Efficient In-Network Evaluation of Complex Event Processing Queries
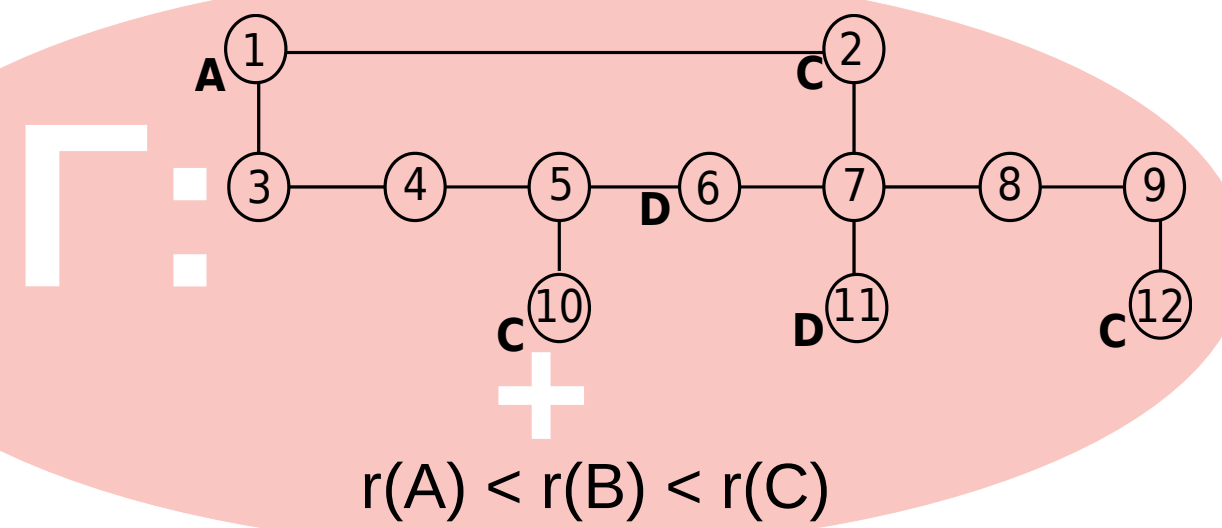
Samira Akili
Humboldt-Universität zu Berlin

Evaluate **CEP query**...

q:
```
SEQ(A a, D d, C c)
WHERE a.x < c.y
WITHIN 30 sec
```

...in **Event Network**...

Γ:

$r(A) < r(B) < r(C)$

...such that:

- **network transmission costs** minimized
- **given Latency bound** respected
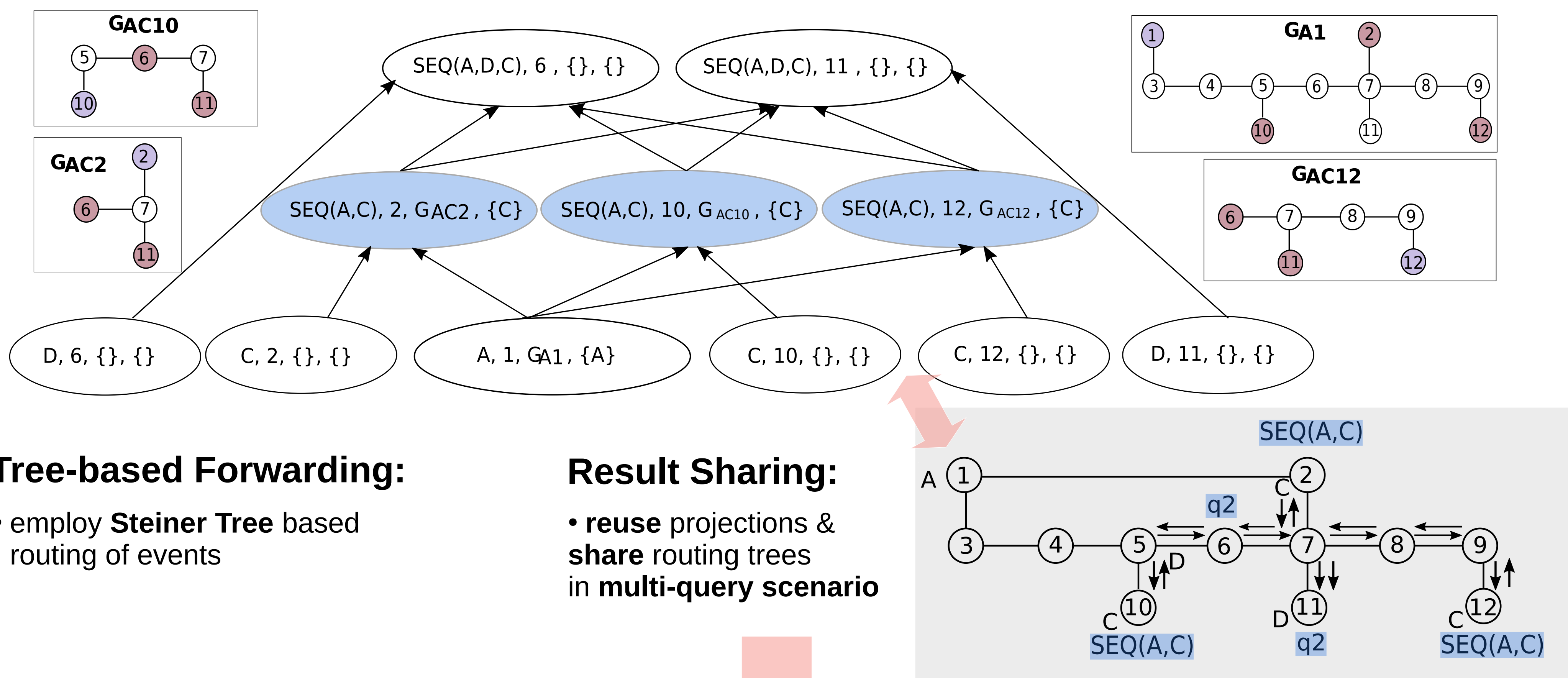
In-Network Evaluation Graphs

Query Splitting:

- split query into **projections**
- construct results using **combinations** of projections

Multi Sink Placements:

- **partition** generation of projection matches over **multiple nodes**

Output Selection:

- send only **partial results** of projection matches

Tree-based Forwarding:
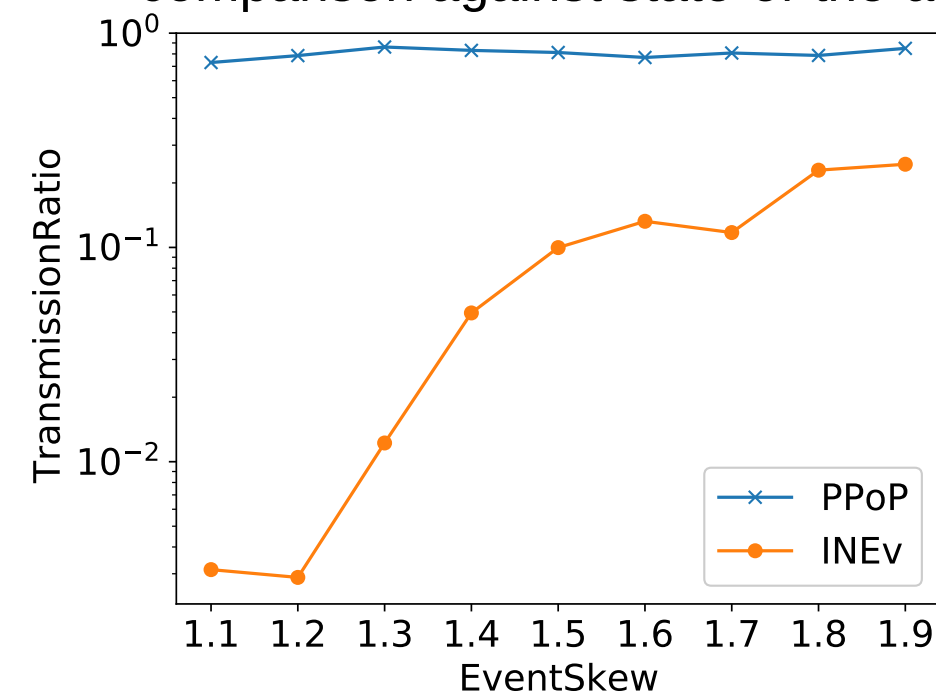
- employ **Steiner Tree** based routing of events

Result Sharing:

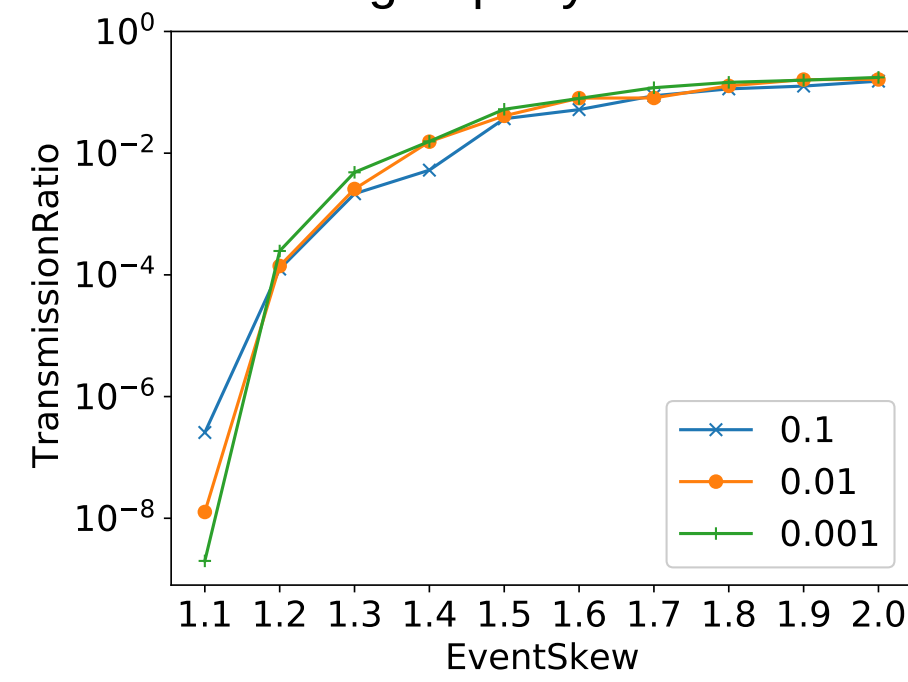- **reuse** projections & **share** routing trees in **multi-query scenario**

Experimental Setup

- simulation study with synthetic data sets

- varying query and network parameters (network size, selectivities, query length, event skew)

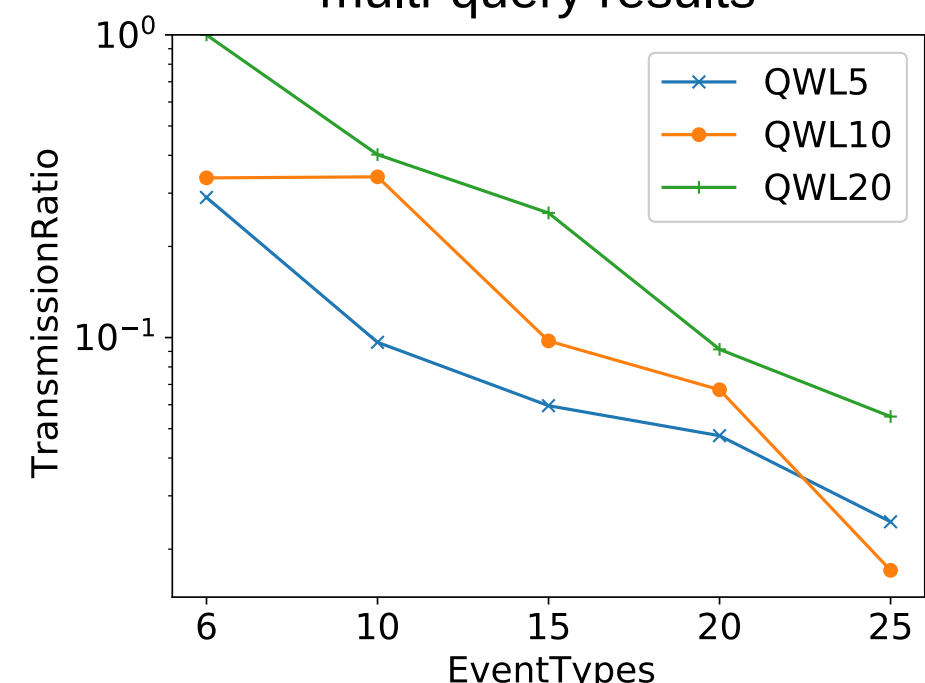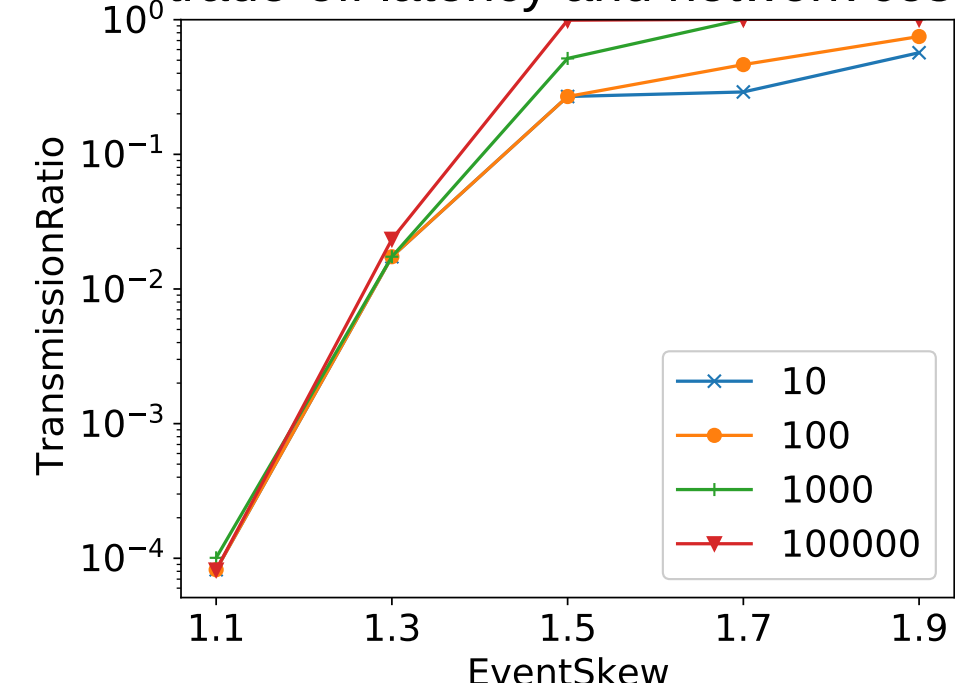- implementation of prototype CEP engine for execution of In-Network Evaluation Graphs

Take Away

- In-Network Evaluation Graphs reduce network transmission costs up to **8 orders of magnitude** compared to centralized evaluation

- reducing network transmission costs, reduces processing latency but potentially increases communication latency

Previous Results:

- Samira Akili and Matthias Weidlich. *MuSE Graphs for Flexible Distribution of Event Stream Processing in Networks*. In SIGMOD '21
- Samira Akili and Matthias Weidlich. *Reasoning on the Efficiency of Distributed Complex Event Processing*. Fundam. Informaticae 179