

# Coalitional Game Theory in Wireless Networks

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Game theoretical techniques have recently become prevalent in many engineering applications, notably in wireless networks. With the emergence of cooperation as a new communication paradigm, and the need for self-organizing, decentralized, and autonomic networks, it has become imperative to seek suitable game theoretical tools that allow to analyze and study the behavior and interactions of the nodes in future communication networks. In this context, this tutorial introduces the concepts of cooperative game theory, namely coalitional games, and their potential applications in wireless networks. For this purpose, we classify coalitional games into three categories: Canonical coalitional games, coalition formation games, and coalitional graph games. This new classification represents a novel application-oriented approach for understanding and analyzing coalitional games. For each class of games, we present the fundamental components, introduce the key properties, and solution concepts, and describe the methodologies for applying these games in several applications drawn from the state-of-the-art research in wireless networks. In a nutshell, this tutorial aims to provide an in-depth and solid introduction on applying coalitional game theory in wireless and communication networks.

Biographies: Walid Saad received his B.E. degree in Computer and Communications Engineering from the Lebanese University, Faculty of Engineering II, in 2004 and his M.E. in Computer and Communications Engineering from the American University of Beirut (AUB) in

2007. He is a PhD student at the University of Oslo since August 2007, and he is expected to graduate in July 2010. His research interests are in the applications of game theory in wireless networks.

Zhu Han received the B.S. degree in electronic engineering from Tsinghua University, in 1997 and the M.S. and Ph.D. degrees in electrical engineering from the University of Maryland, College Park, in 1999 and 2003, respectively. Currently, he is an assistant professor in the Electrical and Computer Engineering Department at the University of Houston, Texas.

Are Hjørungnes works as a Professor at UNIK - University Graduate Center, at the University of Oslo, Norway. He obtained his Sivilingeniør (M.Sc.) degree with honors in 1995 from the Norwegian Institute of Technology in Trondheim, and his Doktor ingeniør (Ph.D.) degree in 2000 from the Norwegian University of Science and Technology.

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