Distributed Query Answering for Large Data Series Collections

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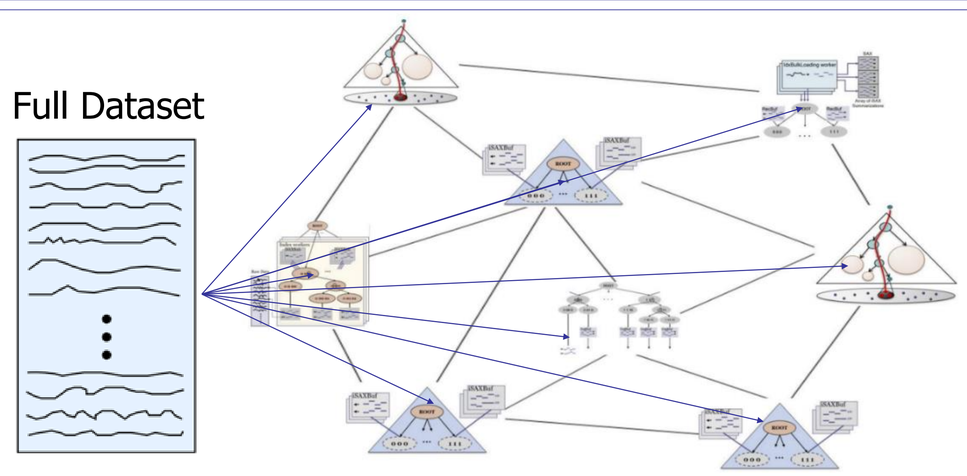
Motivation

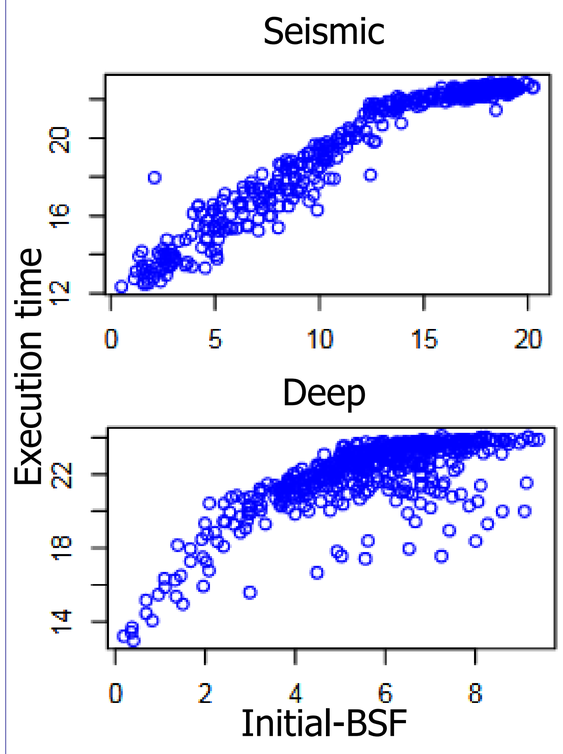
- Achieve very fast query answering
- Assume that nodes have enough memory to maintain the whole dataset
- Design efficient scheduling algorithms to assign the queries to the available nodes

Full Data Replication



- Load full dataset on every node
- Each node builds an iSAX index

Predictions of Query Execution Time

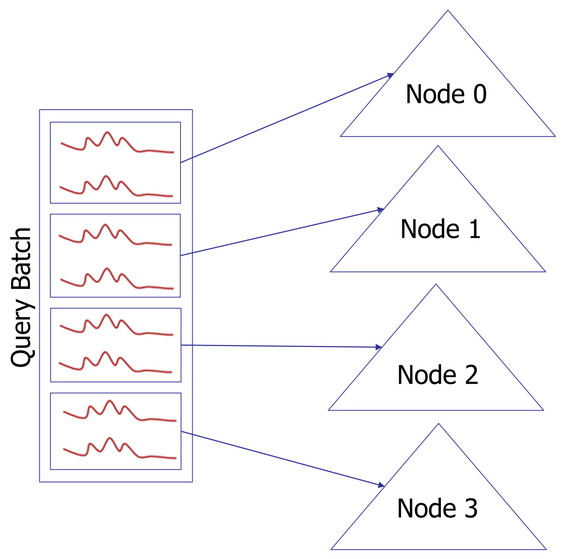


- Correlation between initial BSF and total execution time
- Predict total execution time per query
- Query scheduling based on these predictions

InitBSF → Fitting Function → Estimation

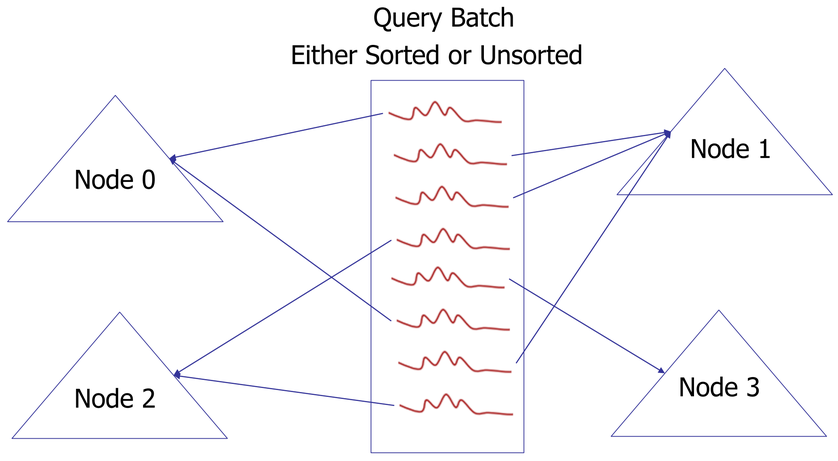
Distributed Query Answering

Static Scheduling



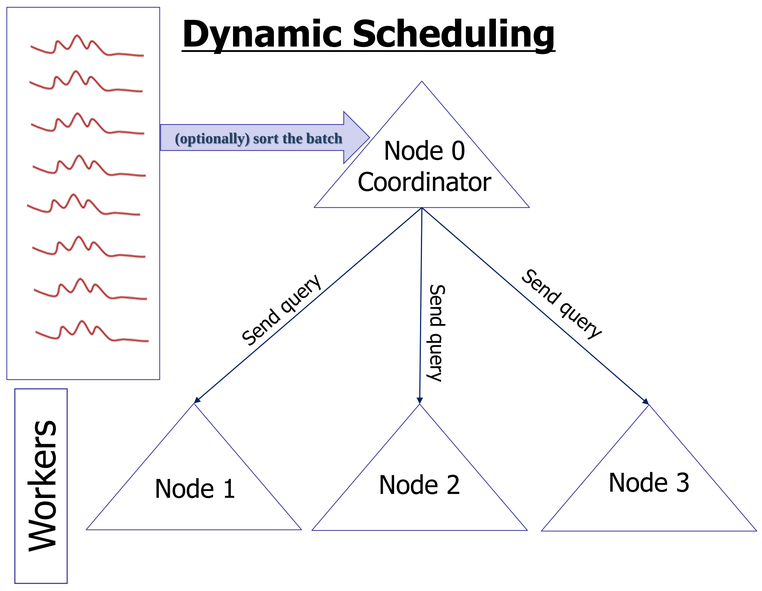
- Split the query batch into chunks

Prediction-based Scheduling



- Static scheduling based on predictions to balance workload among different nodes

Dynamic Scheduling



- Each worker node requests a new query from a coordinator, which
  - optionally sorts the batch based on predictions
  - assigns queries to the workers

Evaluation

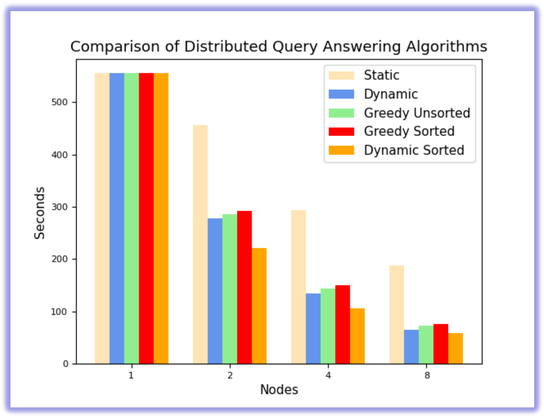
Results

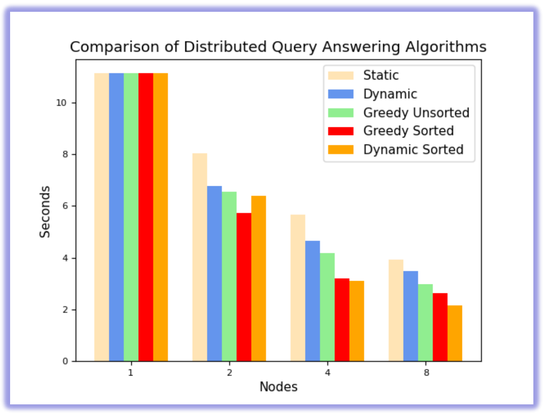
Configurations and Datasets

- Seismic dataset (seismic records)
- Query batches:
  - Big Batch: ~1000 queries
  - Small Batch: ~200 queries

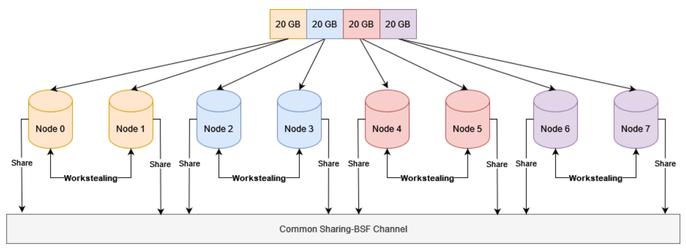
Experimental Findings

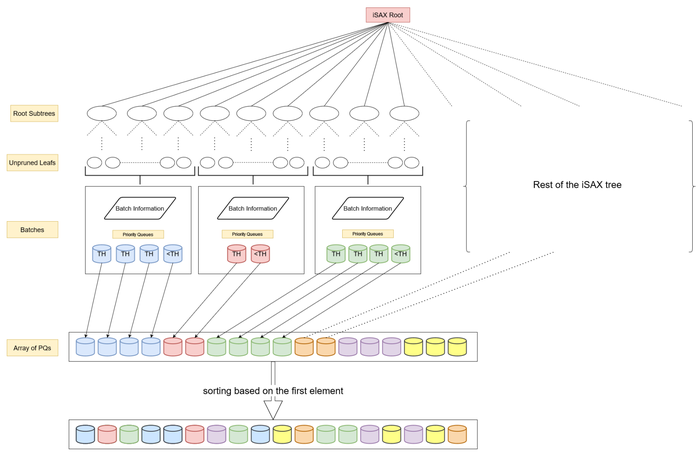
- Dynamic scheduling is better than static
- Scheduling based on predictions performs better.
- Linear Speedup





Limitations and Current work





Current Work

- Memory limitations
  - Extend the algorithms for Partial Data Replication
- There exists query batches for which all algorithms have poor performance
  - Design work-stealing schemes to tackle load imbalances between nodes

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