



COST

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



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

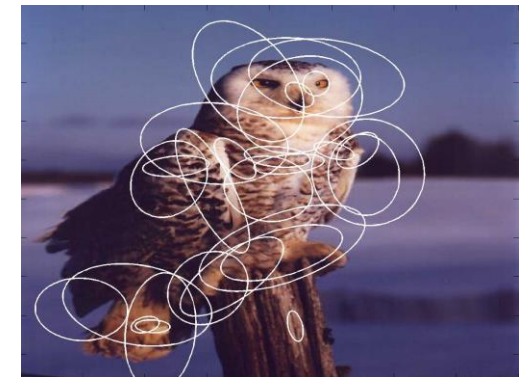
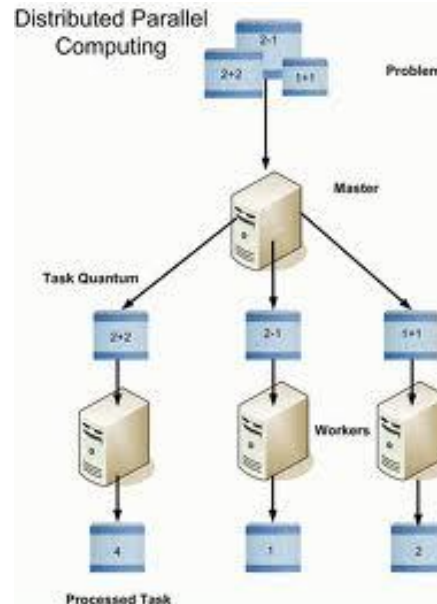
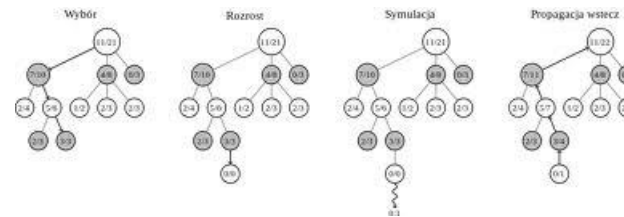
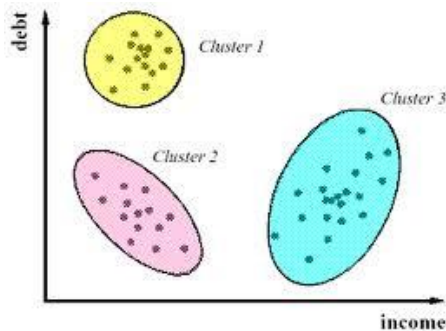
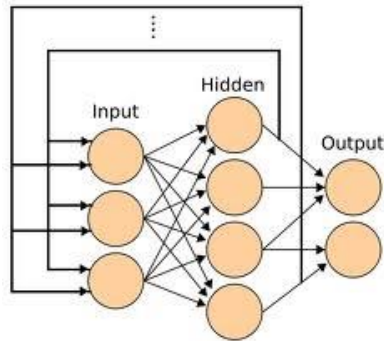
- **Background / Problem statement:**
 - Modeling of distributed (decentralized) sensor networks with Soft Computing applications
- **Brief reminder of MoU objectives:**

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.