

Subject

Methodically Unified Procedures for Outliers Detection, Clustering, and Classification in Conditional Approach

Supervisors, contact, place of research

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Project Description

The subject of the studies are procedures for identification of atypical elements (outliers), clustering, and classification for the conditional case, i.e. when distribution characteristics of the dataset are dependent on quantities metrologically available (e.g. current temperature), which in practice efficiently allows to make the model used more precise and up-to-date. In order to solve the issue thus formulated. nonparametric estimation methods will be used, which frees the procedures under research from the distribution in the investigated dataset. Elements of computational intelligence - fuzzy logic (including intuitionistic fuzzy sets) and genetic algorithms - will be applied in particular aspects. The results obtained will be illustrated and tested using synthetic data and benchmarks, and also research in environmental engineering conducted at the Faculty of Physics and Applied Computer Science at AGH, as well as - optionally - in a domain proposed by the Ph.D.-student. The unconditional case was successfully investigated out, verified, and applied [1-4] in cooperation with former Ph.D.-students - participants of Ph.D.-Studies of the Systems Research Institute - M. Charytanowicz, D.Sc., P.A. Kowalski, D.Sc., D. Kruszewski, Ph.D., and S. Łukasik, Ph.D.

Mathematical predispositions and programing ability are required from the Ph.D.-student.

Bibliography

1. Kulczycki P. (2018) Kernel Estimators for Data Analysis, in: Advanced Mathematical Techniques in Engineering Sciences, Ram M., Davim J.P. (eds.), CRC/Taylor & Francis, Boca Raton, pp. 177-202.
2. Kulczycki P., Charytanowicz M., Kowalski P.A., Łukasik S. (2012) The Complete Gradient Clustering Algorithm: Properties in Practical Applications, Journal of Applied Statistics, vol. 39, no. 6, pp. 1211-1224.
3. Kulczycki P., Kowalski P.A. (2015) Bayes Classification for Nonstationary Patterns, International Journal of Computational Methods, vol. 12, no. 2, sygn. #1550008 (19 pages).
4. Kulczycki P., Kruszewski D. (2017) Identification of atypical elements by transforming task to supervised form with fuzzy and intuitionistic fuzzy evaluations, Applied Soft Computing, vol. 60, no. 11, pp. 623-633.

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