Visit to The University of Texas at El Paso

Marketa Krmelova, Martin Trnecka

International Center for Information and Uncertainty
Palacky University, Olomouc

european social fund in the czech republic
EUROPEAN UNION
MINISTRY OF EDUCATION, YOUTH AND SPORTS
OP Education for Competitiveness
INVESTMENTS IN EDUCATION DEVELOPMENT

Basic Information about Visit

- Visited institution: University of Texas at El Paso, Department of computer science
- Location: El Paso, Texas, USA
- Date: Marketa Krmelova (4.8. 2013 - 13.10. 2013), Martin Trnecka (16.8. 2013 - 18.9. 2013)
- Guarantee: Vladik Kreinovich (over 900 publications)
- See: `http://www.cs.utep.edu/vladik/`

University of Texas

- Public institution
- Old university, established in 1914
- 22,749 students
- 1,309 academic staff
- 12. place in rating of public universities in USA
- Campus: Urban, 366 acres
- Nickname: Miners

Areas of Interest

- Interval computations
- Intelligent control (including fuzzy and neural approaches)
- Reasoning under uncertainty

Papers from this Visit

During this internship has produced two articles:

1. Martin Trnecka, J. Lorkowski: Similarity Approach to Defining Basic Level of Concepts Explained from the Utility Viewpoint
2. M. Krmelova, M. Trenecka, V. Kreinovich a B. Wu: How to Distinguish True Dependence from Varying Independence?"

Varying independence

- Let K be a total number of different populations.
- Let $w_k (1 \leq k \leq K)$ denote the probability that a randomly selected object belongs to the k-th population.
- Let $A_k(x)$ and $B_k(y)$ be marginal distribution functions corresponding to the k-th population.

$$F(x, y) = \sum_{k=1}^{K} w_k \cdot A_k(x) \cdot B_k(y)$$

- In general case:

$$F(x_i, y_j) \approx \sum_{k=1}^{K} w_k \cdot A_k(x_i) \cdot B_k(y_j)$$

Solution of problem

A usual statistics-motivated way to deal with approximate equalities is to use the least squares approach, i.e., to look for the values w_k and the functions $A_k(x_i)$ and $B_k(y_j)$ for which the sum of the least squares

$$s \stackrel{\text{def}}{=} \sum_{i=1}^{I} \sum_{j=1}^{J} (F(x_i, y_j) - \sum_{k=1}^{K} w_k \cdot A_k(x_i) \cdot B_k(y_j))^2$$

attains the smallest possible value.

New algorithm: base on SVD method. First compute Frobenius norm of input matrix F then SVD compute first K singular values.

Other Activities

- Visited courses: Advance algorithms, Interval Computing a Special Topic in Computer Science: Computational Number Theory with Applications to Cryptography
- Visited seminar: Team base learning
- Two talk about research at the Department of Computer Science at Palack University, Olomouc (Basic Level Of Concepts in Formal Concept Analysis, Factor Analysis of Ordinal Data).

Photo Documentation