

# **INSTITUTO de SISTEMAS E ROBÓTICA**

**Institute for Systems and Robotics**



# Mission and Goals

**ISR-Lisbon** is an RD&I institution, affiliated to the Instituto Superior Técnico (IST), where multidisciplinary advanced research activities are developed in the areas of Robotic Systems and Information Processing,

## **Research domains:**

Systems and Control Theory, Robotics, Signal Processing, Computer Vision, Optimization, AI and Intelligent Systems, Biomedical Engineering.

## **Three-fold activities:**

Research, advanced training and outreach



# Facts and figures

Foundation: 1992

# Faculty: 31

# Post docs: 12

# PhD students: 82

# PhD theses awarded (2014): 9

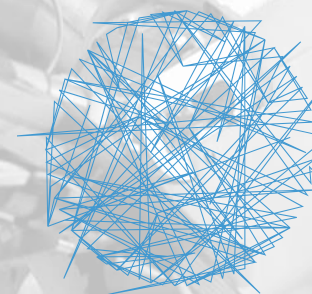
Funding (2008-12):

FCT: 7,4M€

EU: 4.8M€

Other: 0.7M€

Member of



**LARSyS**

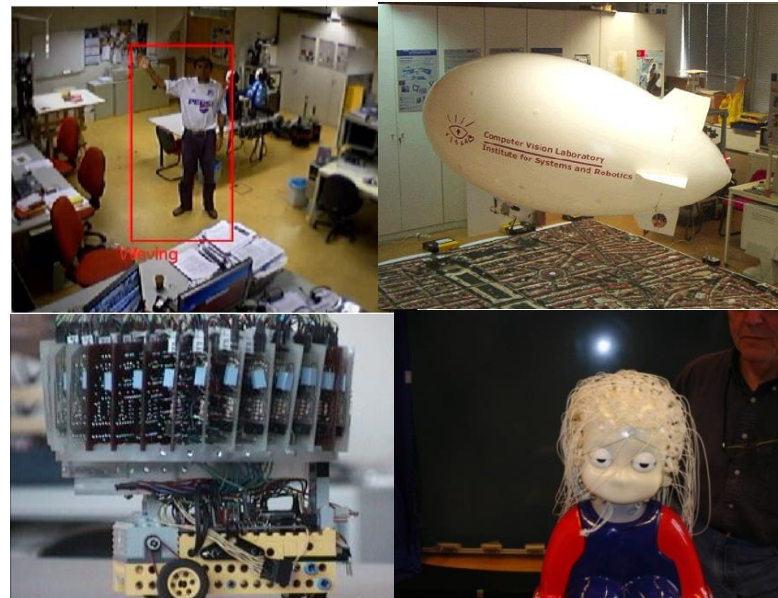
Laboratory of Robotics  
and Engineering Systems



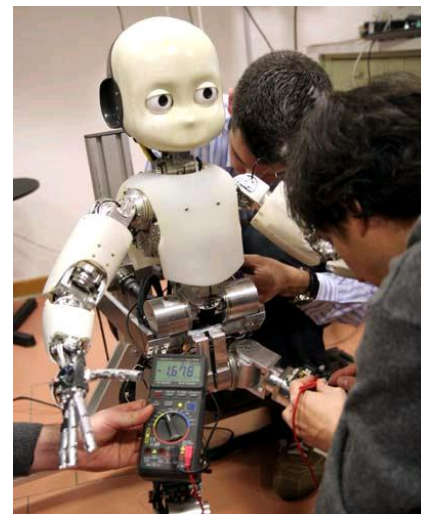
# Computer and Robot Vision Lab (VisLab)

## Research Areas

- Image Analysis & Surveillance
- Visual Navigation & Calibration
- Bioinspired Vision and Learning
- Cognitive Robots



- 9 Phds (4 Faculty + 5 PostDocs)
- 16 PhD students
- 8 PhDs awarded (2013/2015)
- Hosts of the iCub



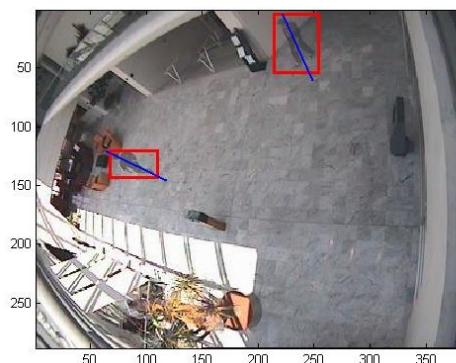


# Research @ VisLab: Image Analysis & Surveillance

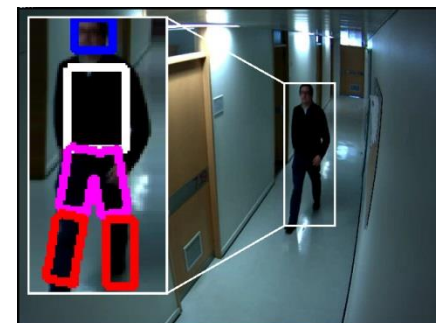
## Projects:

- CAVIAR (EU-FP6)
- URUS (EU-FP7)
- DICORE2S (EU-FP7)
- HDA (QREN)
- SEAGULL (QREN)
- MAIS-S (CMU-PT)
- ARGUS (FCT)

Gesture and activity recognition



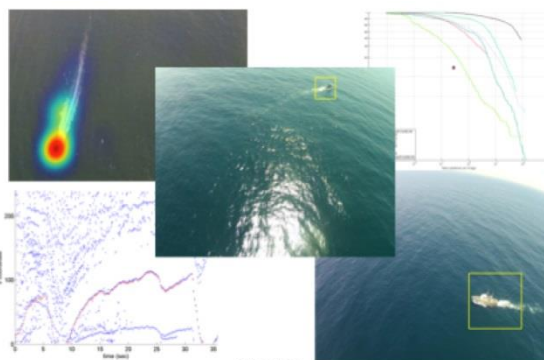
People detection, identification and tracking



Behaviour Modeling



Airborne Surveillance



Camera/Robot Networks







# Dynamical Systems and Ocean Robotics group (DSOR<sub>G</sub>)

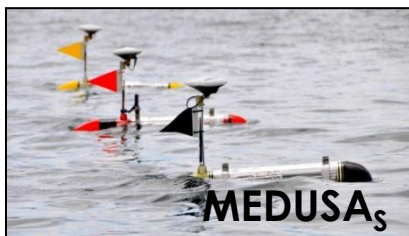
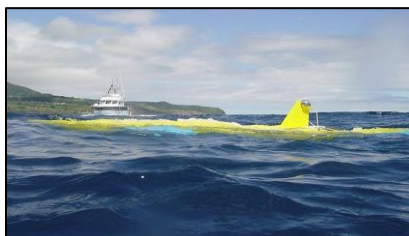
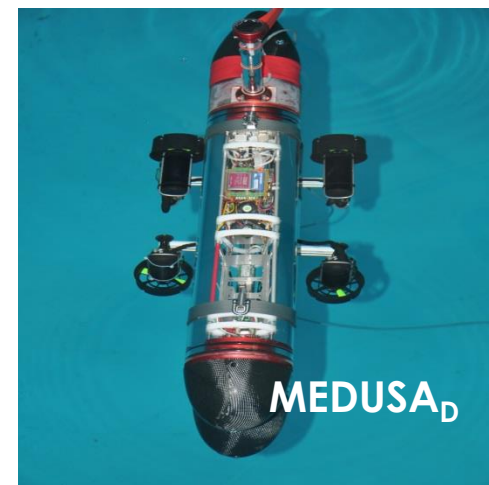
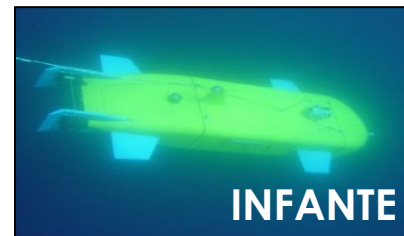
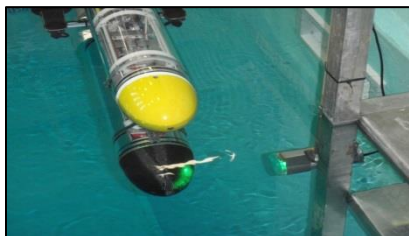
## Areas of intervention:

- Technologies for ocean exploration including networked air and marine robots
- Robotic systems for the inspection of critical marine infrastructures





# R&D capabilities / major achievements



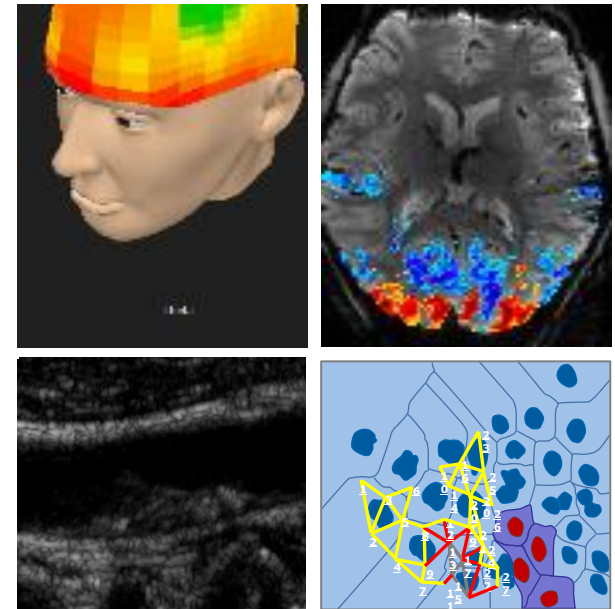
**Fleet of 4 autonomous Surface and  
2 underwater robots  
Underwater optical communications  
system**



# Evolutionary Systems and Biomedical Engineering (LASEEB)

Research areas:

1. Neuroengineering (sleep, emotions, neurofeedback)
2. Neuroimaging (EEG, fMRI, brain dynamics and networks)
3. Biological and medical imaging
4. Biologic inspired optimization and complex systems simulation

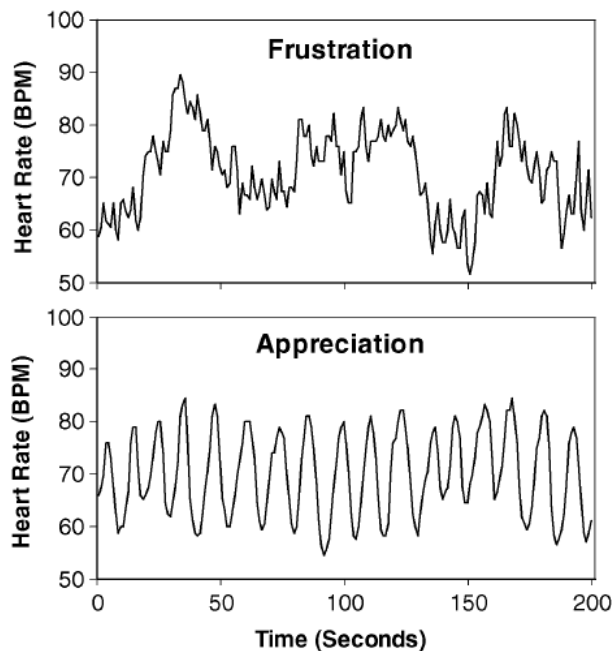


- 4 Faculty
- 2 Postdocs
- 14 PhD students
- 4 Active Projects





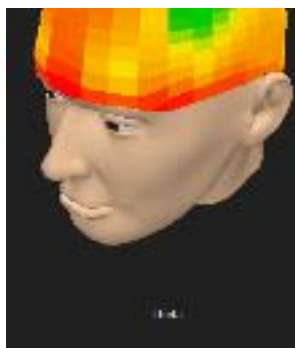
# Research @ LASEEB: Neuroengineering - sleep, emotions, neurofeedback



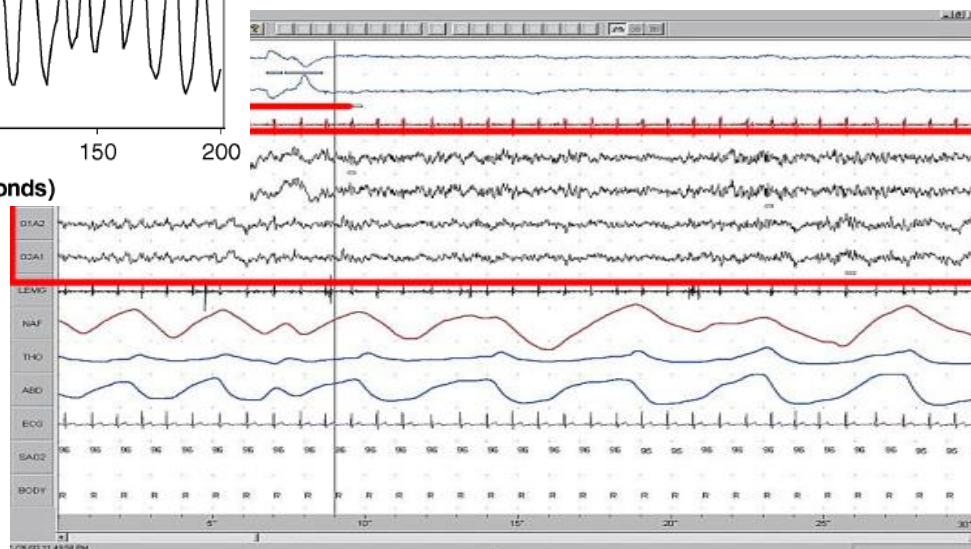
EMG



Actigraphy



EEG





# Intelligent Robots and Systems group (IRSg)

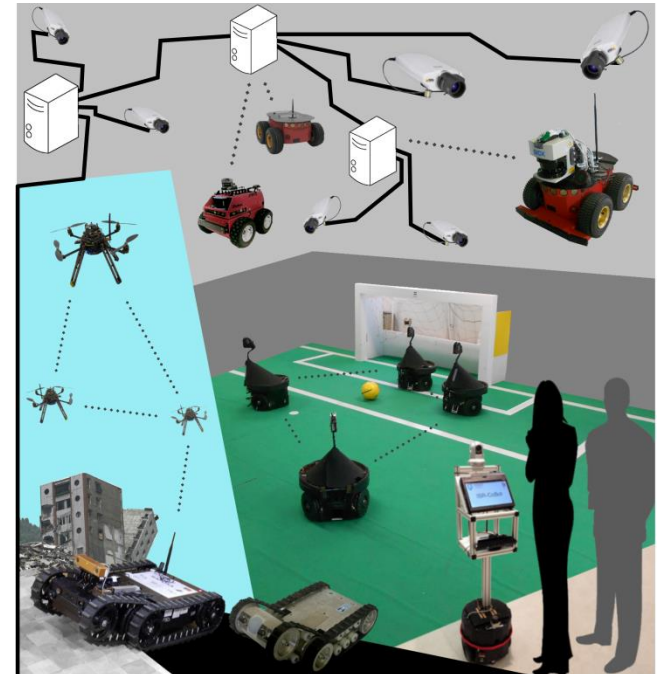
Research

Holistic view of complex systems control and coordination, following approaches that fuse Systems, Control, and Decision Theories with Artificial Intelligence.

Framework:

Since 2002:

- 16 PhDs finished
- Currently 5 PhD students
- 6 active faculty (IST) and 2 Post-Doctoral Fellows
- ~2.5 M€ in R&D projects (FCT, AdI, EU, ESA) through competitive funding
- 4 Books, 75 journal papers and 315 conference papers



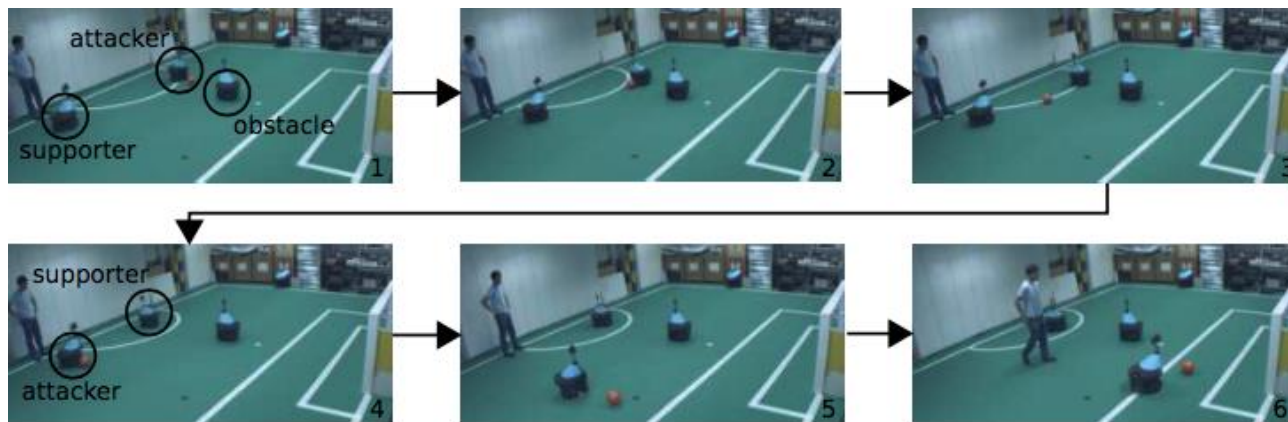


# Research interests @IRSg

cooperative perception



decision-making under uncertainty





# Flagship Projects @ IRSg

## (Networked) Robot Systems for Assisted Living



FP7 STREP MOnarCH (Coordinator)



FP7 CA RoCKIn (Coordinator)

CMU-Pt

- MAIS-S
- INSIDE



Application domains

- Domestic environments
- Hospital environments

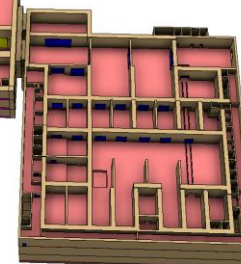
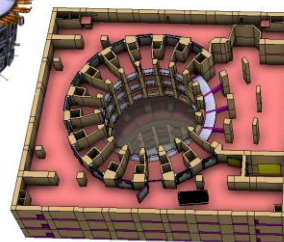
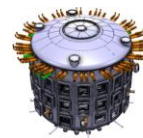
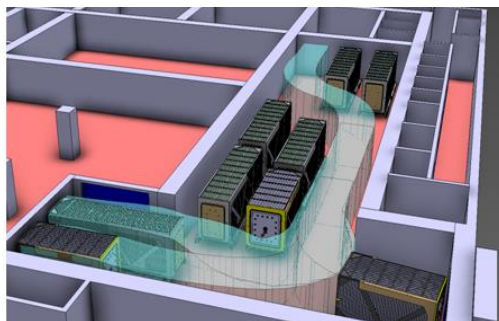
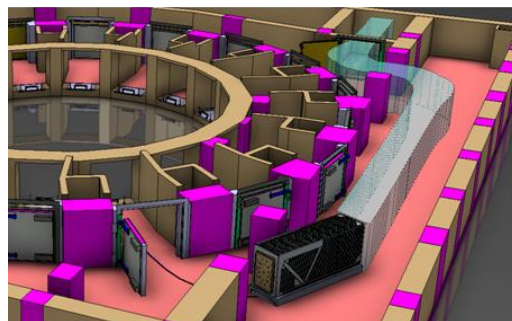
**Key players in Europe on robot competitions**  
(SocRob project: Soccer, Rescue and @Home since 1997)







# Flagship Projects @ IRSg ITER Remote Handling



## Teams of Land + Air Robots for Field Robotics

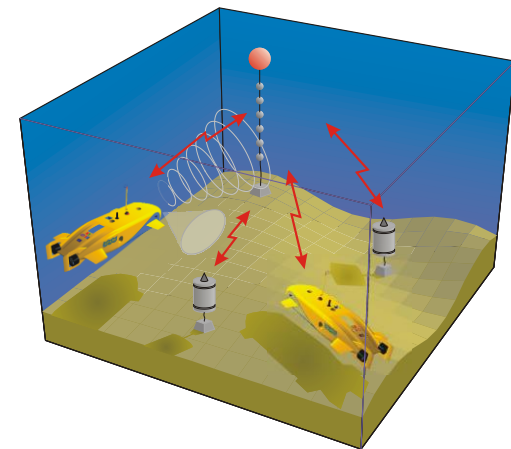
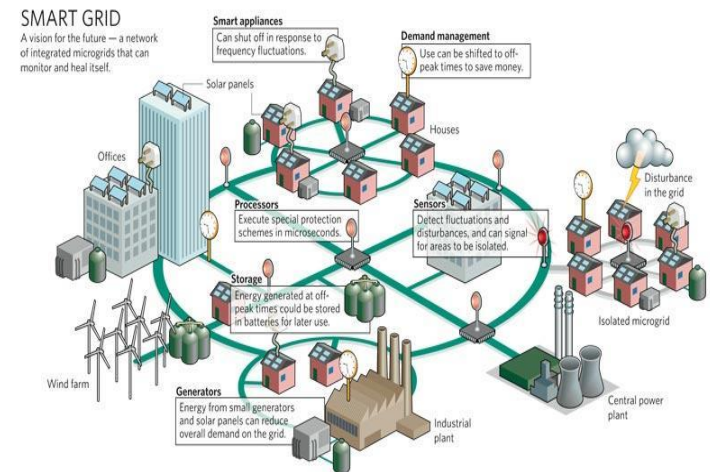




# Signal and Image Processing Group (SIPg)

## Research Areas

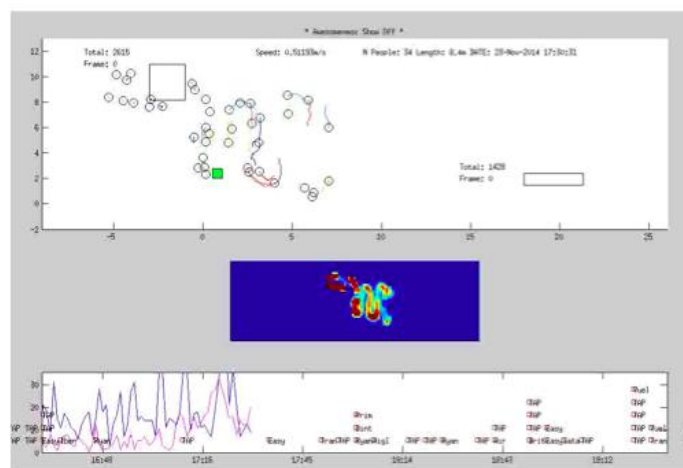
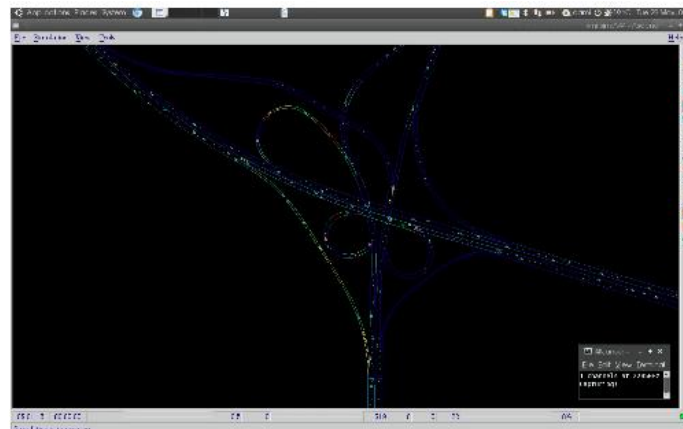
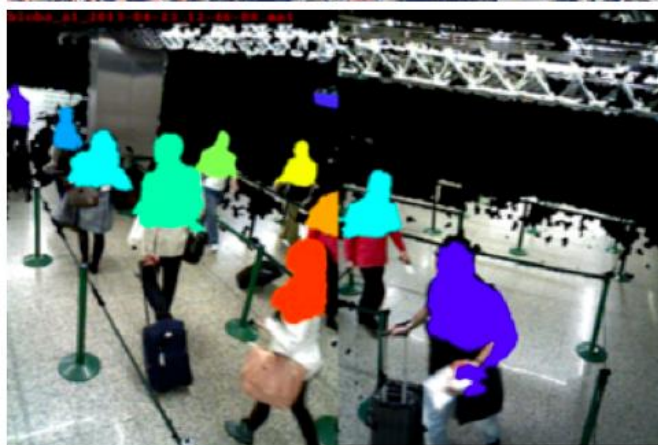
- Large Scale/Nonlinear/Distributed Signal Processing
  - Image/video recognition, 3D reconstruction
  - Underwater Signal Processing
- 
- 17 PhDs (16 Faculty+1 Researcher FCT)
  - 18 PhD students
  - 23 PhDs awarded (2005-2015)





# Research @ SIPg

## Critical Infrastructures 2D/3D object tracking



Systems and Robotics



# Research @ SIPg

## Pollution Monitoring: The URBISNET concept

- Air-quality sampling
- Georeferencing
- Wireless communication
- Remote configuration/monitoring



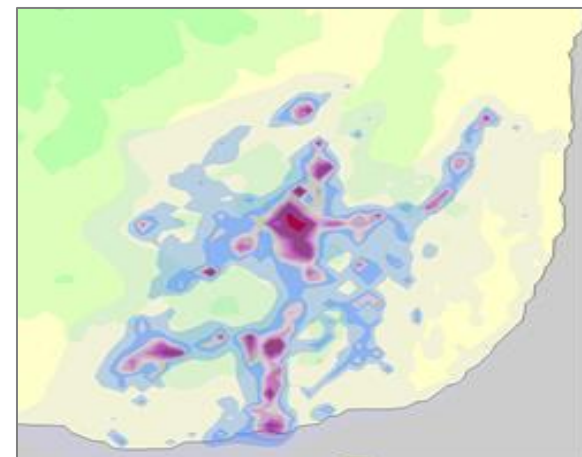
Line 44 – 19 km

Line 742 – 15 km

Line 716 – 7 km

Line 714 – 17 km

Line 717 – 15 km



CO distribution  
(simulated,  
Jan. 2007)

# Advanced training/ infrastructures

## Premium partnerships

- CMU – Portugal: Dual PhD Program
- IST-EPFL Joint Doctoral Initiative

## • FCT Doctoral Programs

- RBCog:Robotics, Brain and Cognition
- NetSys: Networked Interactive Cyber Physical Systems

## • National Roadmap of Research infrastructures

- Robotics, Brain and Cognition Lab
- Brain Imaging Network (BIN)
- European Multidisciplinary Seafloor Observatory





# Nurturing innovation: spin-off companies

**observit**  
tecnologias de visão por computador

**mind**

**reverse**  
LEAGUE

**Blue Edge**



**DISTALMOTION**

**selfTech**

**μROBOPTICS**  
TECHNICAL CONSULTING AND RESEARCH