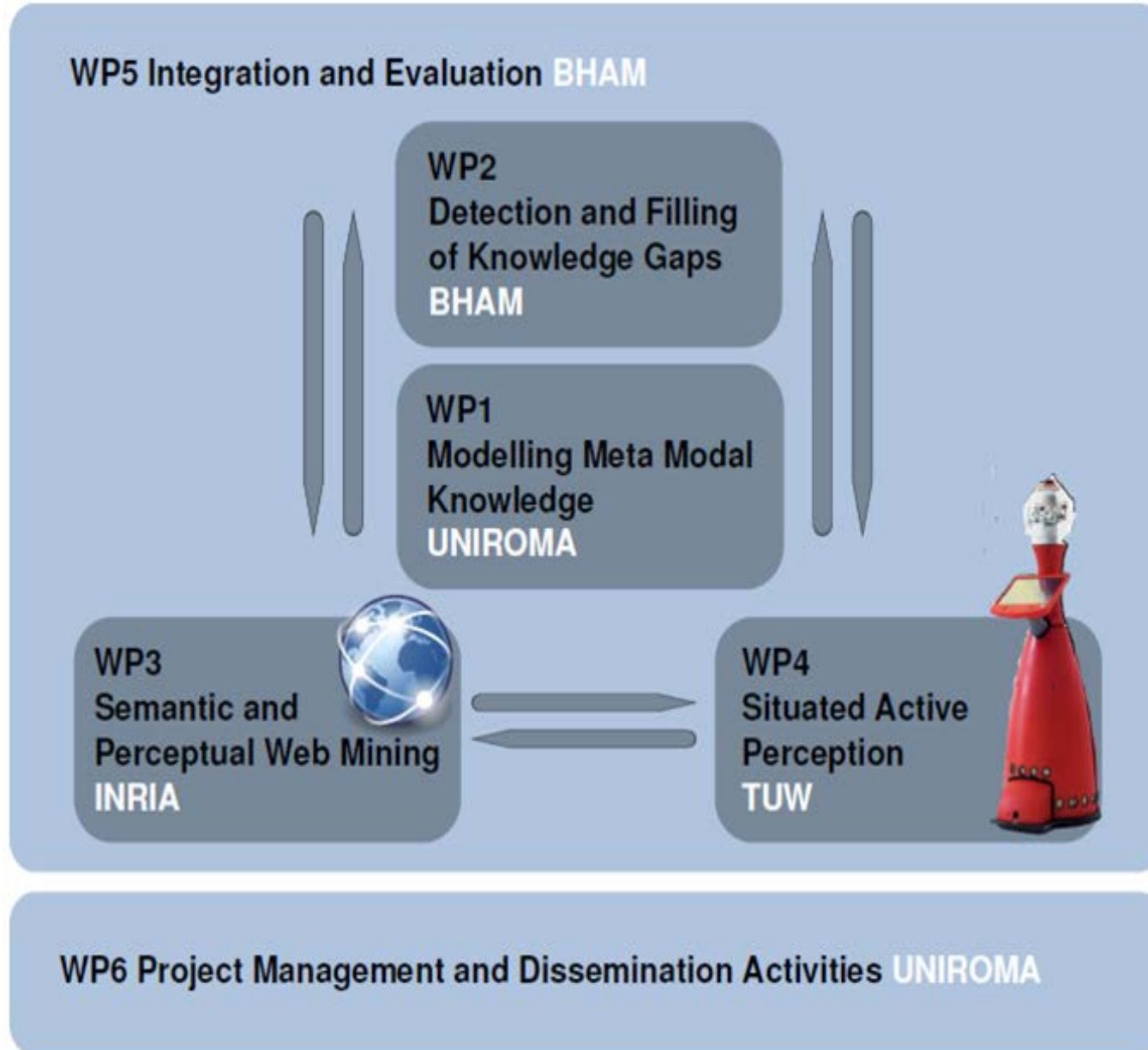
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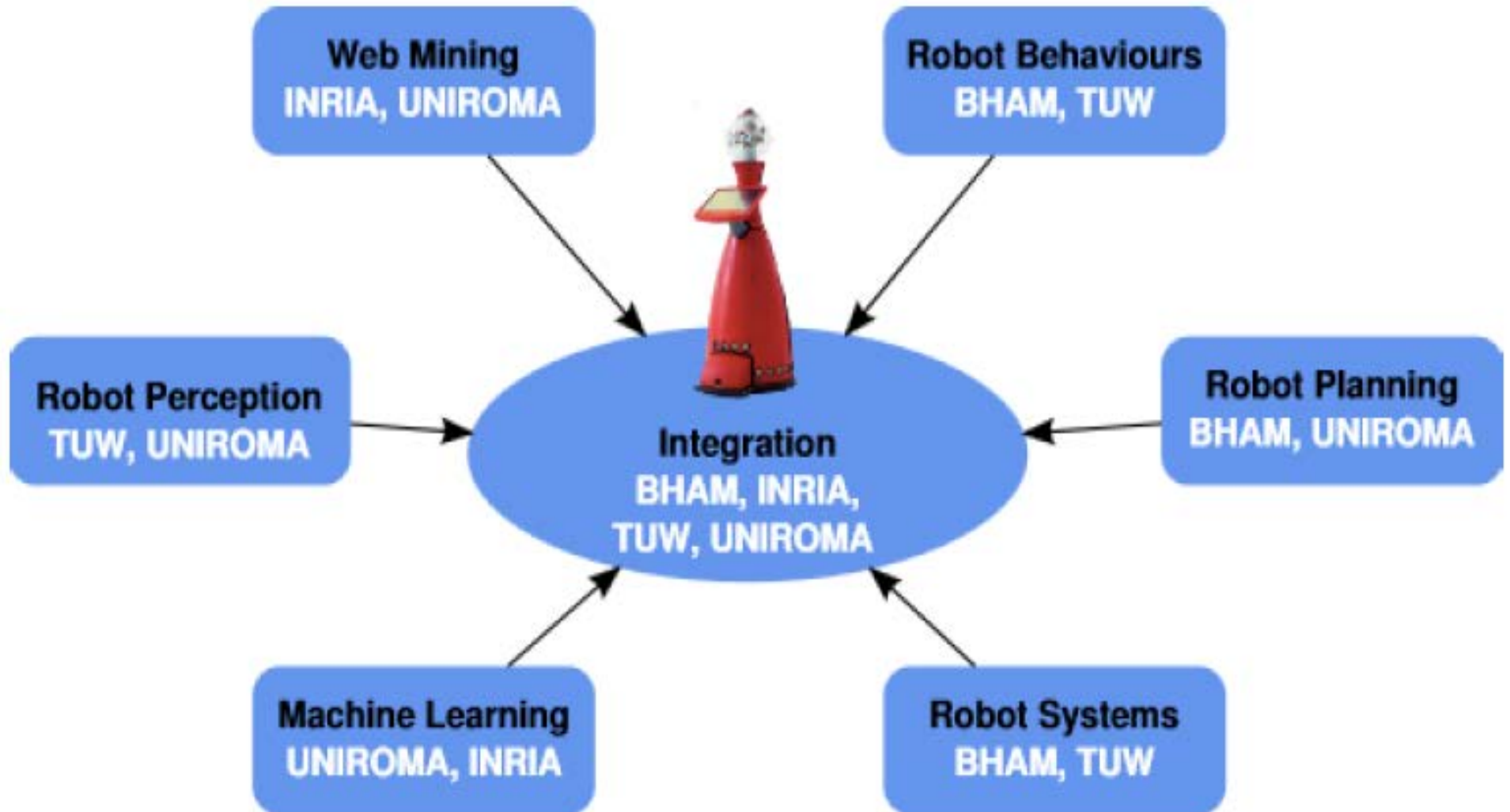
How to extract from the Web information useful for a robot, from a robot query?



The Project Structure



Partners



Working Scenario

Task1: Where is X?

Task2: What is Y?

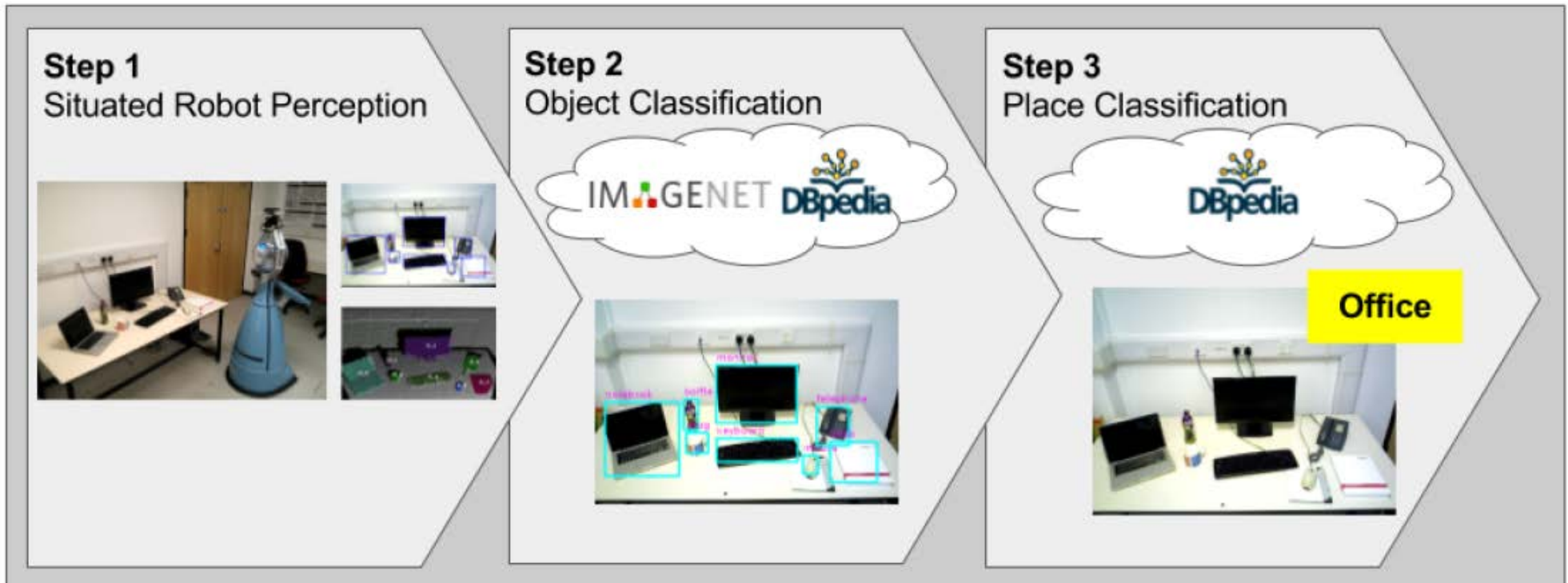
Learning from the Web:

- object type,
- room type,
- proximity of furniture,
- 3D shape models



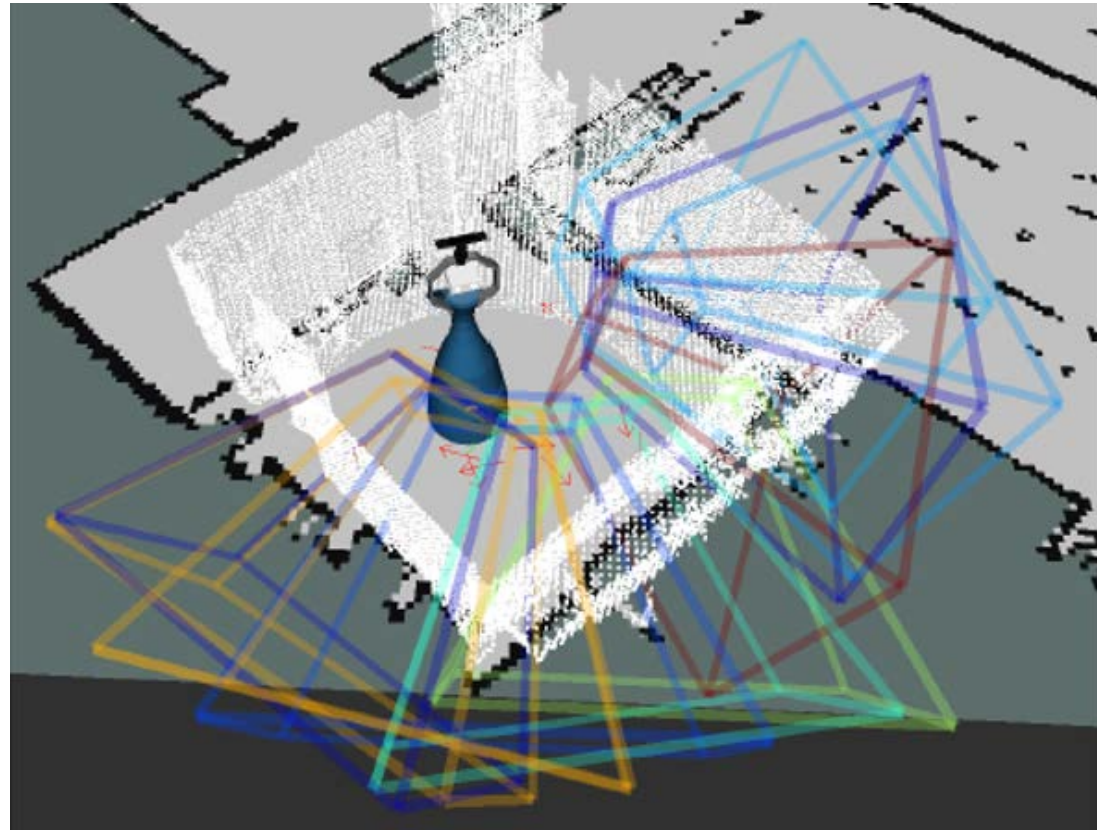
Main Scientific Results

- Detecting objects and classifying novel objects from autonomous robot



Long Term Trial

- Deployment in large office environment in UK
- Autonomous over four months (jointly with STRANDS)



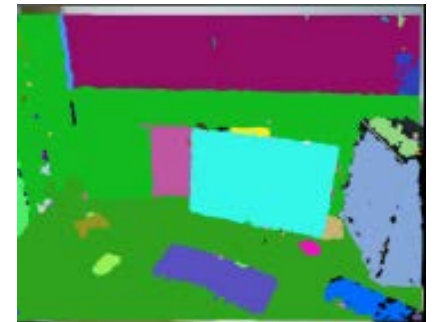
Object Detection and Classification

- Autonomously detect objects on horizontal surfaces
- Collect data of novel objects
- 3D modelling from multiple views
- Web search to identify objects
- Use nearby objects to aid object identification



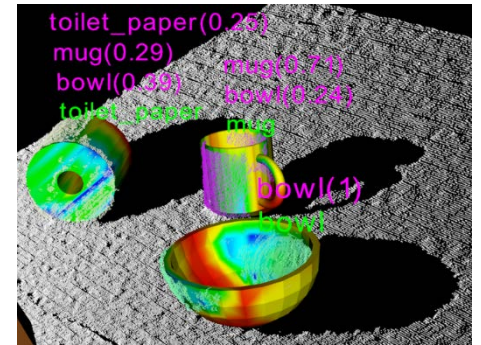
Main Scientific Results

- Long-term deployment of ALOOF integrated technology at an end-user site in the UK
 - Substantial practical experience of the use of autonomous object learning under real world
- Controlled study on the life-long learning of objects and resulting search for previously unknown objects
- Significant improvements to object segmentation and detection pipeline
- Significant improvement to view planning process, more informative views, better performance, overall speed up



Main Scientific Results


- Creation of perceptual knowledge bases on demand from the Web, aligned to semantic knowledge base
- Significant improvement of learning object classes from Web and real data
 - 3D object modelling; Semi-automatic, pixel-wise tool for semantic annotation
- Semantic web search and DB for objects
 - Knowledge about objects; type, room, actions, relations



Dissemination

- AnSWeR 2017 best paper award
 - Joint ALOOF paper on spatial categorization
 - 1st International Workshop on Application of Semantic Web Technologies in Robotics
- 4 Journal publications (RA-L, CVIU, E&I, SWJ)
- 22 Conference papers (IROS, ICRA, CVPR, ...)
- 4 Workshop / ArXiv papers
- 2 PhDs (Jay Young, Daniel Wolf), 4 Master theses
- 9 invited talks
- 3 Workshops organised

Sustainability

- Data bases
 - OSD Object Segmentation Database
 - ARID Autonomous Robot Indoor Dataset (ICRA 2018)
 - Default Knowledge of Objects  DeKO
- Tools
 - MORSE robot simulation: generation of the spatio-temporal dynamics of everyday objects
 - Software library for semantic segmentation, ROS
 - View planning, crowd-based labelling and unknown object inference: integrated in STRANDS project
 - <http://strands.readthedocs.io/en/latest/index.html>
 - KNEWS, a pipeline of NLP that outputs frame-based knowledge

Valorisation

- Roma: ImageNet for robots, e.g., iCub (IIT)
- BHAM: UK project on sorting nuclear waste
- INRIA exploiting KNEWS and DeKO
- TU Wien: Doctorate College on TrustRobots
- Aeolus Robotics started office in Vienna
 - Building first personal robots with manipulation; Exploiting object detection, classification and recognition expertise
- Exploiting project results in several EC and national proposals

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