



Course Assignment  
Master of  
Applied Computer Science  
Department of Technology

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Assignment title	Exploring Bitcoin
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Course code	MA120
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Course name	Big Data
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**Declaration:**

Through the submission of this assignment, we hereby declare that this report is the result of our own work, and that all sources have been properly cited to throughout the text.

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# Exploring Bitcoin

## ABSTRACT

In this assignment we parsed a dataset, in the form of XMLs, through a Hadoop- and Pig apache. We learned how to write MapReduce jobs and Pig scripts, and how effective it is on our dataset based on XML files from Bitcoin stack exchange.

## Contents

## Introduction

We choose to work together because both of us have python background, therefor we choose python as main programming language. We explored Bitcoin as given dataset from [archive.org/download/stackexchange/bitcoin.stackexchange.com.7z](https://archive.org/download/stackexchange/bitcoin.stackexchange.com.7z) through Apaches: Hadoop and Pig.

## Main functions

The datasets contains only XML files, which it means values to different attributes have a lot of ascii characters, punctuations, numbers and HTML tags. We also needed a function to parse the XML files to Hadoop and to create a mapper for the data. Therefor we created three different main functions thats being reused through the project. :

### CleanBody

In cleanBody function it formats strings for mapper function. The function makes non-case sensitivity, removes ascii characters , HTML formatting, and treats anything saperated by blanked space or as separated words. Most of the words after separating/splitting will be counted as separate words, and this will effect the results of some tasks. For instance the name "Jens-Petter" will be counted as two words; "Jens" and "Petter". The input for the function is a string body which will be formatted and it returns a list of formatted string.

```
1 def cleanBody(body):
2     body = body.lower()
3     body = ascii(body)
4     body = sub("<.+?>", "", body)
5     body = body.replace("/", " ")
6     body = body.strip()
7
8     for i in ignore_char:
9         body = body.replace(i, "")
10
11     body = body.split(" ")
12
13     return body
```

**Listing 1.** CleanBody function

### Mapper Core

mapper\_core is the core of the mapper function; it prints out the relevant data in a format parseable by Hadoop. It functions through three modes, as determined by the parameter mode: "single", "double", and "triple".

- Single: Assumes input "words" is a list of words to print. Prints word in words as (word, 1). Ignores empty strings and spaces.
- Double: Assumes input "words" is two nested lists to print. Prints word, count in words as (word, count). Ignores empty strings and spaces.
- Triple: Assumes input "words" is three nested lists to print. Prints id, score, title in words as (id, score, title). does not ignore empty strings and spaces.

```
1 def mapper_core(words, mode="single"):
2     if mode == "single":
3         for word in words:
4             if word not in ["", " "]:
5                 print("%s %s" % (word, 1)) #Emit the word
6
7     elif mode == "double":
8         in1, in2 = words
9         for word, count in zip(in1, in2):
10             if word not in ["", " "]:
11                 print("%s %s" % (word, count)) #emit the words
12
13     elif mode == "triple":
14         in1, in2, in3 = words
15         for id, score, title in zip(in1, in2, in3):
16             print("%s %s %s" % (id, score, title)) #emit the words
```

**Listing 2.** mapper\_core function

## Xmlparser

The chosen method to interpret the dataset is to parse to the mapper function. Although parsing an entire XML-file takes up significant memory, this method fits our dataset. It has been separated out as a function so it may be easily replaced by other methods more fit for large files. The input for this function is a XML-file and the output is a parsed XML-file

```
1 def xmlparser(infile):
2     if not isinstance(infile, str):
3         infile = infile.detach()
4     mytree = ET.parse(infile)
5     myroot = mytree.getroot()
6     return myroot
```

**Listing 3.** xmlparser function

## Task 1 Warmup

### 1a) WordCount

**Assumption:** Count the words in body of questions PostTypeID="1" in the *Posts.xml* file. The result should be how many times a word occur in the body of questions.

**Implementation**The will

**Notes/Reflection** bye bye

```
1 abovennthanks 1
2 abovennthanksn 2
3 abovenwhat 1
4 abovenwill 1
5 aboventhe 1
6 aboventrying 1
7 abr 1
8 abra 4
9 abras 1
10 abreast 1
11 abridge 1
```

1a\_output

### 1b) Unique words

**Assumption:** Write a MapReduce job where the result should be unique words in the titles PostTypeID="1" in the *Posts.xml* File.

**Implementation**

**Notes/Reflection**

```
1 asm
2 asn
3 aspect
4 aspects
5 aspnet
6 assemble
7 assembled
8 assembles
9 assembling
10 assert
11 assertion
```

1b\_output

### 1c) MoreThan10

**Assumption:** Write a simple python code to check the title length in *Posts.xml*. The result should output how many titles have more than 10 words.

#### Implementation

#### Notes/Reflection

```
1 7600
```

1c\_output

### 1d) Stopwords

**Assumption:** Write a simple python code based on task 1a to exclude [stopwords](#) from body of questions PostTypeID="1" in the *Posts.xml*. The output should be text file without any stopwords.

#### Implementation

#### Notes/Reflection

```
1 ati 8
2 atiradeon 1
3 atlcoin 1
4 atm 18
5 atms 5
6 atom 1
7 atomic 17
8 atomically 1
9 attach 8
10 attached 6
```

1d\_output

### 1e) Pig top 10

**Assumption:** Write a pig script to select top 10 listed words after removing the stopwords from *Posts.xml*. The output should print out top 10 listed words and the corresponding occurrence rate.

#### Implementation

#### Notes/Reflection

```
1 bitcoin 5918
2 transaction 2376
3 wallet 2320
4 address 1550
5 block 1222
6 mining 1172
7 blockchain 1169
8 the 1148
9 transactions 1127
10 bitcoins 1050
```

1e\_output

### 1f) Tags

**Assumption:** Write a MapReduce job to create a dictionary over unique tags in *Posts.xml*. The result should print the unique tags.

#### Implementation

#### Notes/Reflection

```
1 moneylaundering
2 moneysupply
3 moneytransfer
4 movecmd
5 msigna
6 mtgox
7 multibit
8 multibithd
9 multifactor
10 multigateway
11 multipartycomputation
```

1f\_output

## Task 2 Discover

### 2a) Counting

**Assumption:** We chose to write a MapReduce job to count the total unique users there are in *Users.xml*. The result will print out how many unique users there are.

#### Implementation

#### Notes/Reflection

```
1 56451
```

2a\_output

### 2b) Unique users

**Assumption:** Write a MapReduce job based on task 2a) to create a mapper and a reducer functions in *Users.xml*. The result should contain unique users in the dataset.

#### Implementation

#### Notes/Reflection

```
1 10597 frabcus
2 10599 mediatorMatthews
3 105 dh bitcoinse
4 10600 lucifirius
5 10601 adithya
6 10602 user
7 10603 amb
8 10609 ivan malyshev
9 1060 nlovric
10 10610 ajeet ganga
11 10611 michael merickel
```

2b\_output

### 2c) Top miners

**Assumption:** Write a MapReduce job to find top 10 users based on attribute Reputation="x" in *Users.xml*. The result will print out top 10 users based on their reputation.

#### Implementation

#### Notes/Reflection

```
1 david 87354
2 user 64135
3 pieter 51598
4 andrew 46149
5 murch 36524
```

```

6 thepiachu 31489
7 nick 29072
8 stephen 27509
9 chris 24736
10 nate 21620

```

2c\_output

## 2d) Top questions

**Assumption:** Write a MapReduce job to find top 10 title questions PostTypeID="1" based on attribute Score="x" in Posts.xml. The result lists top 10 questions using id, question and the score.

## Implementation

### Notes/Reflection

```

1 336, detecting dishonest mergedmining pool, 186
2 148, what bitcoin mixing laundry services are available today, 176
3 845, change address after payment, 164
4 114, how can i make my own pool, 151
5 3536, blockchain for internetofthings or is there any mining algorithm that can be utilized in
lowcomputational power devices preserving security, 142
6 8031, what should i do if i change my bitcoin wallet, 136
7 9046, how does bitcoin prevent someone from sending more money than he she has, 133
8 658, is it possible for a country to control bitcoin usage, 132
9 91, how does the mining process support the currency, 119
10 876, is there a ripple whitepaper, 118

```

2d\_output

## 2e) Favorite questions

**Assumption:** Write a MapReduce job to find top 10 title questions PostTypeID="1" based on attribute FavoriteCount="x" in Posts.xml. The result lists top 10 questions like id, question and the score.

## Implementation

### Notes/Reflection

```

1 148, what bitcoin mixing laundry services are available today, 103
2 336, detecting dishonest mergedmining pool, 95
3 8031, is this calculation of mining probability using the bernoulli trial formula accurate, 83
4 12427, can i force my wallet to only have news keys postencryption, 60
5 9046, how does a client know it is connected to the right pp network, 60
6 3374, can a mobile be protected against the linode problem, 52
7 3536, how does shapeshift operate on confirmations, 52
8 12670, what is a mining pool what is it good for, 48
9 658, is it possible for a country to control bitcoin usage, 47
10 118, is there a mtgox live alternative which supports euro, 46

```

2e\_output

## 0.1 2f) Average answers

**Assumption:**

## Implementation

### Notes/Reflection

```

1 1.4316527838667252

```

2f\_output

## 2g) Countries

**Assumption:** We chose to write a MapReduce job to discover users by countries in *Users.xml*. The result lists different countries and corresponding users.

### Implementation

#### Notes/Reflection

```
1 f starworld hotel avenida da amizade macau 1
2 godavripark soc yogichowk surat gujarat india pin 1
3 arakawa arakawa city uecueacufdueuc 1
4 bay dr bay point ca usa 1
5 beulah way se conyersga united states 1
6 canada 1
7 candiles mxmexico 1
8 corners 1
9 dev null 4
10 florabunda lane lefevres corner nsw 1
```

2g\_output

## 2h) Names

**Assumption** We chose to write a MapReduce job to find the most popular names in *Users.xml*. The result lists top 10 common names and how many.

### Implementation

#### Notes/Reflection

```
1 user 3584
2 alex 102
3 john 99
4 david 84
5 mike 74
6 chris 70
7 mark 68
8 michael 65
9 peter 55
10 sam 53
```

2h\_output

## 2i) Answers

**Assumption:** Write a simple python code to find how many titles of questions `PostTypeId="x"` have at least one answers based on attribute `AnswerCount` in *Users.xml*. The result prints out how many questions have been answered.

### Implementation

#### Notes/Reflection

```
1 20492
```

2i\_output

## Task 3 Numbers

### 3a) Bigram

**Assumption:** We chose to write a MapReduce job to find the most common pair of adjacent words in *Posts.xml*. For instance, "big data" or "Fast car" are examples of bigram. The result print the most common bigram

### Implementation

#### Notes/Reflection



### 3b) Trigram

**Assumption:** This task is based on 3a, to find three words that appear consecutively in *Posts.xml*. The result print the most common trigram.

#### Implementation

#### Notes/Reflection

### 3c) Combiner

**Assumption:** Write a MapReduce job and add a combiner before the data sent to the reducer. The result should be the same as a reducer, but the reducer receive a smaller volume of data.

#### Implementation

**Notes/Reflection** Having a combiner in A MapReduce jobs saves us bandwidth and computational strain by decreasing the volume of data sent from the mapper. What combiner means is to have a semi-reducer after the mapper before sending it to the reducer.

### 3d) Useless

**Assumption:** We chose write a MapReduce job to find how many times the word "useless" in *Posts.xml* occurs in the body of questions PostTypeId="1". The result print how many times the word useless occurs.

#### Implementation

#### Notes/Reflection

## Task 4 Search engine

### 4a) Title index

**Assumption:** We chose to write MapReduce job to create index over titles, bodies and answers of questions in *Posts.xml*. We are after having a simple index that lists publications in which a search term/s and occur/s. The result is a list of words and their index appearance in posts

#### Implementation

#### Notes/Reflection

```
1 angel, ,11695,8519,5197
2 angeles, ,5197,11695
3 angellist, ,11695
4 angels, ,11695,687
5 anger, ,2749
6 angered, ,11912
7 angle, ,2937,4110,1224
8 angles, ,1859
9 angry, ,2240,10044
```

4a\_output

## Conclusion