

# Granular Computing Theory and Its Application

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*Abstract*—Granular computing is a new paradigm of information processing and has attracted many researchers and practitioners. Granular computing is an umbrella term to cover any theories, methodologies, techniques, and tools that make use of information granules in complex problem solving. The aim of this report is to review foundations of research and to elaborate on its some applications in granular computing research, and then to discuss that what the opportunities and challenges are when we study granular computing in the era of big data.

Firstly, the report has reviewed some basic notions of granular computing. And nine models of granulation, unifying rough set theories by neighborhood systems(NS) of research in granular computing and the granular matrix reduction algorithm based on binary relations are given. Further, its some applications, such as in the control system (SDG(Signed Directed Graph) fault diagnosis, artificial neural networks fault diagnosis), medical image processing and digital logic circuit, have been elaborated in granular computing research. In these applications, based on granular computing theory, remove redundant attributes and make the problems simplify using the matrix reduction algorithm. And these are our primary achievements in recent years. Finally, we discuss and identify some research directions in granular computing, what is our current works in granular computing research.