



Fakultätskolloquium

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Contractions Based on Optimal Repairs

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Removing unwanted consequences from a knowledge base has been investigated in belief change under the name contraction and is called repair in ontology engineering. Simple repair and contraction approaches based on removing statements from the knowledge base (respectively called belief base contractions and classical repairs) have the disadvantage that they are syntax-dependent and may remove more consequences than necessary. Belief set contractions do not have these problems, but may result in belief sets that have no finite representation if one works with logics that are not fragments of propositional logic. Similarly, optimal repairs, which are syntax-independent and maximize the retained consequences, may not exist. In a paper published at KR 2024, we have leveraged advances in characterizing and computing optimal repairs of ontologies based on the description logics EL to obtain contraction operations that combine the advantages of belief set and belief base contractions. The basic idea was to employ, in the partial meet contraction approach, optimal repairs instead of optimal classical repairs as remainders. We have introduced this new approach, called partial product contractions (PPCs), in a very general setting, and proved a characterization theorem that relates the obtained contractions with well-known rationality postulates. This general approach has a large number of concrete instances, not only in the standard repair/contraction setting where one wants to get rid of an unwanted consequence, but also in other settings such as variants of forgetting in propositional and description logic.

In this talk, I will sketch the results of the KR 2024 paper, but also report on more recent work (published at ECSQARU 2025), where we have investigated whether the rather weak conditions imposed by our framework are sufficient to generalize further classical results from belief change to this setting. To this purpose, we have considered Gärdenfors's supplementary postulates for belief contractions. We were able to show that, under two reasonable additional conditions, PPCs induced by maximizngly and transitively relational selection functions indeed satisfy these postulates, similarly to the classical case.

Prof. Dr. Franz Baader received his PhD in Computer Science from the University of Erlangen-Nürnberg in 1989, was a senior scientist at DFKI in Kaiserslautern and Saarbrücken from 1989 to 1993, and a Professor for Theoretical Computer Science at RWTH Aachen from 1993 to 2022. Since 2002 he is a professor at TU Dresden, until September 2025 as Professor for Automata Theory and since October 2025 as Senior Professor. His research is mainly concerned with different subareas of symbolic AI, such as Automated Reasoning and Knowledge Representation. He has published more than 300 articles in scientific conferences and journals, and was PC chair of the conferences CADE, KI, KR, LPAR, and RTA. He has received the Herbrand Award for Distinguished Contributions to Automated Reasoning in 2020, is EurAI fellow, and member of the Academia Europaea.