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Toward Approximate Intelligence inspired by Rough Sets and Granular Computing

Ku inteligencji aproksymacyjnej inspirowanej zbiorami przybliżonymi i obliczeniami granularnymi

It is evident that humans do not operate with precise information in decision-making and thus, it might be unnecessary to provide them with precise outcomes of reasoning, modeling or analytical processes. Consequently, the question arises whether approximate results of computations or, for instance, results derived from the approximate data could be delivered more efficiently than their standard counterparts.

Such questions are similar to those about precision of calculations conducted by ML and KDD methods, whereby heuristic algorithms could be boosted by letting them rely on approximate computations. This leads us toward a discussion of the importance of approximations in the areas of machine intelligence business intelligence and, generally, the meaning of approximate derivations for various aspects of AI.

This talk provides a few illustrations for the above discussion, with a special focus on the rough set and information granulation approaches. We begin with a case study of attribute selection understood as extraction of multiple approximate data models. We recall our earlier experiences with incorporating attribute selection tools into coal-mine monitoring systems and refer to some of our current projects.

The second case study is about an approximate database engine - deployed in the cyber-security industry - which works on granulated data summaries. Herein, query operations take form of fast transformations of input summaries into summaries reflecting the output data. We show how rough set principles helped us to reach good accuracy of query results. We also discuss how to design similar tools for ML purposes.

In the third case study, we follow paradigms of information granulation in order to create a software library which helps developers to create AI agents for eSport games. The idea is to let humans encode basic game-related concepts which can be used by intelligent bots in a simplified abstraction of a game. We refer also to another project in which a similar layer of intuitively defined game-related concepts is designed for an opposite purpose - to advise players how they can improve their skills basing on analysis of their past playouts. In both cases, the ability to approximate ``real game world'' is the key to success.