

# Master Thesis

Institute for Artificial Intelligence

## Scalable Reasoning using Apache Flink and Abstraction Refinement

### Description

Description Logics are decidable fragments of first order logic and allow the formalization of knowledge in so called ontologies. An ontology can be divided into two parts, having some similarities with classical databases:

The TBox containing terminological axioms similar to the schema and the ABox containing assertional axioms similar to the actual data. Using reasoners, it is possible to derive additional information from the explicitly stated axioms.

As main memory based systems, modern reasoners may have difficulties handling very large ontologies, for example the often occurring scenario of a small TBox in combination with vast amounts of ABox data. A way to overcome this challenge is Abstraction Refinement, which reduces reasoning over the whole data to reasoning over smaller abstractions of the original data. Due to the nature of the constructed abstractions, the algorithm lends itself to a distributed implementation.

Apache Flink is an open source platform for distributed computations over streaming and batch data. Due to a general interest of using resulting implementations for further research e.g. in the area of Stream Reasoning, Apache Flink is a good starting point for this thesis.

The goal of this master thesis is the conception, implementation and evaluation of a distributed version of the Abstraction Refinement algorithm using Apache Flink.

### Main topics

- Implementation and evaluation of a parallelized version of Abstraction Refinement using Apache Flink

### Requirements

- Knowledge of description logics is recommended
- Good Java programming skills

Further topics can be found on the institutes webpage <http://www.uni-ulm.de/in/ki.html>.

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