# European Network on New Sensing Technologies for Air Pollution Control and Environmental Sustainability - *EuNetAir*

## COST Action TD1105

## WGs and MC Meeting at Rome, 4-6 December 2012

**Action Start date: 01/07/2012 - Action End date: 30/06/2016**

**Year: 2012-2013 (*Starting Action*)**

**Partner's Logo**

Univerza v Ljubljani

**Branko Šter**

**Function in the Action** (WG member)

**University of Ljubljana / Slovenia**

COST is supported by the EU Framework Progra

ESF provides the COST Office through a European Commission contract

**University of Ljubljana**

**Faculty of Computer and Information Science**

**Laboratory of Adaptive Systems and Parallel Processing**


- Branko Šter (associate professor)
- Uroš Lotrič (associate professor)
- Nejc Ilc (assistant)
- Davor Sluga (PhD student)
- Tom Vodopivec (PhD student)
- Andrej Dobnikar (retired professor)

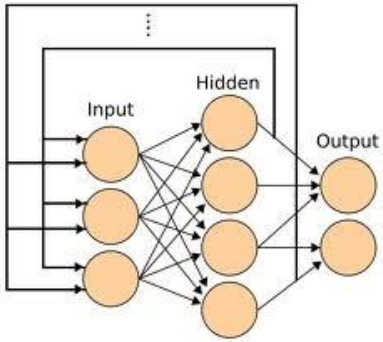
# Scientific context and objectives in the Action

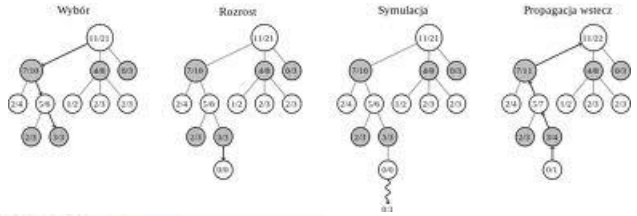
- **Background / Problem statement:**
  - Modeling of distributed (decentralized) sensor networks with Soft Computing applications
- **Brief reminder of MoU objectives:**

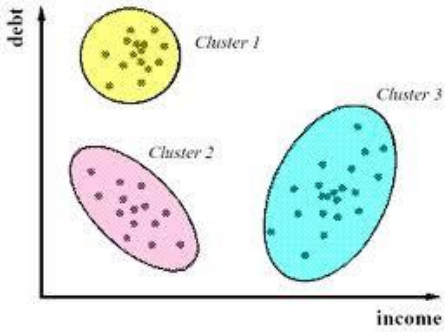
  The Action's objectives *matching* the partner activities:
  - to investigate the best available technology for sensor deployment, communication, power supply and data storage, analysis and display
    - Intelligent algorithms and distributed computing for networked AQC sensors (sub-working group 2.4)
  - WG2, SIG2

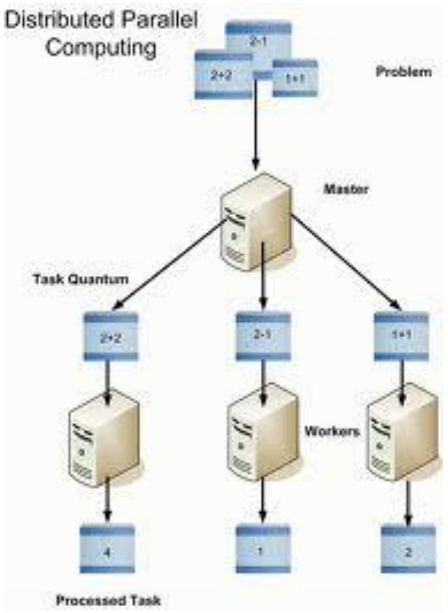
# Current research activities of the Partner (1/2)

- **Current research topics at the partner organization / Problem statement:**




**Brief list of ongoing research topics of the Partner:**

- Parallel / Distributed Processing and Modeling
- Machine Learning (Monte Carlo Tree Search)
- Recurrent Neural Networks (Sequence Processing)
- Pattern Recognition (Clustering)
- Information Theoretic Feature Selection

# **Research Facilities** available for the Partner (2/2)

- **Research Facilities:**
  - Computing Cluster
  - GPUs
  - Automation (Process Control)
  - Mobile Robots
  - Digital Board Kits
  - Cloud facility

# Suggested Priorities for future research

- **Research directions as PRIORITIES:**
  - data preprocessing / filtering, coding
  - Sofrt computing:
    - data mining
    - clustering
    - decision making
  - parallel/distributed processing
  - network analysis

# Friends

Our friends and collaborators, who could not come to Rome:

- Vera Kurkova (Prague)
  - + 2 researchers and 1 PhD student
  - WG2

- Bernardete Ribeiro (Coimbra)
  - + 1 researcher and 2 PhD students
  - WG2

# Vera Kurkova

## (Academy of Sciences, Czech Republic)

**Modeling of Complex Systems by Soft-Computing Methods**

- The goal of the research
  - to develop soft-computing methods suitable for interpretation and prediction based on large-scale complex data sets, applicable to data obtained by new sensing technologies.

- Some of the research objectives:
  - Complexity analysis of large-scale distributed computational systems
  - Estimates of model complexity in dependence on types of computational units and input dimension
  - Theoretical framework for multi-objective optimization.
  - Development of hybrid learning algorithms with meta-learning procedures
  - Agent implementation for distributed environment
  - Applications of agents to autonomous gathering and processing of heterogeneous data in cooperation with other agents

# Bernardete Ribeiro

## (University of Coimbra)

Contribution to activity of WG2

- sub-working group 2.4 Intelligence algorithms and distributed computing for networked AQC sensors

High-performance data mining techniques for large data analysis

- Pre-processing of sensory data using sparse coding learning and tensors techniques
- Development of intelligent processing techniques and machine learning methods for multidimensional and multi-sensorial large data
  - (e.g. applications on renewable energy, weather and/or pollution control, etc.)
- Utilization of machine learning algorithms using Graphics Processing Units (GPU) on multi-core architectures to speed-up the handling of large sensory data sets and to facilitate real-time prediction.