Final Review
Anurag Nagar
Topics Covered
Spark GraphX
Structured Streaming
Hive
NoSQL technologues
MongoDB
HBase
Cassandra

Final Review

** This is a review of some post-midterm topics.
This review is not exhaustive.
You are responsible for covering the entire course.
The final will be comprehensive, with more weightage on post-midterm topics **

Anurag Nagar

Big Data Class

Outline

Topics Covered

Spark GraphX

Structured Streaming

Hive

NoSQL technologues

MongoDB

HBase

Cassandra

1 Topics Covered

2 Spark GraphX

3 Structured Streaming

4 Hive

5 NoSQL technologues

6 MongoDB

7 HBase

8 Cassandra

Topics Covered Post-Midterm

Final Review

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Topics Covered

Spark GraphX

Structured Streaming

Hive

NoSQL technologues

MongoDB

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List of topics covered post-midterm:

- Spark GraphX / GraphFrames
- Structured Streaming
- Hive and Impala
- NoSQL technologies
- MongoDB
- HBase
- Cassandra

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2 Spark GraphX

3 Structured Streaming

4 Hive

5 NoSQL technologues

6 MongoDB

7 HBase

8 Cassandra

Spark GraphFrames

What is GraphX?

- Unifies traditional computing and graph based computing.
- Can read tabular data, run graph algorithms, and save data as graph or table.
- Graph computation is everywhere - PageRank, Hyperlink analysis, Term-Document graph, Community Detection, Topic Modeling, etc
- Rather than GraphX, which is RDD based, we worked with GraphFrames, which are DataFrame based.

Questions

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GraphFrames are contained in which Scala library?

Questions

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org.graphframes.GraphFrame

Questions

When instantiating a GraphFrame object, two DataFrames are needed. Explain?

Questions

When instantiating a GraphFrame object, two DataFrames are needed. Explain?

First DataFrame should contain data about vertices (nodes) and their properties.
Second DataFrame should contain data about the edges and their properties.

Questions

Final Review

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Structured Streaming

Hive

NoSQL technologues

MongoDB

HBase

Cassandra

What are the columns required in each DataFrame?

Questions

What are the columns required in each DataFrame?

Vertices DataFrame: id, vertex property
Edges DataFrame: sourceid, destinationid, edge property

Questions

If **g** is a GraphFrame object, which of the following are valid methods that can be called on it?

1. g.vertices.show(...)
2. g.edges.show(...)
3. g.find(pattern)
4. g.filterVertices(criteria)
5. g.connectedComponents.run()
6. g.stronglyConnectedComponents.run(...)
7. g.pageRank(...)
8. g.triangleCount.run()

Questions

If **g** is a GraphFrame object, which of the following are valid methods that can be called on it?

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6. g.stronglyConnectedComponents.run(...)
7. g.pageRank(...)
8. g.triangleCount.run()

All of the above. See https://graphframes.github.io/graphframes/docs/_site/user-guide.html

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Go through the examples for above topics from class lab and quiz.
Remember how to run each i.e. parameters, and what they mean.

Outline

1 Topics Covered

2 Spark GraphX

3 Structured Streaming

4 Hive

5 NoSQL technologues

6 MongoDB

7 HBase

8 Cassandra

Structured Streaming

Final Review
Anurag Nagar
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Idea: Run streaming queries just like you would run static queries.
System takes are of updating results periodically, making it fault tolerant, handles out of time data, watermarking.

Structured Streaming

Final Review

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Topics Covered

Spark GraphX

Structured Streaming

Hive

NoSQL technologues

MongoDB

HBase

Cassandra

Structured streaming can read from a variety of sources and can write to various sinks.
E.g. Kafka, file system, etc

Structured Streaming

How does Structured Streaming store the streaming data?

Structured Streaming

How does Structured Streaming store the streaming data?

Unbounded table. New rows appended to the table
For details see

https://spark.apache.org/docs/latest/structured-streaming-programming-guide.html

Structured Streaming

How does Structured Streaming achieve fault tolerance?

Structured Streaming

How does Structured Streaming achieve fault tolerance?

Checkpointing

Structured Streaming

At each trigger point, how does the system write its external output?

Structured Streaming

At each trigger point, how does the system write its external output?

One of three modes: Complete, Append, Update

Structured Streaming

Final Review

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Structured Streaming

Hive

NoSQL technologues

MongoDB

HBase

Cassandra

Read about event time, handling late data, watermarking

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Spark GraphX

Structured Streaming

Hive

NoSQL technologues

MongoDB

HBase

Cassandra

1 Topics Covered

2 Spark GraphX

3 Structured Streaming

4 Hive

5 NoSQL technologues

6 MongoDB

7 HBase

8 Cassandra

Hive

Understand following for Hive:

- Architecture of Hive
- Hive partitions, and partition keys
- Practice Hive queries

Outline

1 Topics Covered

2 Spark GraphX

3 Structured Streaming

4 Hive

5 NoSQL technologues

6 MongoDB

7 HBase

8 Cassandra

NoSQL technologies

Understand following:

- Why strict ACID is difficult to achieve for distributed and partitioned data
- For Big Data, BASE is more useful than ACID
- Understand eventual consistency
- Understand CAP theorem and which database is where on the CAP axis.
- Types of NoSQL databases: Key-Value stores, Document Databases, Column Oriented Databases and Peer-to-Peer databases.

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HBase

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1 Topics Covered

2 Spark GraphX

3 Structured Streaming

4 Hive

5 NoSQL technologues

6 MongoDB

7 HBase

8 Cassandra

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Structured Streaming

Hive

NoSQL technologues

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Understand following:

- MongoDB hierarchy - databases, collections, documents, fields
- Basic MongoDB query syntax: db.table.find(...), db.table.aggregate(...), db.table.mapReduce(...)

Outline

1 Topics Covered

2 Spark GraphX

3 Structured Streaming

4 Hive

5 NoSQL technologues

6 MongoDB

7 HBase

8 Cassandra

HBase

Understand following:

- Idea of a column oriented database, column family, columns, versioned cells
- It's an architecture on top of HDFS that provides fast random read and writes, rather than bulk read/write provided by HDFS
- Data always ordered by row key
- Regions and RegionServers
- Basic query syntax

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HBase

Cassandra

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3 Structured Streaming

4 Hive

5 NoSQL technologues

6 MongoDB

7 HBase

8 Cassandra

Cassandra

Understand following:

- Properties - P2P, linearly scalable
- Architecture - idea of coordinator for a request, Replication Factor (onto how many nodes should the coordinator *send* a write request)
- Write Consistency Level (how many nodes must *acknowledge and write* the write request of coordinator)
- Read Consistency Level (how many nodes must *acknowledge and reply* with their timestamped data.
- Types of consistencies: Any, One, Quorum, All. Which provides fastest response, which guarantees no stale read, which guarantees absolute consistency

Cassandra

Understand following:

- Partitions, Partition Keys, Hashing, Token range
- First copy of replica stored to node that owns that token range. e.g. if node X owns token range from 0 - 24, then any data whose hash value falls in that range will be stored in node X as a primary copy.
- How is network topology shared among peers? Gossip Protocol

Cassandra

Understand following:

- Data model, rows as column family, columns as key-value pairs, data stored according to column key
- Partition key determines how data is stored, Clustering key is an index within a partition
- Partition key + Clustering key form the primary key
- What predicates have to be specified in the WHERE clause? At least Partition key
- Go through lab examples