1. General Information

Our modern society relies more and more on collecting and analysing huge amounts of data. A standardised way to publish these datasets is by using the *Resource Description Framework* (RDF). To also capture data that is only implicitly there, sets of reasoning rules are added, expressed in the *Ontology Web Language* (OWL). Next to reasoning on the data, it is important to be able to check the quality of the data. For this, the SHApes Constraint Language (SHACL) was specifically designed and set as a standard. The goal of this project is to clarify how SHACL can be used together with OWL in a meaningful way. Although there is a great interest in the combination, prior to this project no satisfying proposals have been put forth.

2. Results

During the term of this stipend, we have written and published the following paper:

> Anouk M. Oudshoorn, Magdalena Ortiz, Mantas Šimkus, *Reasoning with the Core Chase: the Case of SHACL Validation over ELHI Knowledge Bases.* **Description Logics 2024**, Bergen, Norway.

Furthermore, we wrote a journal article that is ready for submission but not yet published, and another paper is currently under double-blind submission by an international conference.

3. Planned follow-up activities

There are multiple open projects continuing the results achieved. One of them consists of working on a concrete implementation for some fragments, whereas another is lifting our developed techniques to the more general case of existential rules (instead of OWL), over which we consider a certain query language (instead of SHACL). These projects are the result of my previous research stay at the Technical University of Dresden, which took place during the term of this stipend, and have seen great progress.

Recently, we also started looking into whether we can decide satisfiability for a certain fragment of SHACL, possibly in combination with OWL.

To finish my dissertation, there are at least another 18 months left to complete any leftover projects and answer the proposed questions to a larger extent..

4. Suggestions for continuations by third parties

We strongly believe in the usefulness of combining SHACL and OWL and performed preliminary work in this regard. However many fragments remain untouched from only the theoretical perspective already, resulting in a whole bunch of questions that are left to be answered. Furthermore, when moving towards implementations or practical tools, there is even more work left to do.

Moreover, we developed some nice techniques that need not be limited to this project. In fact, we have already encountered some examples, like the generalisation to existential rules, in which our techniques appear to be useful outside of the initial setting we developed them for, and there must be many more such cases we are not (yet) aware of.