SCIENCES & BIOENGINEERING SCIENCES

The Research Group

Artificial Intelligence Lab

has the honour to invite you to the public defence of the PhD thesis of

Sofie DE CLERCQ

to obtain the degree of Doctor of Sciences

Title of the PhD thesis:

Reaching a Consensus under Multi-agent Preferences

Joint PhD VUB and UGent

Promotors:
Prof. Dr. Ann NOWÉ (VUB)
Prof. Dr. Martine DE COCK (UGent)
Dr. Steven SCHOCKAERT (Cardiff University)

The defence will take place on

Monday 19 December 2016 at 17h

in the multimediazaal in building S9 on the campus De Sterre of Ghent University, Krijgslaan 281 in 9000 Gent, and will be followed by a reception.

Members of the jury:

Dr. Chris Cornelis (UGent)
Prof. Dr. Wolfgang Faber (University of Huddersfield, UK)
Prof. Dr. Viviane Jonckers (VUB)
Dr. Jérôme Lang (Université Paris-Dauphine, France)
Prof. Dr. Bernard Manderick (VUB)
Prof. Dr. Marnix Van Daele (UGent, voorzitter)

Curriculum vitae

Sofie's research focuses on settings characterized by the presence of multiple agents, each with their individual preferences. More particularly, she researched stable matching problems — in which for instance patients are matched to compatible donors — and Boolean games — in which agents formalize their goal by means of propositional logic. She has presented her work at top venues such as KR, IJCAI and ECAI.

Abstract of the PhD research

Multi-agent systems are characterized by different agents — humans or robots — that each have their own goals or preferences. For instance, in classical stable matching problems agents have a preference to which agent they want to be matched. In games — in this context defined as situations in which agents have to make strategic decisions — agents have preferences regarding the outcome of the game. A well-known example is the 'Battle of Sexes', in which a man and woman wish to go out together, but the wife prefers to go to the theatre, whereas the husband prefers to attend a soccer game. Moreover, the preferences are not necessarily subjective of nature: they can for instance be based on compatibility, as in donor-patient matching problems. In multi-agent systems it is a challenge to characterize stable outcomes on the one hand and to detect these consensus-outcomes or coordinate agents towards them on the other hand. These are the type of problems that we considered in this thesis.

In the first part we used the logical programming language ASP to compute optimal stable matchings. In the second part we focused on Boolean games, in which agents can choose to undertake an action or not, and each agent aims to fulfil a logical expression. By means of ASP we implemented the first general solver for these games. Next we extended the framework to allow agents to have incomplete or uncertain information about the other agents' preferences. To this end, we used possibilistic logic. Finally we investigated how agents in Boolean games can reach a consensus. Among others we developed a negotiation protocol such that the agents are guaranteed to reach a fair and efficient outcome. Furthermore we showed how conditional commitments can be used to formalize negotiations.

Not only have these results broadened and deepened our insight into optimal stable matchings and Boolean games, they have also contributed to closing the gap between theory on the one hand and practical implementation and applications on the other hand.