COST

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

COST Action TD1105

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Year 2: 1 July 2013 - 30 June 2014 (*Ongoing Action*)

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COST
EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

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

Scientific context and objectives in the Action

Background: **Investigation of softcomputing methods** suitable for **interpretation and prediction based on large-scale complex data sets**, which are **applicable to data obtained by new sensing technologies**.

Problem statement: Spatially distributed sensor units gathering and processing environmental data represent a **challenge for research in the field of distributed computing**. Due to the **spatially distributed nature of sensors, incompletness, noisy character and high-dimensionality of data**, which such sensors produce, traditional approaches such as linear regression and sequential algorithms are not suitable for deployment in this environment.

WG2: Sensors, Devices & Systems for AQC

Intelligence algorithms and distributed computing for networked sensors.

Current research activities of the Partner (1/2)

CZ national project

Modeling of Complex Systems by Softcomputing Methods

Softcomputing models can learn from samples of empirical data and when properly designed, they can generalize acquired knowledge so that they can properly process new data that were not used for training. They can more efficiently deal with high-dimensional data than traditional linear methods.

Tools: neurocomputing, kernel methods, fuzzy inference systems, inverse problems, metalearning, hybrid learning algorithms, and agent implementations.

Goals: design of suitable network architectures and learning algorithms for filtering, unification, clustering, classification, prediction, filtering, and knowledge extraction from sensory data in distributed environment.

Learning with generalization

application of regularization methods developed for problems from physics

generalization = stability

Tractability of learning tasks

choice of network architectures and algorithms suitable for high-dimensional data (model complexities do not grow untractably with increasing dimension)

Multicriterial algorithms

trade-off between minimization of model complexities of networks and maximization of their generalization capabilities, design of meta-learning algorithms, ensembles of algorithms, etc.

Research Facilities available for the Partner

- Machine learning

- Neurocomputing

- Softcomputing

- Fuzzy systems

- Data-mining

- Algorithms proposal, design, testing, and implementation

Suggested **R&I Needs** for future research

Research directions as R&I NEEDS:

- Application of softcomputing methods for surrogate modeling, classification, prediction and data-mining.

- Design-criteria for data-dependent computational models and learning algorithms suitable for data typical for new sensing technologies.

- Multicriterial approaches combining generalization capabilities with tractability of growth of model complexities with dimensions of data.