

# Query Processing for Complex, Large-Scale Data Analysis

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# MRQL – a Querying System for Big Data

Project: MRQL – a Querying System for Big Data

Part of the Database Lab (ERB 514)

Current students:

PhD student: Upa Gupta

MS Student: Ahmed Ulde

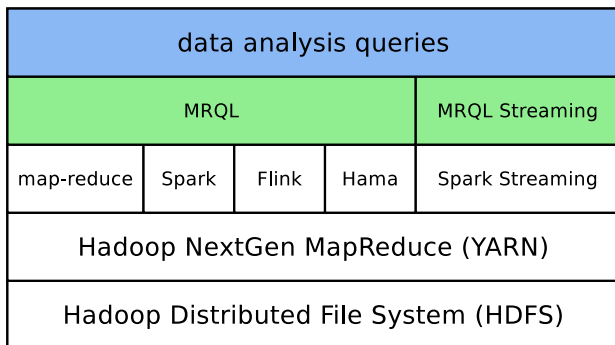
Looking to recruit new MS and PhD students

must be interested in:

- Big Data software (map-reduce, Spark, etc)
- open-source programming (Apache software) using Java

may become an Apache contributor and/or developer

- Apache MRQL: Started at UTA in 2010 as a research project
- Now, an Apache incubating project
- A powerful and efficient query processing system for complex data analysis applications on Big Data
- Web site: <http://mrql.incubator.apache.org/>

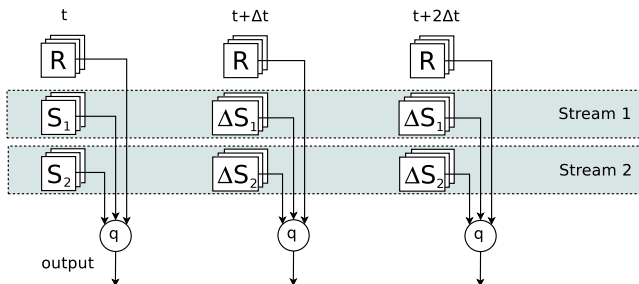


- is more powerful than existing Big Data query languages
- is able to capture most complex data analysis tasks declaratively
- is platform-independent:
  - the same query can run on multiple platforms on the same cluster:  
Hadoop map-reduce, Spark, Flink, and Hama
  - allowing developers to experiment with various platforms effortlessly
- a common front-end for the multitude of distributed processing frameworks emerging in the Hadoop ecosystem
- a tool for comparing these systems (functionality & performance)

- Data analysis applications: implement certain data analysis algorithms in MRQL
  - pagerank, clustering, matrix factorization, ...
- MRQL Streaming: Support for continuous queries on big data streams
  - Currently, works on Spark Streaming. Need to make it work on Flink Streaming and Twitter Storm
- Incremental query processing

# Distributed stream processing engines (DSPs)

- Support for **continuous queries** over multiple streams of data
- Data come in incremental batches  $\Delta S$
- Batch streaming based on **sliding windows**



Query  $q(S_1, S_2; R)$  over one invariant and two streaming data sources

- Currently, works on Spark Streaming

# Current project: incremental query processing

- *Problem:* translate any batch program (eg, PageRank) to an incremental program automatically
- *Solution:* Break the query  $q(S_1, S_2; R) = a(h(S_1, S_2; R))$  such as:

$$h(S_1 \uplus \Delta S_1, S_2 \uplus \Delta S_2; R) = h(S_1, S_2; R) \otimes h(\Delta S_1, \Delta S_2; R)$$

- Requires program analysis & transformation

