Practical Aspects of Query Rewriting for OWL 2

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Data Access with OWL 2 QL

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$Q(x) \leftarrow \text{teaches}(x, y)$

$$\begin{array}{rcl} \text{Teacher} & \sqsubseteq & \exists \text{teaches} \\ \text{Professor} & \sqsubseteq & \text{Teacher} \\ \exists \text{hasTutor}^- & \sqsubseteq & \text{Professor} \end{array}$$

PROFESSOR(*name, office, phone*)
STUDENT(*name, major, tutor*)

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Professor $\mapsto$
```
SELECT name
FROM PROFESSOR
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hasTutor $\mapsto$
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SELECT name,tutor
FROM STUDENT
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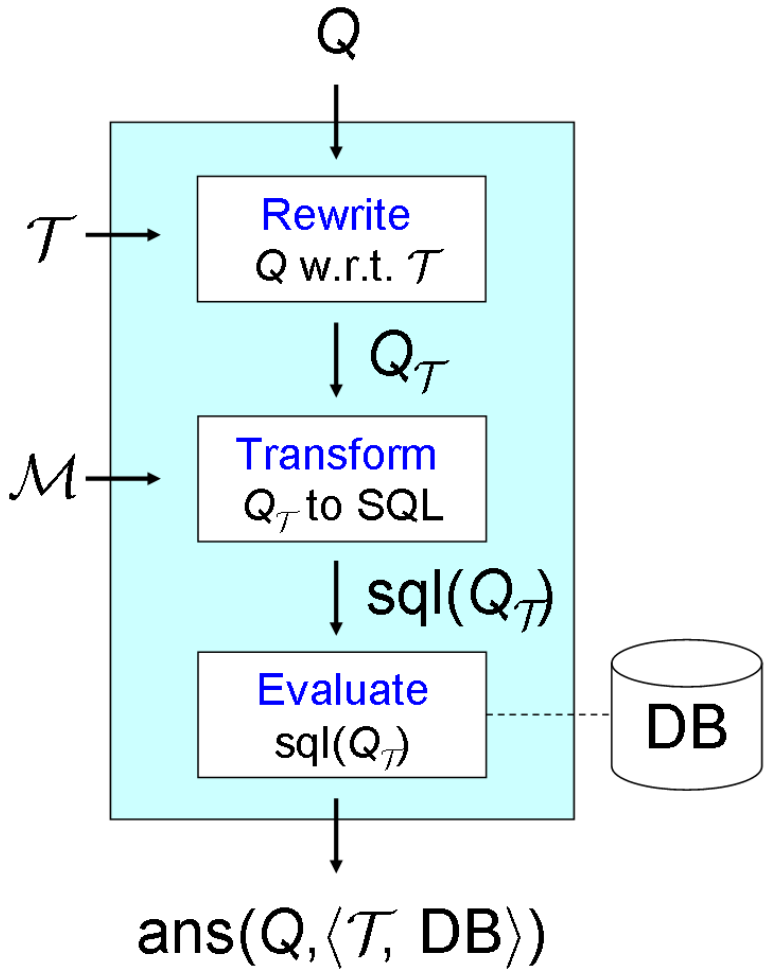

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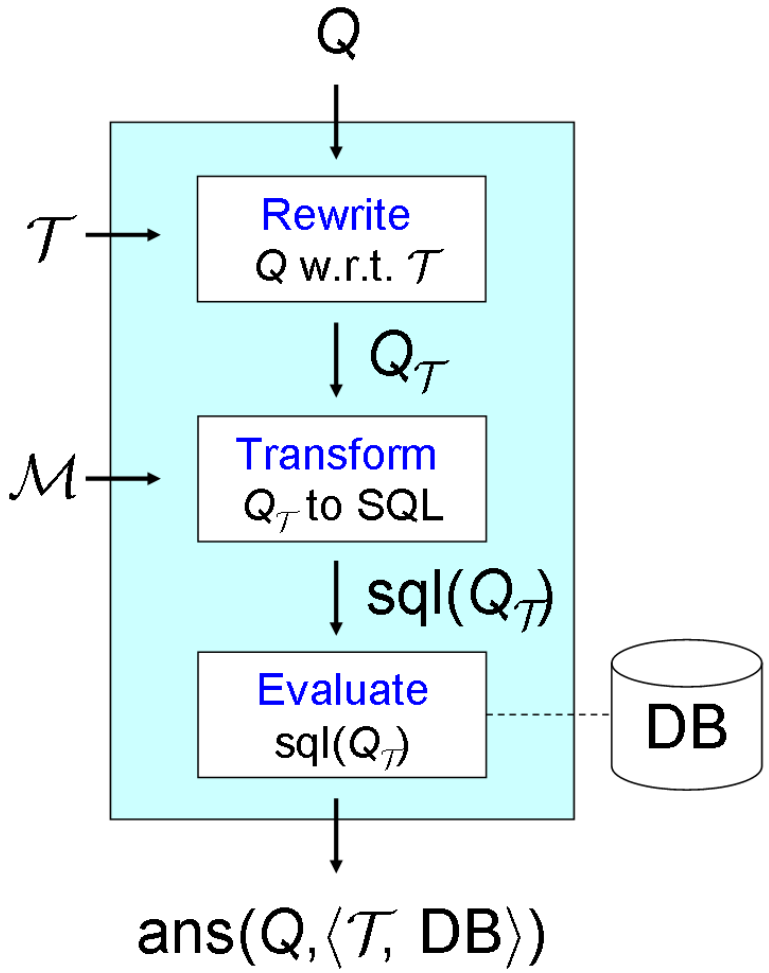
CGLLR rewriting algorithm by Calvanese et al.



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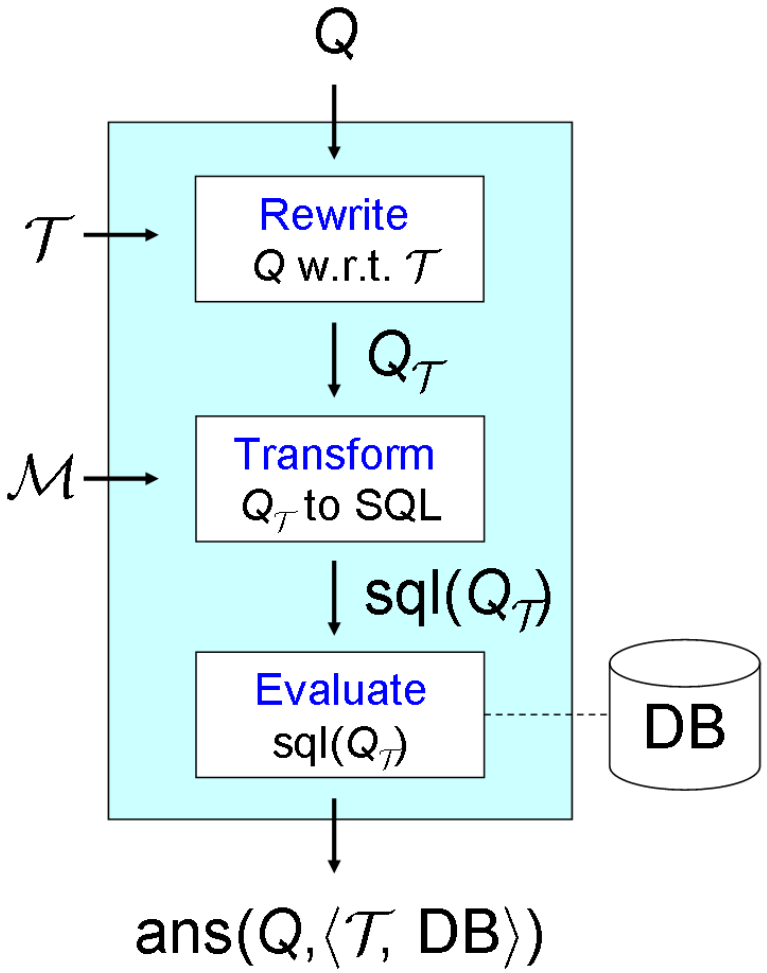

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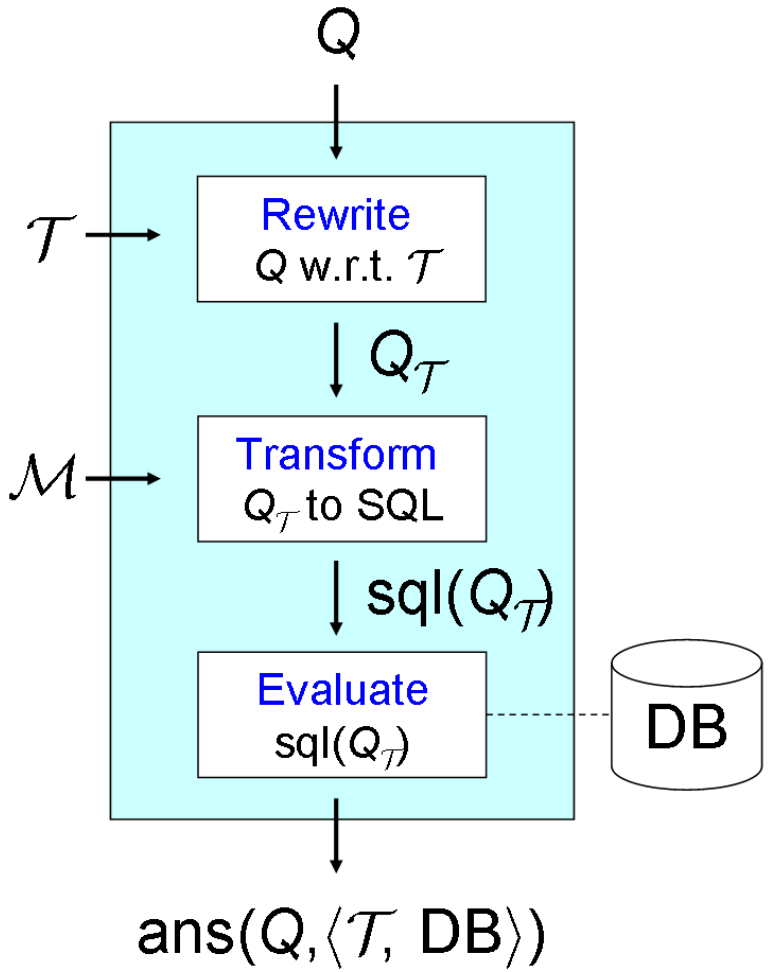
$\text{sql}(Q_{\mathcal{T}}) =$

```
SELECT name
FROM PROFESSOR
UNION
SELECT Tutor
FROM Student
```



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  - Student $\sqcap \exists$hasSupervisor $\sqsubseteq$ GraduateStudent
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RQR (Resolution-based Query Rewriting)

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- $Q_{\mathcal{T}}$ might be a datalog query
- "Pay-as-you-go" behavior: extends and generalizes CGLLR

EVALUATION

Evaluation

Number of inferences ≈ Time

	REQUIEM (RQR)	C (CGLLR)
Overall	70,846	343,813
Average	2,200	12,066

- REQUIEM: 73% smaller, 0% larger, and 27% equal

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Number of queries

	REQUIEM (RQR)	C (CGLLR)
Overall	10,931	75,301
Average	289	2,682

- REQUIEM: 83% smaller, 0% larger, and 17% equal

Optimizing the Rewritings

Query Subsumption

$$Q_1 = Q(x) \leftarrow \text{teaches}(x, y)$$
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- On the fly: forward/backward subsumption
- Straightforwardly applicable to RQR

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Evaluation

- Good performance w.r.t. time and size of the rewritings
- Greedy unfolding produces UCQs in many cases

Conclusions and Future Work

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- Amenable to various straightforward optimizations
- Use of databases for realistic OWL 2 EL ontologies
- Open source implementation: REQUIEM[1]

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Future Work

- Evaluate REQUIEM with databases

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