PG-HIVE: Schema Discovery for Property Graphs

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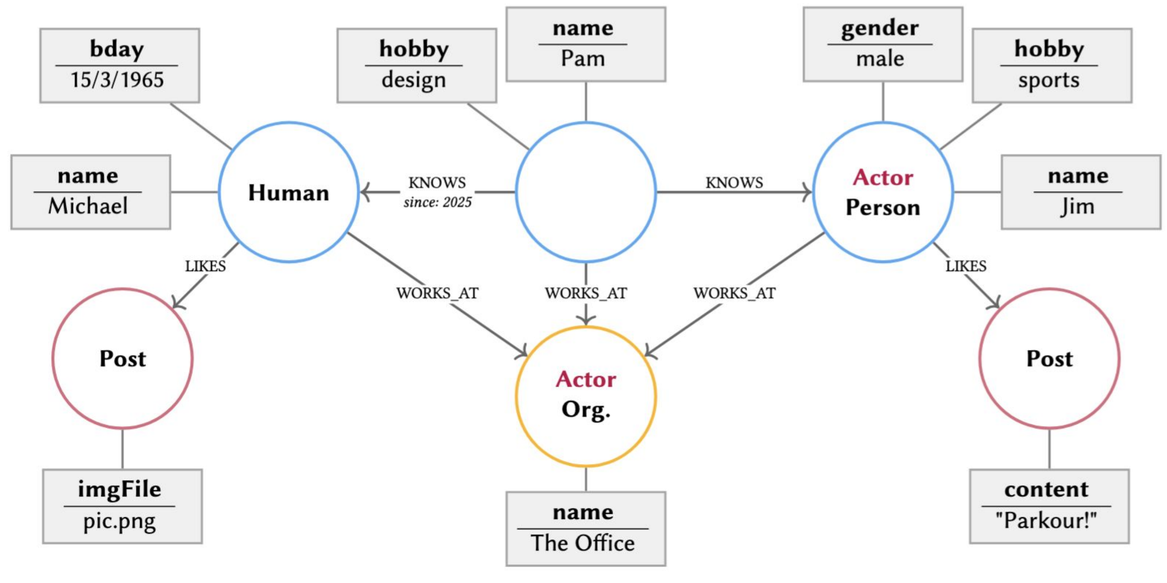
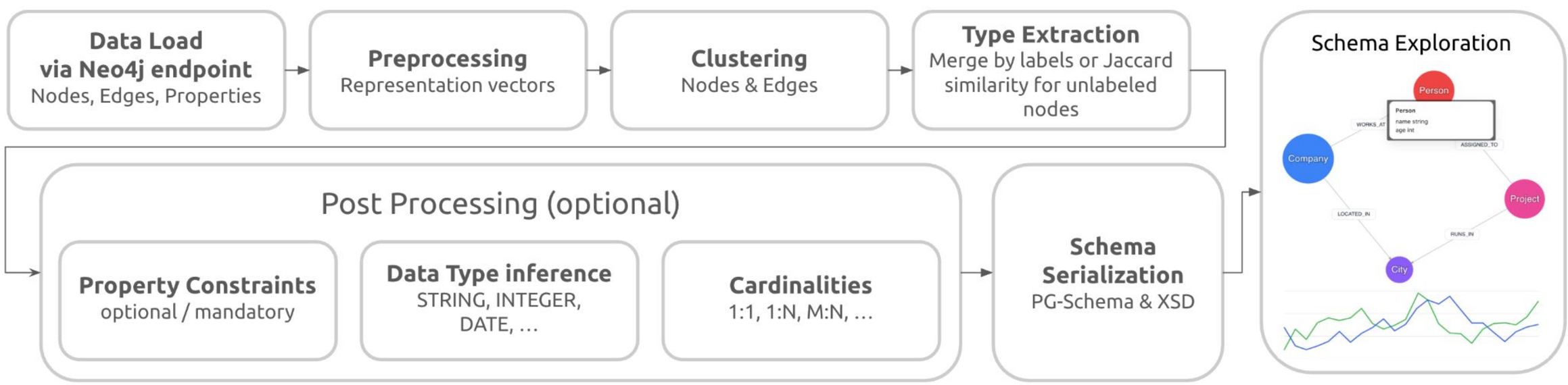
Motivation / Problem

- **Property graphs** are **flexible** & **schema-free**
- Missing or inconsistent labels make schema discovery **difficult**
- Existing methods **struggle** with **noisy** and **incomplete** graphs
- Schema discovery is needed for **integration**, **exploration**, **validation**, and **querying**

*"Given a property graph of **arbitrary size and structure**, with **missing type** information, **heterogeneous properties**, and **frequent updates**, infer the schema graph efficiently and accurately."*





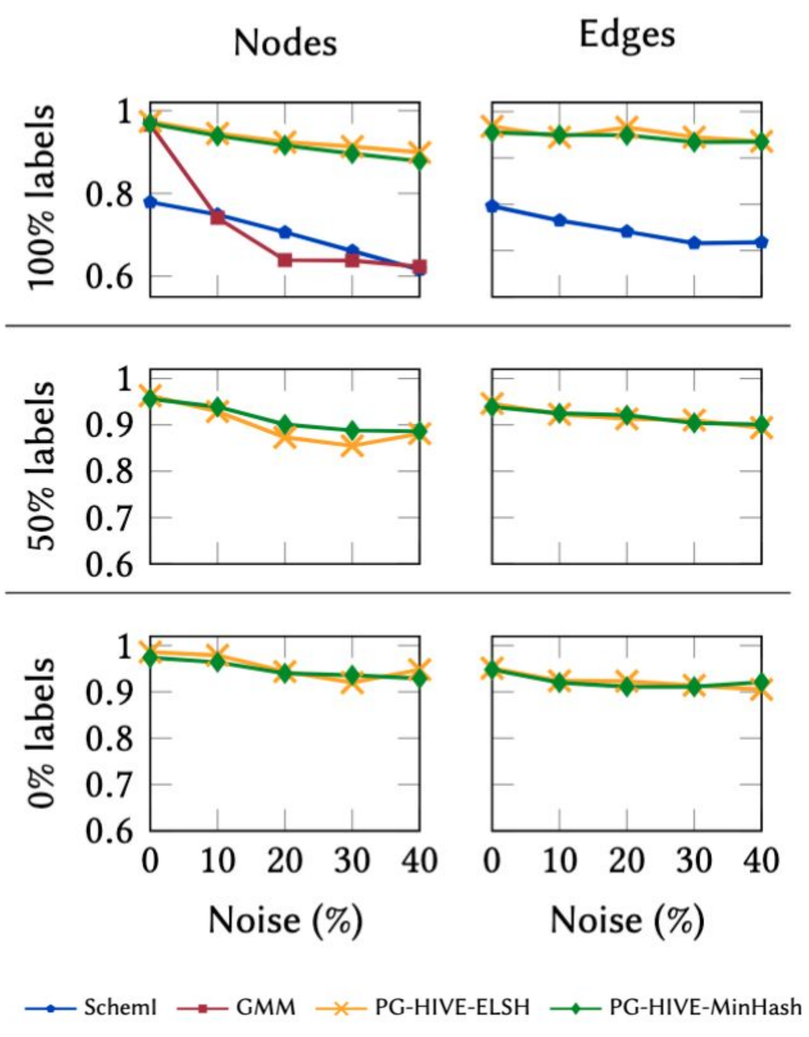
Contributions

- Hybrid schema discovery using **labels**, **properties**, and **graph characteristics**
- Handles missing labels through **structural similarity**
- Supports **incremental updates** without full recomputation
- Infers **schema details**: node & edge types, property data types, mandatory/optional properties, cardinalities

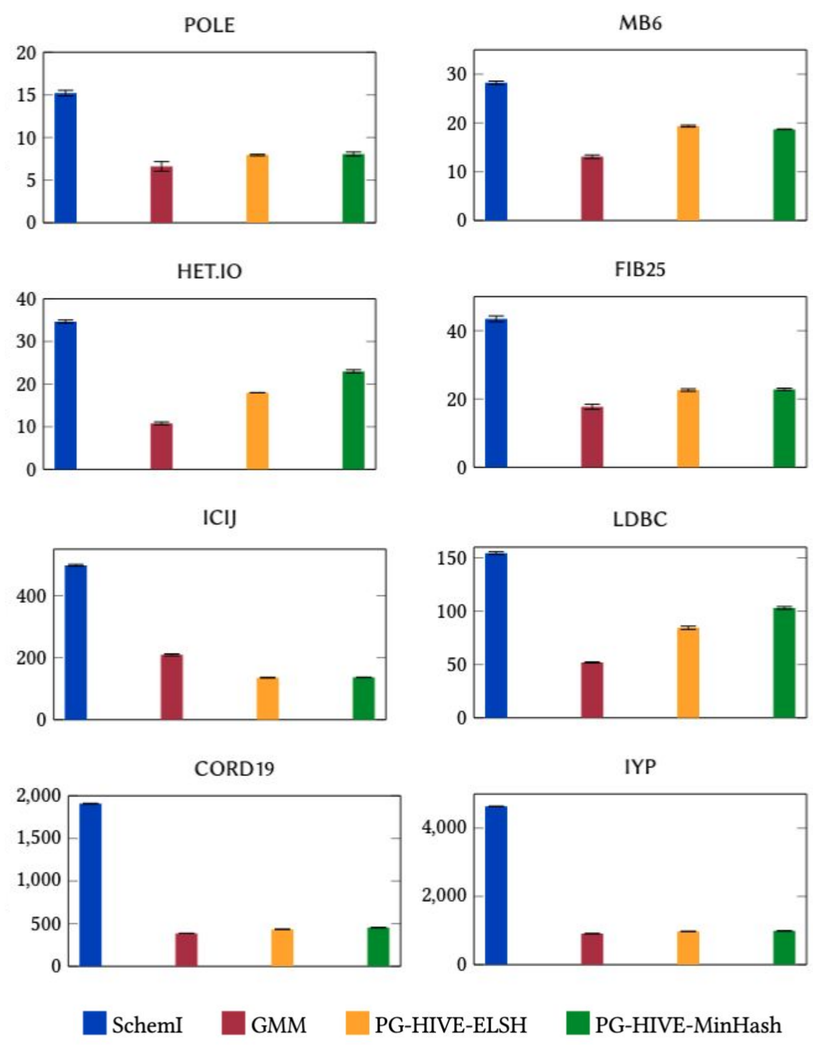
Experiments

- Compared with GMM and SchemI on **synthetic** and **real** datasets.
- To evaluate harder cases, we **add noise** by randomly removing 0%–40% of properties, and test three **label availability scenarios**: 100% labels retained, 50% retained, and 0% labels
- PG-HIVE **outperforms** baseline approaches and infers the schema **successfully** even with noisy and semi-annotated data

Avg F1 Scores across datasets



Type discovery execution time (s)



Results

Accuracy

- PG-HIVE achieves the **highest** F1 across datasets.
- **Robust** to noise.
- Works well even with **missing labels**.

Efficiency

- **Faster** than baseline methods.
- **Stable** runtime across noise levels.

Explore our results and test PG-HIVE with your own datasets!

Github

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