AGGREGATION OF STRUCTURED OBJECTS

UGENT SUPERVISOR
Prof. dr. Bernard De Baets

UG SUPERVISOR
NN

UGENT COLLEAGUE
Dr. ir. Michael Rademaker

MORE INFORMATION
michael.rademaker@ugent.be

Background

Voting theory is one of those rare evergreen topics. It has been around for a long time, and yet has never become outdated. This is not surprising, given that it has connections to preference modeling and database querying theory (see the paper by Chomicki), among others. These fields are not about to lose their relevance any time soon, and neither does voting theory. As such, this research will be of interest to mathematicians interested in discrete mathematics with real-life applications.

The KERMIT research unit has experience with this topic, and several open problems remain. A collaboration and jump-start to research are thus very realistic. KERMIT has focused on aggregating partial orders and more general expressions of preference, with an eye towards identifying preferences that can be considered to be shared among all voters (see the papers by Rademaker *et al.*). In brief, one of the first realizations has been the construction of a new type of operator that is situated between the intersection and the union of a number of preference expressions on a set of objects. Natural extensions such as incremental addition of knowledge, prioritized opinions have been performed, and a first characterization of the method with an eye towards well-known properties such as transitivity and commutativity has been performed. This serves as the basis for the proposed research project.

Relaxations to graded preferences have only been researched very briefly, but one of these first investigations has been met with considerable interest from the scientific community (see the paper by Cheng *et al.*). This will be an excellent first topic for further research.

Related reading

W. Cheng, M. Rademaker, B. De Baets and E. Hüllermeier, *Predicting partial orders: ranking with abstention*, Lecture Notes in Computer Science **6322** (2010), 215–230.

J. Chomicki, *Database querying under changing preferences,* Annals of Mathematics and Artificial Intelligence **50** (2006), 79–109.

M. Rademaker and B. De Baets, *Consistent union and prioritized consistent union: new operations for preference aggregation*, Annals of Operations Research **195** (2012), 237–259.

M. Rademaker, B. De Baets and H. De Meyer, *New operations for informative combination of two partial order relations with illustrations on pollution data*, Combinatorial Chemistry and High Throughput Screening **11**(2008), 745–755.