Preface

Game theory is a mathematical discipline which studies situations of competition and cooperation among several agents or players. This is a consistent definition with its large number of applications. These applications come from economy, sociology, engineering, policy, computation, psychology, or biology. I focus this book in the cooperative branch. This branch analyzes only the outcomes that result in situations of cooperation, those cases where players are grouped in coalitions. In the classical model, there are several basic suppositions. Players are symmetric, and in each coalition, any player is as important as the rest and they cooperate at the same level. Coalitions are all feasible, in the sense that the worth of each coalition does not depend on any particular relation among the players. The use of techniques from determined mathematical structures and fuzzy sets has allowed us to describe better real problems by new models in cooperative games. Numerous studies have been introduced describing certain additional information about the players or the feasibility of the coalitions which modify the cooperation behavior. Fuzzy coalitions defined different levels of participation in a continuous model of cooperation. My work for several years closely with my colleagues in the research group have been focussed in the analysis of games with restricted cooperation, first by certain classical mathematical structures and currently fuzzy cooperation structures.

This book has a double vocation, one to be a treatise and one to be a practical manual. It is treatise on games with a bilateral fuzzy relation among the players. The idea is presenting the difference in the models, and then, I focus on one particular classical solution for games, the Shapley value. It is self-contained, in the sense that all the mean contents about the topic are included. I present several fuzzy models that we have studied particularly in their respective papers but, in the same context, given certain degree of generality. Each model is analyzed first in crisp case and later in the fuzzy option. All the models contain certain nuances which allow the reader to see the results as newness about the subject. But this book is also a good manual for students and researchers, in the sense that all the proofs are included showing different ways of analysis in these situations. So, I opt in each model for an axiomatization in different way. Usually, I present axioms and properties in the most feasible general way. But also I study the last one in

particular cases because the refinement of the model permits to use specific properties. Any person, only with a common knowledge base about maths, can follow the book. There are also a lot of examples which show the application of the different proposed formulas and concepts, in numbers: 104 definitions, 39 theorems, and 96 propositions with their proofs, 110 examples, 37 tables, and 53 figures. I hope that the reader will find useful this work.

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