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Promotionsverfahren von **Frau M.Sc. Anna Maria Kerkmann**
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Sehr geehrte Damen und Herren,

in dem oben genannten Promotionsverfahren wird die Annahme der Dissertation

An Axiomatic and Computational Analysis of Altruism, Fairness, and Stability in Coalition Formation Games

von den Berichterstattenden Prof. Dr. J. Rothe, Juniorprof. Dr. R. Bredereck und Prof. Dr. M. Hoefer beantragt. Sie kann zusammen mit den Gutachten in der Zeit

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Mit freundlichen Grüßen
im Auftrag

Silke Krispin

An Axiomatic and Computational Analysis of Altruism, Fairness, and Stability in Coalition Formation Games

Anna Maria Kerkmann

This thesis deals with coalition formation games, which belong to the research area of cooperative game theory. In these games, players divide into groups, also called coalitions, based on their individual preferences. In our research, we mainly focus on hedonic coalition formation games, hedonic games for short, in which players' preferences are assumed to depend only on the coalitions containing themselves. A central problem in hedonic games research is finding reasonable formats for the elicitation of preferences. These preference representations should be easy to elicit, reasonably expressive, and succinct. Many such formats have already been presented in related literature, some of which we will also discuss in this thesis. A second central point in research concerning hedonic games is the investigation of stability, fairness, and optimality. For instance, common stability concepts deal with the question of whether individual players or groups of players might have an incentive to deviate from their current coalitions. Among those notions are, for example, Nash and core stability.

Based on the current state of research, we introduce new models for (hedonic) coalition formation games and investigate them with respect to axiomatic properties, stability, fairness, and optimality. In particular, investigations of the computational complexity of the associated decision problems play an important role.

We start with introducing several models for altruism in coalition formation games. First, we focus on the context of hedonic games and then extend the models to more general coalition formation games, where a broader form of altruism is possible. We conduct an axiomatic analysis of our models and compare them to related models and to each other. In addition, we study the problems, that arise when considering classical stability concepts in the context of altruistic coalition formation games, with respect to their computational complexity.

Subsequently, we define three threshold-based fairness notions for hedonic games. These notions are considered local fairness notions in the sense that the agents only have to inspect their own coalitions to decide whether a coalition structure is fair to them. We study the relations of these notions to other common stability and fairness concepts and examine them with respect to their computational complexity. Furthermore, we investigate the price of local fairness, i.e., the impact that our fairness concepts have on the social welfare.

Finally, we introduce another preference format in which players distinguish between friends, neutral players, and enemies. Accordingly, they cast their preferences by submitting a weak rankings that is separated by two thresholds. Since the preferences that can be derived from these rankings are not necessarily complete, we distinguish between possible and necessary stability in the resulting games. Again, we perform a computational complexity analysis of the problems that arise with respect to common stability concepts.