TECHNISCHE UNIVERSITÄT DRESDEN

Faculty of Computer Science • Institute of Theoretical Computer Science • Chair of Automata Theory

COMPUTING OPTIMAL REPAIRS OF QUANTIFIED ABOXES W.R.T. STATIC $\mathcal{EL}$ TBOXES

Franz Baader, Patrick Koopmann,
Francesco Kriegel, Adrian Nuradiansyah

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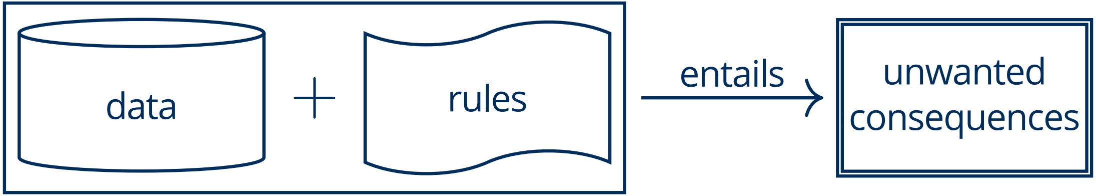
Problem Setting



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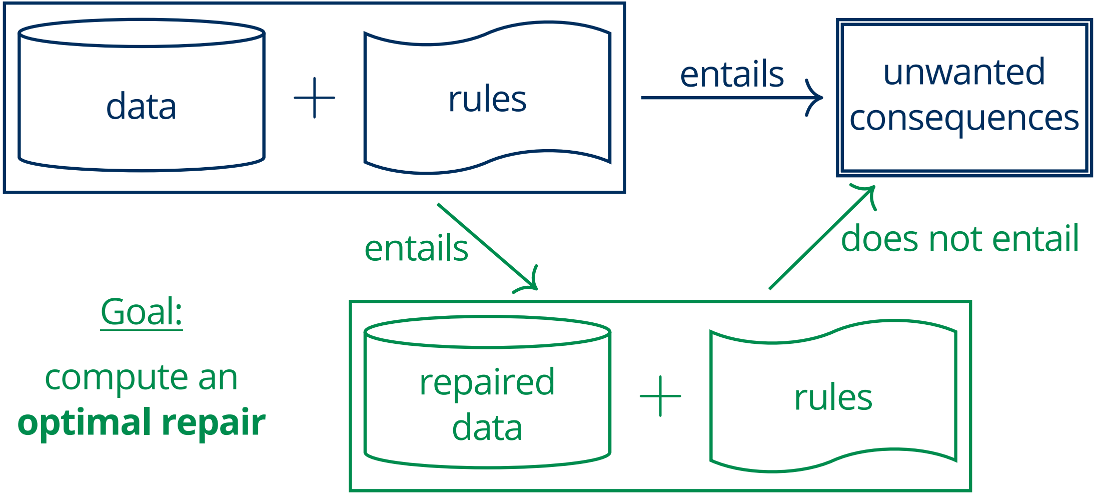

Goal:

compute an **optimal repair**

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syntax independent

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Repair Recipe

$$\boxed{\mathsf{Conj}(C_1 \sqcap C_2 \sqcap \cdots \sqcap C_n) = \{C_1, C_2, \ldots, C_n\}}$$

Repair Recipe: For each unwanted consequence $C(u)$:

- either choose a concept name $B \in \mathsf{Conj}(C)$ and remove $B(u)$ from $\mathcal{A}$,
- or choose an existential restriction $\exists r.D \in \mathsf{Conj}(C)$ and do the following for each $r(u, v) \in \mathcal{A}$:
  - if $D \neq \top$, then recursively modify $\mathcal{A}$ such that it does not entail $D(v)$,
  - otherwise, remove $r(u, v)$ from $\mathcal{A}$.

Taking the TBox into Account

Forward Chaining:

- In order to not lose consequences that follow from removed axioms, but that do not itself violate the repair request, we initially need to **saturate** the qABox by means of the axioms in the TBox.

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Backward Chaining:

- When removing an atomic unwanted consequence $B(u)$ or $\exists r. D(u)$, it is also necessary to remove all $E(u)$ where $E \sqsubseteq_{\mathcal{T}} B$ or $E \sqsubseteq_{\mathcal{T}} \exists r. D$, respectively.
- It suffices to consider concepts $E \in \mathsf{Sub}(\mathcal{T}, \mathcal{R})$.

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Main Results:

- Given a qABox, a cycle-restricted TBox, and a repair request, **the set of all optimal CQ-repairs can be computed in exponential time using an NP-oracle.**
- Given a qABox, a TBox, and a repair request, **the set of all optimal IQ-repairs can be computed in exponential time.**

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- There are examples where an optimal repair need not be exponentially large.
- In these cases, the canonical repair is already equivalent to a small sub-qABox.
- We propose a rule-based approach to computing **optimized repairs**, which contain only relevant parts of the canonical repairs.

That’s it for now!

Do you have questions or comments?

See also our poster for further details.