

Brno University of Technology

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Research affairs

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Statement on the habilitation thesis completed by RNDr. Jan Konecny, Ph.D. entitled 'Formal Concept Analysis with Graded Affirmations and Denials' in the field of the study Computer Science and Engineering.

Formal concept analysis (FCA) offer a method to derive a concept hierarchy or formal ontology from a collection of objects and their properties. Each concept in the hierarchy represents the objects sharing some set of properties; and each sub-concept in the hierarchy represents a subset of the objects (as well as a superset of the properties) in the concepts above it. FCA was introduced by Rudolf Wille in 1980, and builds on the mathematical theory of lattices and ordered sets that was developed by Garrett Birkhoff and others in the 1930s. FCA formalizes the semantic notions of extension and intension. Today FCA finds practical application are in the fields including data mining, text mining, machine learning, knowledge management, semantic web, software development, chemistry and biology etc.

Original FCA is mathematically based on complete lattices, while many-valued alias graded or fuzzy FCA extends the ideas of FCA to cases where objects can have only partly a given property. Therefore, it is natural that the underlying mathematical structure is a residuated complete lattice; this is the key concept of the present thesis. In addition, negation, linguistic hedge and many other issues must be reconsidered when extending FCA to a graded world. In the applicant's scientific work such a fundamental theoretical development work has been done with great success. Indeed, the candidate has published 19 peer-reviewed publications during the years 2011-2018; thus 3 publications per year in average. Moreover, the publishing forums are of high scientific standard. In addition, the applicant has several conference publications. The applicant's publications have also been quoted adequately; depending on the method of calculation, from about one hundred to over two hundred.

Having read carefully all the given material, I can give the following statement.

- a) The topic is appropriate to the particular area of habilitation and is up-to-date from the viewpoint of the present level of knowledge.
- b) The work is original and it means an important contribution to the resears area. I do not know the context of the candidate's Ph.D. thesis; however, almost all the presented papers are published after the candidate obtained his Ph.D., so there is practically no overlap between the candidate's dissertation and the present thesis.
- c) The core of the habilitation work has been published at an appropriate level.

d) Based on the material provided to me, I cannot say anything about the formal arrangement of the habilitation work to show good (or bad) didactic abilities of the candidate. Unfortunately, I have no way to judge this topic.

e) The list of the candidate's publications imply that candidate is a person with an outstanding research erudition.

f) The candidate's key works have been published in renowned professional journals, and all the publishing forums are internationally of high scientific standard.

g) The candidate's activities and work including referee work, scientific visits and organizing conferences receive favorable mention and appreciation within the scientific community.

h) In addition to the written material provided to me, I have found on the internet that the candidate is lecturing four university courses, at least one of them related to the present thesis. On this basis, I may assume that the candidate's pedagogical activities are of a sufficient level, given that the candidate is a research-focused person.

The conclusion

My general impression is that the applicant is a mature researcher in his own research field and, in my opinion, the habilitation work and the candidate's achievements until now meet the requirements of the proceedings leading to the associate professor appointment (in according with Section 72 of Act No. 111/1998 Coll., on higher education institution).

In Tampere, 8.1.2019

(signature)

Esko Turunen, PhD. Professor

Head of the Mathematics Laboratory

Tampere University