Tanta University
Faculty of Engineering
Physics and Engineering Mathematics Dept.

# Topological Generalizations For Some Granular Computing Models

A thesis submitted to

Physics and Engineering Mathematics Department, Faculty of Engineering,

Tanta University in partial fulfillment of the requirements for the degree of

**Master** in Physics and Engineering Mathematics "**Engineering Mathematics**"

By

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*Manal E. Ali*
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**Plan of Research for Master Degree in**
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Title: "Topological Generalizations for Some Granular Computing Models"

**Plan of research aims to:**

- **Give a comprehensive survey for the basic concepts of granular computing.**
- **Use granular computing for converting the complicated information systems into simple ones.**
- **Give a view for the concept of granular computing and its different fields.**
- **Make a comparison for different mathematics methods used for granular computing.**
- **Construct new methods for generalizing granular computing models depending on topological concepts.**
- **Investigate the applicability of the suggested methods in the different fields (Engineering, agriculture, medicine, economy,…….etc).**

**Supervisors** :

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# ABSTRACT

Generalization of granular computing model has been discussed in Chapter III using topological concepts (interior, closure, semi lower and semi upper operators). The statistic correlation coefficients can not deal with all data such as non ordered data. We use the rough set concepts to give a new definition of correlation factor. This definition is used for all data "qualitative, quantities, ordered and unordered data".

By calculating the distance between old objects and new object, we can put a decision value for the new object according to the algorithm which we explained it in Chapter IV and our computer program in Appendix A. We used this program after making the reduction technique for the information system table to decrease the lost time for calculation to all condition attributes. Also we can deal with the attribute values which are symbols by converting it to numbers.

# SUMMARY

Granular computing is a valid way to describe problem spaces or solve problems. It enables us to perceive the real world under various grain sizes, obtain only those useful or interesting things at different granularities, and switch among different granularities to get various levels of knowledge. The basic ideas of granular computing have already been explored in many fields, such as soft computing, knowledge discovery, machine learning, and web intelligence. We give a comprehensive survey for the basic concepts of granular computing in Chapter II.

In Chapter III, Generalization of granular computing model has been discussed by using topological concepts (interior, closure, semi lower and semi upper operators). We defined a new definition for a correlation factor using rough sets technique. This definition is very simpler than statistic definition, that gives us a capability to deal with all information tables (quantities and qualitative). By using this definition, we can deal with an unordered data which we can't deal with it by using a classical definition "statistical definition". Also, we can use this definition for reduction of attributes as discussed at the end of this chapter.

But in chapter IV, we need to give a decision for new objects "new condition attribute values". This decision depends on the old objects "old condition attribute values". By using the technique of rough set, we get to the minimal information system table, also by using the topological concepts "in general case", we get the minimal information system or

minimal knowledge. After this reduction, we put a decision value for new object by calculating the distance function between the condition attribute values for the old objects and new object. This method is discussed by the algorithm and our computer program as in Appendix A. Also we deal with the attribute values which are symbols by converting it to numbers.

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# List of Abbreviations

| | | |
|---|---|---|
| **AI** | : | Artificial Intelligent |
| **BG** | : | Binary Granulation |
| **B-granule** | : | Binary Granule |
| **BNS** | : | Binary Neighborhood System |
| **BR** | : | Binary Relation |
| **DOND** | : | Data Of New Decision |
| **GNS** | : | General Neighborhood System |
| **GrC** | : | Granular Computing |
| **GRS** | : | Generalized Rough Set |
| **IS** | : | Information System |
| **RSDA** | : | Rough Set Data Analysis |
| **RST** | : | Rough Set Theory |
| **TGACF** | : | Topological Generalizations And Correlation Factor |
| **VPRSM** | : | Variable Precision Rough Set Model |