Our Research

- Investigate the integration of data, processes, and knowledge in a unified framework by combining the research in:
  - Ontology-Based Data Access (OBDA), and
  - Data-Centric Dynamic Systems (DCDS).
- Our proposal:
  - Process manipulates the data (characterizes the system evolution)
  - Knowledge component (ontology) is used to
    - Provide a conceptual view of the overall system based on the domain of interest, and
    - Govern the system evolution.

Semantically-Governed Data-Aware Processes (SGDAP) [1]

Semantic Governance

- Semantic Layer:
  - Provides high-level view of the system evolution.
  - Captures Domain of Interest.
  - Regulates:
    - Change of database.
    - Process execution.

- Relational Layer:
  - Processes are defined and executed in the relational layer.
  - Processes manipulate Database.
  - System evolution occurs in the relational layer.

Verification of Dynamic Properties

Example of Dynamic Property

\[ \mu Z. (\forall s. \text{Student}(s) \rightarrow \text{Grad}(s)) \lor \neg Z \]

Intuitive meaning:
Every execution leads to a state in which all the students present in that state are graduated.

Other Research Directions ...

- Accommodating updates over the semantic layer
  - E.g., when a new process is introduced.
- Quantitative property specification.
  - Verification and synthesis in the presence of quantitative requirements.
- High level specification compliance.
- Petri Nets for data-aware process formalism.
  - Verification of temporal properties over data-aware processes that are formalized using Petri Nets.
- Fine-grained analysis of computational complexity.
  - Taking into account requirements from real world use cases.

What's Next?

Dealing with Inconsistency
(Repair-based Semantics)

1. Inconsistency
2. Repair
3. Propagate the repair to the relational layer

Investigate Variation of the Framework

1. Process is specified at high level over the semantic layer
2. Synthesize the Process in the Relational Layer
3. \( \Phi \)

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