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Jörg Verstraete

# Artificial Intelligent Methods for Handling Spatial Data

Fuzzy Rulebase Systems and Gridded Data  
Problems

 Springer

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*To Weronika, for her continuous support and  
enthusiasm*

# Foreword

The management and utilization of spatial data has become an important topic both for research and application. Data science attempts to make effective use of such data for numerous applications. In particular spatial data is now obtained in huge quantities from a variety of sensors and imaging sources. Much of the usage of spatial data requires it to be gridded but if data comes from a variety of sources, the grids are often incompatible. To resolve this problem typically a transformation is constructed by mapping a grid onto the other grids, which however introduces uncertainty and loss of accuracy. The research by Dr. Verstraete has been addressing these issues in his research for a number of years and provides a synopsis of many approaches here. However for data science this problem should be managed and interpreted in an intelligent fashion. In particular he looks at the fact that humans are able to bring their expertise and semantic understanding of domain specifics to obtain good regridding solutions. In order to develop this concept for the spatial problems such as regridding, spatial disaggregation, identification of locations, it is necessary to translate the spatial problem into a problem that can be solved using fuzzy rule- base systems. These capture the human knowledge and expertise to allow an automation of the solution to the spatial organization problems. These approaches are extensively demonstrated in several sets of experiments on disambiguation and regridding. Overall this volume is a significant contribution in the area of management issues required for the complex problems associated with applications involving spatial data.

Hancock County, USA  
March 2018

Fred Petry  
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# Preface

This book combines and summarizes the author's research in developing an artificial intelligent method to cope with the map overlay problem for gridded datasets. This problem encompasses both spatial disaggregation, i.e. increasing the spatial resolution of a gridded dataset, and regridding, i.e. the remapping of a gridded dataset onto another raster; and both approaches take advantage of additional available proxy data to allow the artificial intelligent system to determine the underlying spatial distribution.

This book introduces the basic concepts and presents the issues related to overlaying gridded data in Part I. The shortcomings of the current approaches are indicated, and a novel concept is presented. Part II deals with the aspects of developing the concept into a theoretically sound system. This includes further developments of different aspects of rulebase systems, from the variables and ranges in the rulebase systems to the construction of the rules and further interpretation of the fuzzy results. Part III elaborates on different implementation aspects and demonstrates the performance of the developed method.

The results of this work are of interest to researchers and others who need to process gridded spatial datasets, while the development of the artificial intelligent method advances the state of the art of such systems. In particular, researchers working with fuzzy rulebase systems will discover the novel approaches in both rulebase construction and in the processing of the fuzzy outcomes of such systems.

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March 2018

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