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|  | **Министерство науки и высшего образования Российской Федерации**  **Федеральное государственное бюджетное образовательное учреждение**  **высшего образования**  **«Московский государственный технический университет**  **имени Н.Э. Баумана**  **(национальный исследовательский университет)»**  **(МГТУ им. Н.Э. Баумана)** |

ФАКУЛЬТЕТ **Информатика и системы управления**

КАФЕДРА **Компьютерные системы и сети (ИУ6)**

НАПРАВЛЕНИЕ ПОДГОТОВКИ **09.04.01 Информатика и вычислительная техника**

МАГИСТЕРСКАЯ ПРОГРАММА **09.04.01/07 Интеллектуальные системы анализа, обработки и интерпретации больших данных**

**Отчет**

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| **по лабораторной работе №** | 10 |

**Название:** Spark

**Дисциплина:** Языки программирования для работы с большими данными

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Москва, 2024

**Цель работы:** освоить базовые принципы работы со Spark на языке Java.

**Вариант: 1.**

**Задание 1:** Cделать 10 выборок данных по выбранной предметной области .

Код решения приведен в листинге 1.

Листинг 1 — реализация решения

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| package net.alchim31.maven;  import org.apache.spark.sql.\*;  import org.apache.spark.api.java.JavaSparkContext;  public class Main {  public static void main(String[] args) {  System.out.println("Spark init");  // Create SparkSession  SparkSession spark = SparkSession.builder()  .appName("sparkbyexamples.com")  .master("local[\*]")  .getOrCreate();  spark.sparkContext().setLogLevel("ERROR");  System.out.println("Spark post-init");  System.out.println("Working Directory = " + System.getProperty("user.dir"));  // Create Java SparkContext  JavaSparkContext jsc = new JavaSparkContext(  spark.sparkContext());  Dataset<Row> dataset = spark.read().format("csv")  .option("header", "true")  .load(System.getProperty("user.dir") + "\\transaction\_dataset.csv");  dataset.createOrReplaceTempView("tx\_ether");  System.out.println("\n\n\n1. sample");  spark.sql("select \* from tx\_ether").show();  System.out.println("\n\n\n2. created contracts top");  spark.sql("select Address, `Number of Created Contracts`, FLAG from tx\_ether order by cast(`Number of Created Contracts` as int) desc").show();  System.out.println("\n\n\n3. received-rate top");  spark.sql("select Address, `Avg min between received tnx`, FLAG from tx\_ether where `Avg min between received tnx` > 0.00000001 order by `Avg min between received tnx` asc").show();  System.out.println("\n\n\n4. rate for groups");  spark.sql("select FLAG, avg(`Avg min between sent tnx`) sent\_rate, avg(`Avg min between received tnx`) recieved\_rate from tx\_ether group by FLAG").show();  System.out.println("\n\n\n5. most fraud-profitable tokens");  spark.sql("select ` ERC20 most sent token type`, ` ERC20\_most\_rec\_token\_type`, ` ERC20 max val rec` from tx\_ether where FLAG = 1 order by cast(` ERC20 max val rec` as int) desc").show();  System.out.println("\n\n\n6. most honest-profitable tokens");  spark.sql("select ` ERC20 most sent token type`, ` ERC20\_most\_rec\_token\_type`, ` ERC20 max val rec` from tx\_ether where FLAG = 0 order by cast(` ERC20 max val rec` as int) desc").show();  System.out.println("\n\n\n7. most fraud-rated tokens");  spark.sql("select ` ERC20 most sent token type`, ` ERC20\_most\_rec\_token\_type`, count(1) from tx\_ether where FLAG = 1 group by ` ERC20 most sent token type`, ` ERC20\_most\_rec\_token\_type` order by count(1) desc").show();  System.out.println("\n\n\n8. most honest-rated tokens");  spark.sql("select ` ERC20 most sent token type`, ` ERC20\_most\_rec\_token\_type`, count(1) from tx\_ether where FLAG = 0 group by ` ERC20 most sent token type`, ` ERC20\_most\_rec\_token\_type` order by count(1) desc").show();  System.out.println("\n\n\n9. avg val received top");  spark.sql("select Address, `avg val received`, FLAG from tx\_ether order by cast(`avg val received` as numeric(23,5)) desc").show();  System.out.println("\n\n\n10. avg val received bottom");  spark.sql("select Address, `avg val received`, FLAG from tx\_ether where `avg val received` > 0.00001 order by cast(`avg val received` as numeric(23,5)) asc").show();  // Stop the SparkSession and JavaSparkContext  spark.stop();  jsc.stop();  }  } |

Результат исполнения программы приведен в листинге 2.

Листинг 2 — результат исполнения программы

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| Spark post-init  Working Directory = C:\Users\sergey.astakhov\Desktop\BMSTU-JAVA-BIGDATA\task10\_x  1. sample  +---+-----+--------------------+----+------------------------+----------------------------+---------------------------------------+--------+------------+---------------------------+------------------------------+------------------------+------------------+-------------------+------------------+------------+------------------+------------------+--------------------------+------------------------+--------------------------+----------------------------------------------------+------------------+--------------------+--------------------------+-------------------+-----------------+---------------------------+-----------------------+--------------------------------+---------------------+--------------------+-----------------------+-----------------------------+--------------------------------+-------------------------------+---------------------------------+------------------------------------+-------------------+------------------+------------------+-------------------+-------------------+-------------------+----------------------------+----------------------------+----------------------------+---------------------------+--------------------------+---------------------------+--------------------------+  |\_c0|Index| Address|FLAG|Avg min between sent tnx|Avg min between received tnx|Time Diff between first and last (Mins)|Sent tnx|Received Tnx|Number of Created Contracts|Unique Received From Addresses|Unique Sent To Addresses|min value received|max value received | avg val received|min val sent| max val sent| avg val sent|min value sent to contract|max val sent to contract|avg value sent to contract|total transactions (including tnx to create contract| total Ether sent|total ether received|total ether sent contracts|total ether balance| Total ERC20 tnxs| ERC20 total Ether received| ERC20 total ether sent| ERC20 total Ether sent contract| ERC20 uniq sent addr| ERC20 uniq rec addr| ERC20 uniq sent addr.1| ERC20 uniq rec contract addr| ERC20 avg time between sent tnx| ERC20 avg time between rec tnx| ERC20 avg time between rec 2 tnx| ERC20 avg time between contract tnx| ERC20 min val rec| ERC20 max val rec| ERC20 avg val rec| ERC20 min val sent| ERC20 max val sent| ERC20 avg val sent| ERC20 min val sent contract| ERC20 max val sent contract| ERC20 avg val sent contract| ERC20 uniq sent token name| ERC20 uniq rec token name| ERC20 most sent token type| ERC20\_most\_rec\_token\_type|  +---+-----+--------------------+----+------------------------+----------------------------+---------------------------------------+--------+------------+---------------------------+------------------------------+------------------------+------------------+-------------------+------------------+------------+------------------+------------------+--------------------------+------------------------+--------------------------+----------------------------------------------------+------------------+--------------------+--------------------------+-------------------+-----------------+---------------------------+-----------------------+--------------------------------+---------------------+--------------------+-----------------------+-----------------------------+--------------------------------+-------------------------------+---------------------------------+------------------------------------+-------------------+------------------+------------------+-------------------+-------------------+-------------------+----------------------------+----------------------------+----------------------------+---------------------------+--------------------------+---------------------------+--------------------------+  | 0| 1|0x00009277775ac7d...| 0| 844.26| 1093.71| 704785.63| 721| 89| 0| 40| 118| 0.0| 45.806785| 6.589513| 0.0| 31.22| 1.200681| 0.0| 0.0| 0.0| 810| 865.6910932| 586.4666748| 0.0| -279.2244185| 265.0| 35588543.78| 35603169.52| 0.0| 30.0| 54.0| 0.0| 58.0| 0.0| 0.0| 0.0| 0.0| 0.0| 15000000.0| 265586.1476| 0.0| 16830998.35| 271779.92| 0.0| 0.0| 0.0| 39.0| 57.0| Cofoundit| Numeraire|  | 1| 2|0x0002b44ddb1476d...| 0| 12709.07| 2958.44| 1218216.73| 94| 8| 0| 5| 14| 0.0| 2.613269| 0.385685| 0.0| 1.8| 0.032844| 0.0| 0.0| 0.0| 102| 3.08729702| 3.085478209| 0.0| -0.001818811| 8.0| 403.4283054| 2.260809454| 0.0| 1.0| 5.0| 0.0| 7.0| 0.0| 0.0| 0.0| 0.0| 0.0| 365.0| 57.632615| 2.260809| 2.260809| 2.260809| 0.0| 0.0| 0.0| 1.0| 7.0| Livepeer Token| Livepeer Token|  | 2| 3|0x0002bda54cb772d...| 0| 246194.54| 2434.02| 516729.3| 2| 10| 0| 10| 2| 0.113119| 1.165453| 0.358906| 0.05| 3.538616|1.7943080000000002| 0.0| 0.0| 0.0| 12| 3.58861565| 3.58905665| 0.0| 0.000441| 8.0| 521.5120705| 0.0| 0.0| 0.0| 7.0| 0.0| 8.0| 0.0| 0.0| 0.0| 0.0| 0.0|442.81984000000006| 65.189009| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 8.0| None| XENON|  | 3| 4|0x00038e6ba2fd5c0...| 0| 10219.6| 15785.09| 397555.9| 25| 9| 0| 7| 13| 0.0| 500.0| 99.48884| 0.0| 450.0| 70.001834| 0.0| 0.0| 0.0| 34|1750.0458620000004| 895.399559| 0.0| -854.6463028999998| 14.0| 17111.05191| 11412.23068| 0.0| 2.0| 11.0| 0.0| 11.0| 0.0| 0.0| 0.0| 0.0| 0.0| 11412.23068| 1555.550174| 100.0| 9029.23068| 3804.076893| 0.0| 0.0| 0.0| 1.0| 11.0| Raiden| XENON|  | 4| 5|0x00062d1dd1afb6f...| 0| 36.61| 10707.77| 382472.42| 4598| 20| 1| 7| 19| 0.0| 12.802411| 2.671095| 0.0| 9.0| 0.022688| 0.0| 0.0| 0.0| 4619| 104.3188828| 53.4218965| 0.0| -50.89698629| 42.0| 162829.6609| 123539.9329| 0.0| 4.0| 23.0| 0.0| 27.0| 0.0| 0.0| 0.0| 0.0| 0.0| 90000.0| 4934.232147| 0.0| 45000.0| 13726.65922| 0.0| 0.0| 0.0| 6.0| 27.0| StatusNetwork| EOS|  | 5| 6|0x000895ad78f4403...| 0| 9900.12| 375.48| 20926.68| 2| 3| 0| 2| 1|0.7241479999999999| 4.813776|3.2349080000000003| 4.1668|5.5369160000000015| 4.851858| 0.0| 0.0| 0.0| 5| 9.70371586| 9.70472386| 0.0| 0.001008| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0| 0|  | 6| 7|0x000d63fc5df52b0...| 0| 69.46| 629.44| 8660.35| 25| 11| 0| 9| 20| 0.049| 2.65| 1.098115| 0.009457| 4.284785| 0.482496| 0.0| 0.0| 0.0| 36| 12.0623941| 12.079266| 0.0| 0.016871896| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0| 0|  | 7| 8|0x000e001ab444fa8...| 0| 1497.39| 176.84| 319828.05| 213| 5| 0| 3| 3| 0.11849| 2.0| 0.891098| 0.0| 0.7| 0.040861| 0.0| 0.0| 0.0| 218| 8.703392156| 4.45548974| 0.0|-4.2479024160000005| 7.0| 397.951964| 0.0| 0.0| 0.0| 5.0| 0.0| 7.0| 0.0| 0.0| 0.0| 0.0| 0.0| 365.0| 56.850281| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 7.0| None| XENON|  | 8| 9|0x0012cb699c83604...| 0| 0.0| 0.0| 496.62| 1| 1| 0| 1| 1| 2.0| 2.0| 2.0| 1.99938| 1.99938| 1.99938| 0.0| 0.0| 0.0| 2| 1.99938| 2.0| 0.0| 0.00062| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0| 0|  | 9| 10|0x0012f247c9f980e...| 0| 2570.59| 3336.01| 30572.7| 8| 3| 0| 2| 4| 0.1| 40.0| 16.7| 0.1| 40.0| 18.634625| 0.0| 0.0| 0.0| 11| 149.077| 50.1| 0.0| -98.977| 1.0| 600.0| 0.0| 0.0| 0.0| 1.0| 0.0| 1.0| 0.0| 0.0| 0.0| 0.0| 600.0| 600.0| 600.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 1.0| None| AICRYPTO|  | 10| 11|0x0013e58a315d2e7...| 0| 32.45| 12921.57| 129540.15| 10| 10| 0| 2| 1| 1.000052| 1.014875| 1.004819| 0.999088| 1.01417| 1.004055| 0.0| 0.0| 0.0| 20| 10.04055439| 10.04819041| 0.0| 0.007636018| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0| 0|  | 11| 12|0x0016338abcb6bfa...| 0| 3716.41| 1448.09| 385961.98| 8| 246| 0| 4| 3| 0.118061| 81.38600000000002| 3.381313| 0.01| 300.0| 103.974875| 0.0| 0.0| 0.0| 254| 831.799| 831.8030477000002| 0.0| 0.004047714| 8.0| 6193.025913| 0.0| 0.0| 0.0| 7.0| 0.0| 8.0| 0.0| 0.0| 0.0| 0.0| 0.0| 4035.631891| 774.128239| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 8.0| None| XENON|  | 12| 13|0x001b28141562bc2...| 0| 0.0| 12431.27| 198900.25| 0| 16| 1| 4| 0| 0.0| 1.002069| 0.769166| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 17| 0.0| 12.30665958| 0.0| 12.30665958| 2.0| 0.181283664| 0.0| 0.0| 0.0| 2.0| 0.0| 2.0| 0.0| 0.0| 0.0| 0.0|0.07536699999999999| 0.105917| 0.090642| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 2.0| None| DATAcoin|  | 13| 14|0x001cb265c5606d7...| 0| 9520.7| 5776.32| 78197.58| 7| 2| 0| 2| 4| 0.095|0.26515900000000003| 0.180079| 0.0| 0.133441| 0.037563| 0.0| 0.0| 0.0| 9| 0.262941117| 0.36015854| 0.0| 0.097217423| 3.0| 8.001| 0.0| 0.0| 0.0| 2.0| 0.0| 2.0| 0.0| 0.0| 0.0| 0.0| 0.001| 5.0| 2.667| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 2.0| None| PoSToken|  | 14| 15|0x001cf9871aeaf2a...| 0| 14106.66| 3742.82| 540061.9| 32| 24| 0| 11| 21| 0.0| 1499.9995800000004| 77.125266| 0.0| 1100.0| 102.312148| 0.0| 0.0| 0.0| 56| 3273.988723| 1851.0063760000005| 0.0| -1422.982347| 33.0| 139827.7923| 133086.5| 0.0| 4.0| 23.0| 0.0| 26.0| 0.0| 0.0| 0.0| 0.0| 0.0| 118324.5| 4993.849726| 1e-06| 118324.5| 26617.3| 0.0| 0.0| 0.0| 4.0| 26.0| TenXPay| KyberNetwork|  | 15| 16|0x001d54f72af6eae...| 0| 757.91| 11.08| 25802.32| 34| 3| 1| 3| 13| 0.091844| 1.0| 0.530615| 0.0| 0.933444| 0.044268| 0.0| 0.0| 0.0| 38|1.5051029580000002| 1.591844363| 0.0| 0.086741405| 4.0| 0.0| 5e-06| 0.0| 3.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 5e-06| 1e-06| 0.0| 0.0| 0.0| 1.0| 0.0| NULL| None|  | 16| 17|0x001e6fbcd020823...| 0| 3.13| 4923.24| 280803.43| 57| 57| 0| 2| 2| 0.016037| 0.277689| 0.204013| 0.015617| 0.277269| 0.203593| 0.0| 0.0| 0.0| 114| 11.6048114| 11.6287514| 0.0| 0.023940002| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0| 0|  | 17| 18|0x001eb1e90d25e8c...| 0| 27681.45| 11171.03| 842599.05| 26| 11| 0| 6| 15| 0.09| 34.94| 16.564688| 0.0| 34.9| 9.896423| 0.0| 0.0| 0.0| 37| 257.307| 182.2115661| 0.0| -75.09543387| 13.0| 308440.3104| 307097.3104| 0.0| 4.0| 8.0| 0.0| 7.0| 0.0| 0.0| 0.0| 0.0| 0.0| 274230.0| 34271.1456| 1620.0| 274231.0| 76774.3276| 0.0| 0.0| 0.0| 3.0| 7.0| StatusNetwork| Bancor|  | 18| 19|0x001f357ca933075...| 0| 770.29| 3.82| 2318.5| 3| 2| 0| 1| 3| 7.772| 19.995| 13.8835| 3.7| 20.082772| 9.255226| 0.0| 0.0| 0.0| 5| 27.765677| 27.767| 0.0| 0.001323| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0| 0|  | 19| 20|0x001f99982965a37...| 0| 163.78| 1.11| 329.78| 2| 2| 0| 2| 2| 44.048882| 56.95111800000001| 50.5| 0.61| 100.388974| 50.499487| 0.0| 0.0| 0.0| 4| 100.9989738| 101.0| 0.0| 0.001026218| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0.0| 0| 0|  +---+-----+--------------------+----+------------------------+----------------------------+---------------------------------------+--------+------------+---------------------------+------------------------------+------------------------+------------------+-------------------+------------------+------------+------------------+------------------+--------------------------+------------------------+--------------------------+----------------------------------------------------+------------------+--------------------+--------------------------+-------------------+-----------------+---------------------------+-----------------------+--------------------------------+---------------------+--------------------+-----------------------+-----------------------------+--------------------------------+-------------------------------+---------------------------------+------------------------------------+-------------------+------------------+------------------+-------------------+-------------------+-------------------+----------------------------+----------------------------+----------------------------+---------------------------+--------------------------+---------------------------+--------------------------+  only showing top 20 rows  2. created contracts top  +--------------------+---------------------------+----+  | Address|Number of Created Contracts|FLAG|  +--------------------+---------------------------+----+  |0xb42b20ddbeabdc2...| 9995| 0|  |0x42da8a05cb7ed9a...| 6453| 0|  |0x48d466b7c0d32b6...| 3900| 0|  |0xb49091108e6804d...| 3521| 0|  |0x0536806df512d6c...| 3128| 0|  |0xab11204cfeaccff...| 2550| 0|  |0x1554aa0026292d0...| 2404| 0|  |0xa2a8f158aed54ce...| 2096| 0|  |0x497389bd412e70a...| 1180| 0|  |0x6d28515bf275298...| 41| 0|  |0x991e0dcb162dcc4...| 19| 0|  |0x8334a533f0c3f90...| 16| 0|  |0x36db23fd8e0fabb...| 7| 1|  |0x9e56625509c2f60...| 6| 0|  |0x0f7ce02f8af0405...| 5| 0|  |0xbc9b666f6aa9e5a...| 5| 0|  |0x0167409e6106ec3...| 5| 1|  |0x007cafba4edd0e2...| 4| 0|  |0x6f2dc326b31d512...| 4| 0|  |0x560833296ef7a7f...| 4| 1|  +--------------------+---------------------------+----+  only showing top 20 rows  3. received-rate top  +--------------------+----------------------------+----+  | Address|Avg min between received tnx|FLAG|  +--------------------+----------------------------+----+  |0x06c51cead292c09...| 0.01| 0|  |0x08f1a7010ec9872...| 0.01| 0|  |0x13cd6c860c74502...| 0.01| 0|  |0x14e581d63ab6c0d...| 0.01| 0|  |0x1651abb8e1e5d0f...| 0.01| 0|  |0x2397755bb8a1873...| 0.01| 0|  |0x248631b1e7e4cb0...| 0.01| 0|  |0x25b9c90ebd15ebc...| 0.01| 0|  |0x3ccdbd79d0a4d2d...| 0.01| 0|  |0x51ffad7c0454f8f...| 0.01| 0|  |0x63900050be39ba3...| 0.01| 0|  |0x85a661ba2704a6b...| 0.01| 0|  |0x85ef23bf9503300...| 0.01| 0|  |0x984ff9f9520a7ab...| 0.01| 0|  |0x071076ad315dbdc...| 0.02| 0|  |0x12f376654fb9169...| 0.02| 0|  |0xbc8d1b285478593...| 0.02| 0|  |0x58cdd82d39b6c65...| 0.02| 0|  |0x6316f4bd5bfe767...| 0.02| 0|  |0xc0df8637eb67500...| 0.02| 0|  +--------------------+----------------------------+----+  only showing top 20 rows  4. rate for groups  +----+------------------+------------------+  |FLAG| sent\_rate| recieved\_rate|  +----+------------------+------------------+  | 0| 5427.797217436722| 9463.813842338806|  | 1|3888.1097797154634|2874.7126388251477|  +----+------------------+------------------+  5. most fraud-profitable tokens  +---------------------------+--------------------------+------------------+  | ERC20 most sent token type| ERC20\_most\_rec\_token\_type| ERC20 max val rec|  +---------------------------+--------------------------+------------------+  | | Blockwell say NOT...| 1553031038.0|  | Blackmoon Crypto ...| KickCoin| 151272204.3|  | Dao.Casino| RvT| 80000000.0|  | Raiden| OmiseGO| 32888666.0|  | POWERBANK| TemboCoin| 22000000.0|  | Veritaseum| KickCoin| 21925498.71|  | Populous| Snovio| 12879640.0|  | Tronix| Tronix| 11600000.0|  | | USDDex Stablecoin| 10000000.0|  | BitDice| Cashaa| 5000000.0|  | Litecoin One| Litecoin One| 3500000.0|  | PRG| OmiseGO|3342155.3860000004|  | WaBi| LendConnect| 3089827.293|  | Brickblock| KickCoin| 1704864.397|  | Populous| OmiseGO| 1670000.0|  | OCoin| Amplify| 1010000.0|  | Lucky Token| Galbi| 1000000.0|  | blockwell.ai KYC ...| Helbiz| 950000.0|  | BAT| StatusNetwork| 714006.9167|  | Storj| StatusNetwork| 694980.5937|  +---------------------------+--------------------------+------------------+  only showing top 20 rows  6. most honest-profitable tokens  +---------------------------+--------------------------+------------------+  | ERC20 most sent token type| ERC20\_most\_rec\_token\_type| ERC20 max val rec|  +---------------------------+--------------------------+------------------+  | Ether| KickCoin| 1599270152.0|  | Dai Stablecoin v1.0| BAT| 1553054446.0|  | MOT| Livepeer Token| 1553054418.0|  | CultureVirtue| KickCoin| 1553054333.0|  | SwarmCity| SwarmCity| 1553054321.0|  | WePower| KickCoin| 1553054293.0|  | Flyp.me| Flyp.me| 1553054158.0|  | REP| REP| 1553054158.0|  | blockwell.ai KYC ...| DATAcoin| 1553054097.0|  | Golem| Golem| 1553054037.0|  | blockwell.ai KYC ...| Beauty Coin| 1553054037.0|  | None| 1irst| 1553054037.0|  | None| www.pnztrust.com| 1553031969.0|  | EOS| EOS| 1553031969.0|  | WaykiCoin| Enumivo| 1553031969.0|  | None| https://findthera...| 1553031895.0|  | None| Livepeer Token| 1553031895.0|  | blockwell.ai KYC ...| https://findthera...| 1553031862.0|  | Mavrodi| Mavrodi| 1553031862.0|  | blockwell.ai KYC ...| https://findthera...| 1553031793.0|  +---------------------------+--------------------------+------------------+  only showing top 20 rows  7. most fraud-rated tokens  +---------------------------+--------------------------+--------+  | ERC20 most sent token type| ERC20\_most\_rec\_token\_type|count(1)|  +---------------------------+--------------------------+--------+  | NULL| NULL| 829|  | | Blockwell say NOT...| 767|  | | GSENetwork| 77|  | | Livepeer Token| 45|  | | blockwell.ai KYC ...| 38|  | | ERC20| 33|  | | Free BOB Tokens -...| 32|  | | XENON| 21|  | blockwell.ai KYC ...| | 20|  | | VIU| 14|  | | Lino| 11|  | Tronix| Tronix| 11|  | | WinETHFree| 10|  | | INS Promo| 10|  | | Yooba token| 9|  | | Tronix| 8|  | | OCoin| 8|  | | CANDY| 7|  | | Bulleon Promo Token| 7|  | blockwell.ai KYC ...| Blockwell say NOT...| 6|  +---------------------------+--------------------------+--------+  only showing top 20 rows  8. most honest-rated tokens  +---------------------------+--------------------------+--------+  | ERC20 most sent token type| ERC20\_most\_rec\_token\_type|count(1)|  +---------------------------+--------------------------+--------+  | 0| 0| 4399|  | None| OmiseGO| 742|  | None| DATAcoin| 326|  | None| Livepeer Token| 138|  | None| XENON| 95|  | EOS| EOS| 92|  | Golem| Golem| 91|  | OmiseGO| OmiseGO| 77|  | None| Promodl| 39|  | None| Tronix| 35|  | None| Bulleon Promo Token| 33|  | None| INS Promo| 32|  | None| VIU| 31|  | None| www.pnztrust.com| 29|  | None| BOX Token| 29|  | None| blockwell.ai KYC ...| 25|  | StatusNetwork| StatusNetwork| 25|  | Qtum| Qtum| 24|  | None| AICRYPTO| 22|  | BAT| BAT| 22|  +---------------------------+--------------------------+--------+  only showing top 20 rows  9. avg val received top  +--------------------+----------------+----+  | Address|avg val received|FLAG|  +--------------------+----------------+----+  |0x267be1c1d684f78...| 283618.8316| 0|  |0x151e201b90f8790...| 12963.95| 0|  |0x5167052b83f3695...| 10000.0| 1|  |0x4de76b3dfd38292...| 10000.0| 1|  |0x0b21fd643aaaf5a...| 10000.0| 1|  |0x2d146aa23645950...| 10000.0| 1|  |0x6a14e385fff2f21...| 10000.0| 1|  |0xef0683bef79b7ad...| 10000.0| 1|  |0xd624d046edbdef8...| 6333.265078| 1|  |0xae91740e90d0c67...| 6333.016626| 0|  |0x3c286cfb30146e5...| 5101.6| 0|  |0x422e396e941ebd2...| 5000.5| 0|  |0x446db2f7896d13d...| 5000.5| 0|  |0x45c5836edcc5c42...| 5000.5| 0|  |0x16402006acad644...| 5000.5| 0|  |0xa47ef476c1b4942...| 5000.5| 0|  |0xcbeabeff1f18c6f...| 5000.5| 0|  |0x7932e1ed8586fff...| 5000.0| 0|  |0x474aa9c6f46dc63...| 4999.999685| 1|  |0x18345118bd04c40...| 3750.0015| 1|  +--------------------+----------------+----+  only showing top 20 rows  10. avg val received bottom  +--------------------+--------------------+----+  | Address| avg val received|FLAG|  +--------------------+--------------------+----+  |0x5ef5309d2864bb2...| 1.2e-05| 0|  |0x1da022710df5002...| 2.4e-05| 0|  |0x1a95b271b0535d1...| 2.2e-05| 0|  |0x3750d8ef9d9c58a...| 4e-05| 0|  |0x9609a82d20182d9...| 5e-05| 0|  |0x9e12d932c429107...| 5e-05| 1|  |0x08711d3b02c8758...| 6.2e-05| 0|  |0x5ffc014343cd971...| 6.9e-05| 0|  |0xcbcc0f036ed4788...| 7e-05| 0|  |0x48c80f1f4d53d59...| 8e-05| 0|  |0xaf48cfd4eee2b9f...| 0.000105| 1|  |0xaef38fbfbf932d1...| 0.00015| 0|  |0x314159265dd8dbb...| 0.000152| 0|  |0xaaaf91d9b90df80...|0.000158000000000...| 0|  |0xb734c74ff408749...| 0.000196| 0|  |0xf91446ead6aadd4...| 0.0002| 1|  |0x1a986f1659e11e2...| 0.000233| 0|  |0x4427ee02ffa0bfa...| 0.000242| 1|  |0xdd1db171b110fb8...| 0.0004| 1|  |0x3b53ac518414c51...| 0.00048| 0|  +--------------------+--------------------+----+  only showing top 20 rows |

**Вывод:** в ходе лабораторной работы были освоены базовые принципы работы со Spark на языке Java.