

# Big data: architectures and data analytics

## MapReduce - Exercises

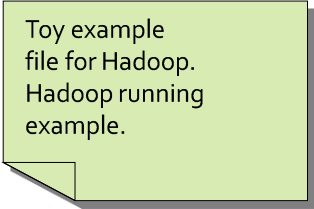
## Exercise #9

- Word count problem
  - Input: (unstructured) textual file
  - Output: number of occurrences of each word appearing in the input file
- Solve the problem by using in-mapper combiners

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## Exercise #9 - Example

- Input file



Toy example  
file for Hadoop.  
Hadoop running  
example.

- Output pairs (toy, 1)  
(example, 2)  
(file, 1)  
(for, 1)  
(hadoop, 2)  
(running, 1)

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## Exercise #10

- Total count
  - Input: a collection of (structured) textual csv files containing the daily value of PM10 for a set of sensors
    - Each line of the files has the following format  
sensorId,date,PM10 value ( $\mu\text{g}/\text{m}^3$ )\n
  - Output: total number of records

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## Exercise #10 - Example

- Input file

```
s1,2016-01-01,20.5
s2,2016-01-01,60.2
s1,2016-01-02,30.1
s2,2016-01-02,20.4
s1,2016-01-03,55.5
s2,2016-01-03,52.5
```

- Output: 6

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## Exercise #11

- Average
  - Input: a collection of (structured) textual csv files containing the daily value of PM10 for a set of sensors
    - Each line of the files has the following format  
sensorId,date,PM10 value ( $\mu\text{g}/\text{m}^3$ )\n
  - Output: report for each sensor the average value of PM10
  - Suppose the number of sensors is equal to 2 and their ids are s1 and s2

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## Exercise #11 - Example

- Input file

```
s1,2016-01-01,20.5
s2,2016-01-01,60.2
s1,2016-01-02,30.1
s2,2016-01-02,20.4
s1,2016-01-03,55.5
s2,2016-01-03,52.5
```

- Output

```
s1, 45.4
s2, 34.3
```

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## Exercise #12

- Select outliers
  - Input: a collection of (structured) textual files containing the daily value of PM<sub>10</sub> for a set of sensors
    - Each line of the files has the following format  
 sensorId,date\tPM<sub>10</sub> value (μg/m<sup>3</sup>)\n
  - Output: the records with a PM<sub>10</sub> value below a user provided threshold (the threshold is an argument of the program)

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## Exercise #12 - Example

- Input file

s1,2016-01-01	20.5
s2,2016-01-01	60.2
s1,2016-01-02	30.1
s2,2016-01-02	20.4
s1,2016-01-03	55.5
s2,2016-01-03	52.5

- Threshold: 21
- Output

s1,2016-01-01	20.5
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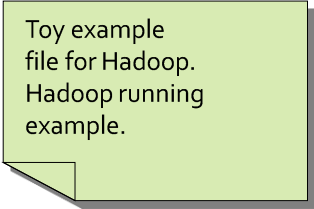
## Exercise #14

- Dictionary
  - Input: a collection of news (textual files)
  - Output:
    - List of distinct words occurring in the collection

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## Exercise #14 - Example

- Input file



Toy example  
file for Hadoop.  
Hadoop running  
example.

- Output

example  
file  
for  
hadoop  
running  
toy

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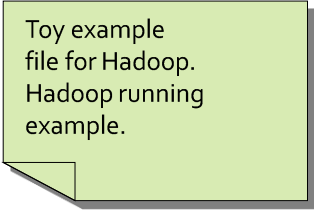
## Exercise #15

- Dictionary – Mapping word - integer
  - Input: a collection of news (textual files)
  - Output:
    - List of distinct words occurring in the collection associated with a set of unique integers
      - Each word is associated with a unique integer (and viceversa)

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## Exercise #15 - Example

- Input file



Toy example  
file for Hadoop.  
Hadoop running  
example.

- Output

(example, 1)  
(file, 2)  
(for, 3)  
(hadoop, 4)  
(running, 5)  
(toy, 6)

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