## Abstract

The aim of the dissertation is to introduce the reader to the world of granular computing derived from Polkowski's methods in terms of rough set theory [19]. Our goal was to expand our knowledge of this particular niche of data analysis. To present our new approximation techniques for decision systems in the area of classification. In particular, we plan to show exemplary new results using known granulation methods, but also a new method that does not require parameter estimation - homogeneous granulation. Its use for missing values handling, its use in an ensemble model (a competitive technique to other ensemble models including boosting and bagging) and the epsilon variant applied to numerical data. An additional aim is to test the performance of the aforementioned granulation methods in combination with oversampling. Our methods are dedicated to reducing the size of decision-making systems while extracting the most important information - maintaining classification efficiency. In the dissertation, we will present, among others, results that were accepted or recognized in the competition - PP-RAI Contest for the Most Influential Article on Rough Sets co-authored by Polish Researchers in 2020-2021 papers [36] and [4]. In order to achieve the aim of the dissertation, the following theses have been formulated:

(i) It is possible to design a knowledge granulation method that does not require

the estimation of the optimal parameter value for the granulation radius,

(ii) The use of knowledge granules can have an effective application in reinforcing

classification processes in Ensemble models,

(iii) The use of knowledge granules can have wide application in various data analysis processes - including the absorption of missing values,

(iv) Oversampling and undersampling techniques affect the process of creating granular reflections of decision-making systems.