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Interpretability and Explainability in Data Analytics:

A Design of Concepts with Information Granules

Abstract

In data analytics, system modeling, and decision-making models, the aspects of interpretability and explainability are of paramount relevance, just to mention only explainable Artificial Intelligence (XAI).

In this talk we highlight that there are two factors that immensely contribute to the realization of the above important features, namely, a suitable level of abstraction in describing the problem and a logic fabric of the resultant construct. It is demonstrated that their conceptualization and the following realization can be conveniently carried out with the use of information granules (for example, fuzzy sets, sets, rough sets, and alike).

Concepts are building blocks forming the interpretable environment capturing the essence of data and key relationships existing there. The emergence of concepts is supported by a systematic and focused analysis of data. At the same time, their initialization is specified by stakeholders or/and the owners and users of data. We present a comprehensive discussion of information granules-oriented design of concepts and their description by engaging an innovative mechanism of conditional (concept)-driven clustering. It is shown that the initial phase of the process is guided by the formulation of some generic (say, *low* profit) or some complex multidimensional concepts (say, *poor* quality of environment or *high* stability of network traffic) all of which are described by means of some information granules. In the sequel is explained by other variables through clustering focuses by the context. The description of concepts is delivered by a logic expression whose calibration is completed by a detailed learning of the associated logic neural network. The constructed network helps quantify contributions of individual information granules to the description of the underlying concept and facilitate a more qualitative characterization achieved with the aid of linguistic approximation. This form of approximation delivers a concise and interpretable abstract description through linguistic quantifiers. A detailed example of enhancement of interpretability of functional rule-based models with the rules in the form “if x is A then $y = f(x)$ ” with A being an information granule is discussed leading to the relational rules with condition and conclusions coming in the form of information granules.