



## Colloquium



*Date, time & venue:* Tuesday, October 25th, 2016, 4:15-5:30 in BB129

*Title:* **Adding Threshold Concepts to the Description Logic EL**

*Speaker:* **Prof. Dr.-Ing. Franz Baader**

TU Dresden, Germany

(<https://lat.inf.tu-dresden.de/~baader/index-en.html>)

**Abstract:** Description Logics (DLs) are a well-investigated family of logic-based knowledge representation languages, which are, e.g., frequently used to formalize ontologies for application domains such as biology and medicine. To define the important notions of such an application domain as formal concepts, DLs state necessary and sufficient conditions for an individual to belong to a concept. Since traditional DLs are based on classical first-order logic, their semantics is strict in the sense that all the stated properties need to be satisfied for an individual to belong to a concept. In applications where exact definitions are hard to come by, it would be useful to relax this strict requirement and allow for approximate definitions of concepts, where most, but not all, of the stated properties are required to hold. In order to allow for approximate definitions of concepts, we have introduced the notion of a graded membership function, which instead of a Boolean membership value 0 or 1 yields a membership degree from the interval  $[0,1]$  expressing the degree to which the individual belongs to the concept. Threshold concepts  $C_{\sim t}$  for  $\sim$  in  $\{<, <=, >, >=\}$  then collect all the individuals that belong to  $C$  with degree  $\sim t$ . We generalize a well-known characterization of membership in EL concepts to construct a specific graded membership function  $\text{deg}$ , and investigate the complexity of reasoning in the Description Logic  $\text{tauEL}(\text{deg})$ , which extends EL by threshold concepts defined using  $\text{deg}$ . We also compare the instance problem for threshold concepts of the form  $C_{>t}$  in  $\text{tauEL}(\text{deg})$  with the relaxed instance queries of Ecke et al. (This is joint work with Gerhard Brewka and Oliver Fernandez Gil.)

**Speaker's brief bio:** Franz Baader is full professor for Theoretical Computer Science at TU Dresden, Germany. He has obtained his PhD in Computer Science at the University of Erlangen, Germany. He was senior researcher at the German Research Institute for Artificial Intelligence (DFKI) for four years, and associate professor at RWTH Aachen for eight years. His main research area is Logic in Computer Science, in particular knowledge representation (description logics, modal logics, nonmonotonic logics) and automated deduction (term rewriting, unification theory, combination of decision procedures).