Pagerank in Apache Flink

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Agenda

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The experiment

The different algorithm implementations

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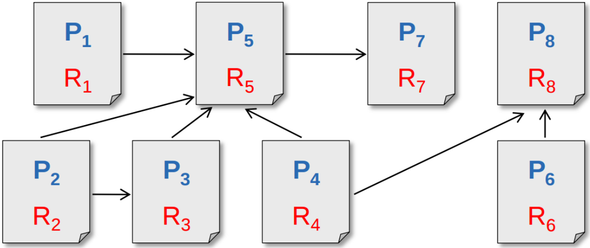
Pagerank



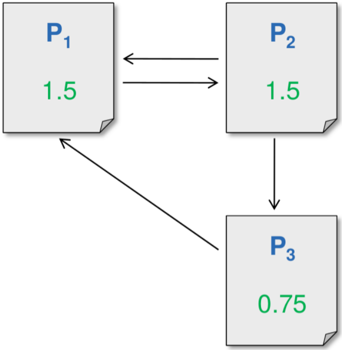
PageRank example 1 [5]

- A page has a high PageRank *R* if
  - there are many pages linking to it
  - or, if there are some pages with a high PageRank linking to it

Pagerank

$$R(P_i) = \sum_{P_j \in B_i} \frac{R(P_j)}{L_j}$$

- where
  - B_i is the set of pages that link to page P_i
  - L_j is the number of outgoing links for page P_j linking to it



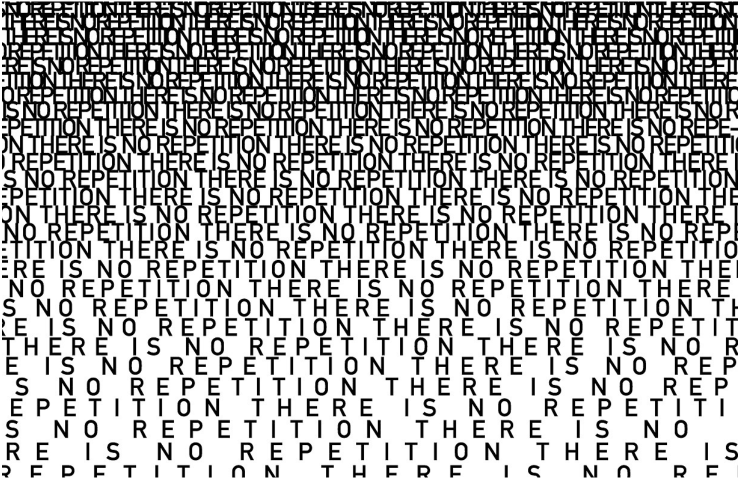
PageRank example 2 [5]

[2]

Apache Flink

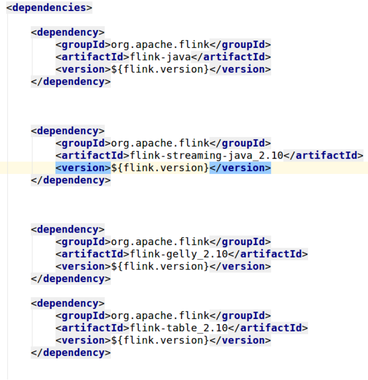
- Open source framework for distributed Big Data Analytics
- Exploits:
  - data streaming
  - in-memory processing
  - iteration operators

  to improve performance
- Formerly Stratosphere (Flink means agile)
- Developped here at TUB



[6]

Apache Flink: 2 possible setups



```
<dependencies>

    <dependency>
        <groupId>org.apache.flink</groupId>
        <artifactId>flink-java</artifactId>
        <version>${flink.version}</version>
    </dependency>


    <dependency>
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        <artifactId>flink-streaming-java_2.10</artifactId>
        <version>${flink.version}</version>
    </dependency>


    <dependency>
        <groupId>org.apache.flink</groupId>
        <artifactId>flink-gelly_2.10</artifactId>
        <version>${flink.version}</version>
    </dependency>

    <dependency>
        <groupId>org.apache.flink</groupId>
        <artifactId>flink-table_2.10</artifactId>
        <version>${flink.version}</version>
    </dependency>
```
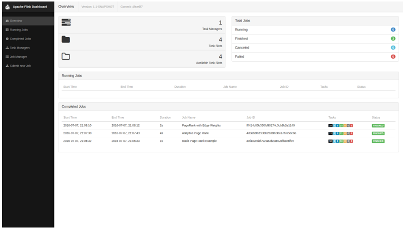

Maven



Overview Version: 1.1-SNAPSHOT Commit: 49ce6f7

1 Task Managers

4 Task Slots

4 Available Task Slots

Total Jobs	
Running	0
Finished	3
Canceled	0
Failed	0

Running Jobs

Start Time	End Time	Duration	Job Name	Job ID	Tasks	Status

Completed Jobs

Start Time	End Time	Duration	Job Name	Job ID	Tasks	Status
2016-07-07, 21:08:10	2016-07-07, 21:08:12	2s	PageRank with Edge Weights	ff414c00b530fd90174c3cb8b2e1149	14 0 0 14 0 0 0	FINISHED
2016-07-07, 21:07:38	2016-07-07, 21:07:43	4s	Adaptive Page Rank	4d3ab6f61930b23d6f630ea7f7a50e66	11 0 0 11 0 0 0	FINISHED
2016-07-07, 21:06:32	2016-07-07, 21:06:33	1s	Basic Page Rank Example	acf402ed3f702a83b2a692afb3c6ff97	10 0 0 10 0 0 0	FINISHED

Binary version (self compiled)

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General experiment setup

1. Data file with graph and pagerank solution

Flink experiment setup

GraphLab experiment setup

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Flink algorithm 1

Flink algorithm 2

Flink algorithm 3

GraphLab algorithm

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Thank you for your attention

Questions?

References I

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- Apache Flink. *Apache Flink Squirrel*. URL: %5Curl%7Bhttps://flink.apache.org/img/logo/png/1000/flink_squirrel_1000.png%7D.
- Lawrence Page et al. “The PageRank citation ranking: bringing order to the web.” In: (1999).

- Lawrence Page et al. “The PageRank citation ranking: bringing order to the web.” In: (1999).

References II

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- Mathias Spahlinger. *There is no repetition*. URL: %5Curl%7Bhttps://www.google.com/search?q=repeat&source=lnms&tbm=isch&sa=X&ved=0ahUKEwi4laH2tuLNAhVnB8AKHTPQCU4Q_AUICCgB&biw=1590&bih=765#tbm=isch&q=no+repetition&imgrc=h1qwLbEEezv8SM:%7D.