SKaMP. Tests

The goal of this report is to provide information on the performed testing of data acquisition and data pre-processing.

GitHub repository: https://github.com/salveendutt/Big-Data-Analytics.

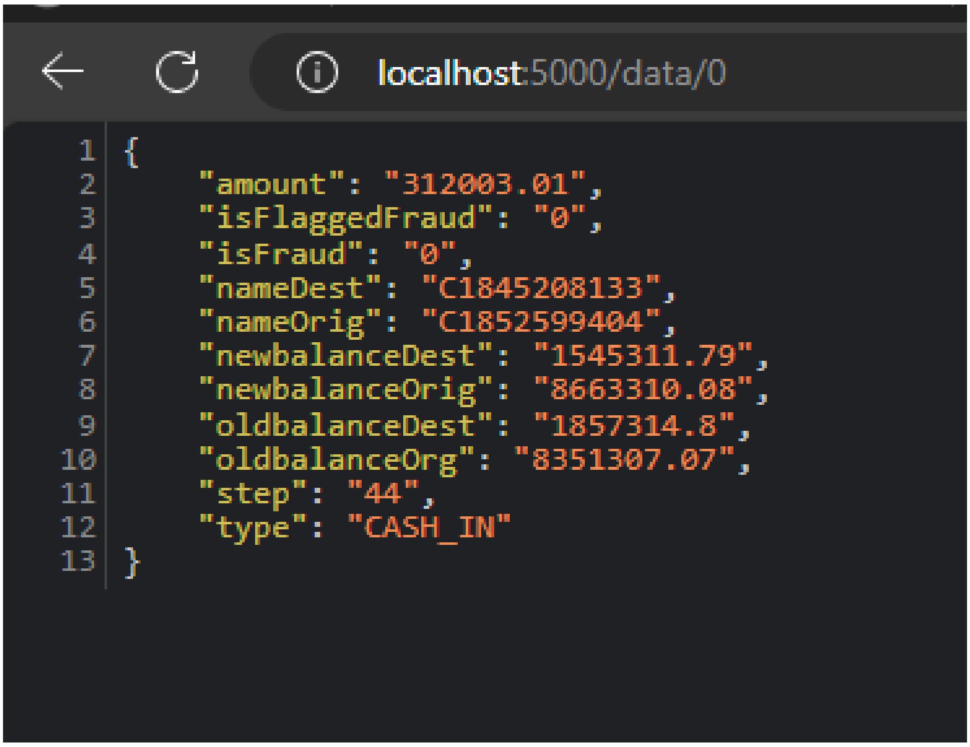
1 Data acquisition

Test objective	**Steps**	**Expected Result**	**Actual Result**
Verify data incoming from stream API	1. Start the server using start_containers.bat; 2. Navigate to http://localhost:5000	Incoming data is available on /data/0	Passed. The screenshot is provided in Fig.1 and Fig.2
Verify correct setup of the stream	Run 'pytest' from the root folder	Data stream is configured as expected; Incoming data is not null; Returned status code - 200	Passed. The screenshot is provided in Fig. 8
Verify correct setup of NiFi, Kafka and Cassandra	Run the containers - follow steps in README.md	Data flows from streamin API to Kafka topics and Cassandra tables	Passed. The screenshot is provided in Fig. 2, 3, 4, 5, 6, 7

Table 1: Data acquisition tests

2 Data pre-processing

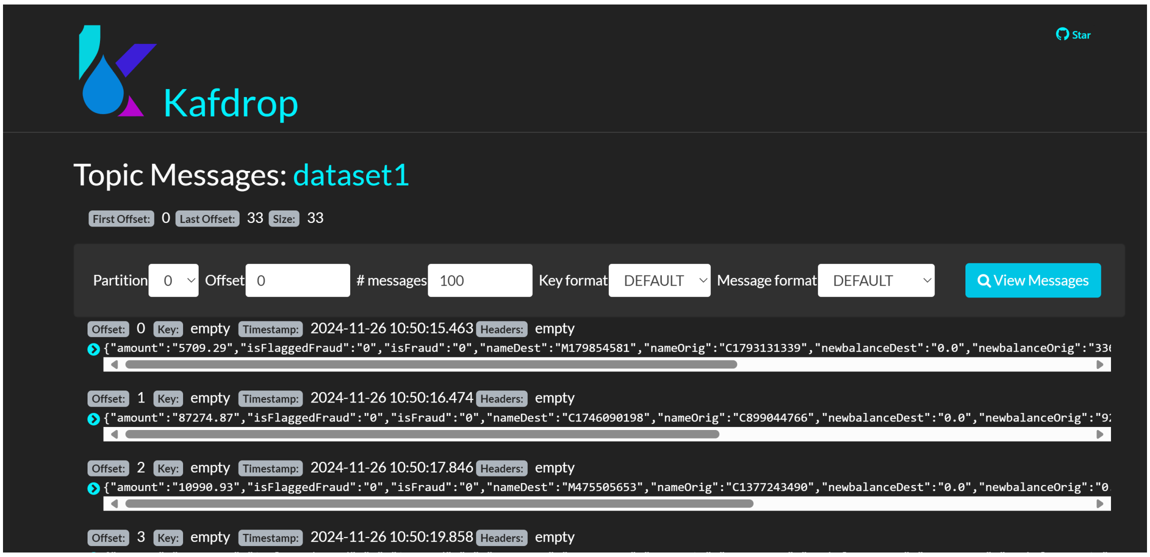
Unit testing is included in the CI/CD pipeline on GitHub and must be successful before any merge into the main branch.



localhost:5000/data/0

```
{
    "amount": "312003.01",
    "isFlaggedFraud": "0",
    "isFraud": "0",
    "nameDest": "C1845208133",
    "nameOrig": "C1852599404",
    "newbalanceDest": "1545311.79",
    "newbalanceOrig": "8663310.08",
    "oldbalanceDest": "1857314.8",
    "oldbalanceOrg": "8351307.07",
    "step": "44",
    "type": "CASH_IN"
}
```

Figure 1: Data incoming via the stream



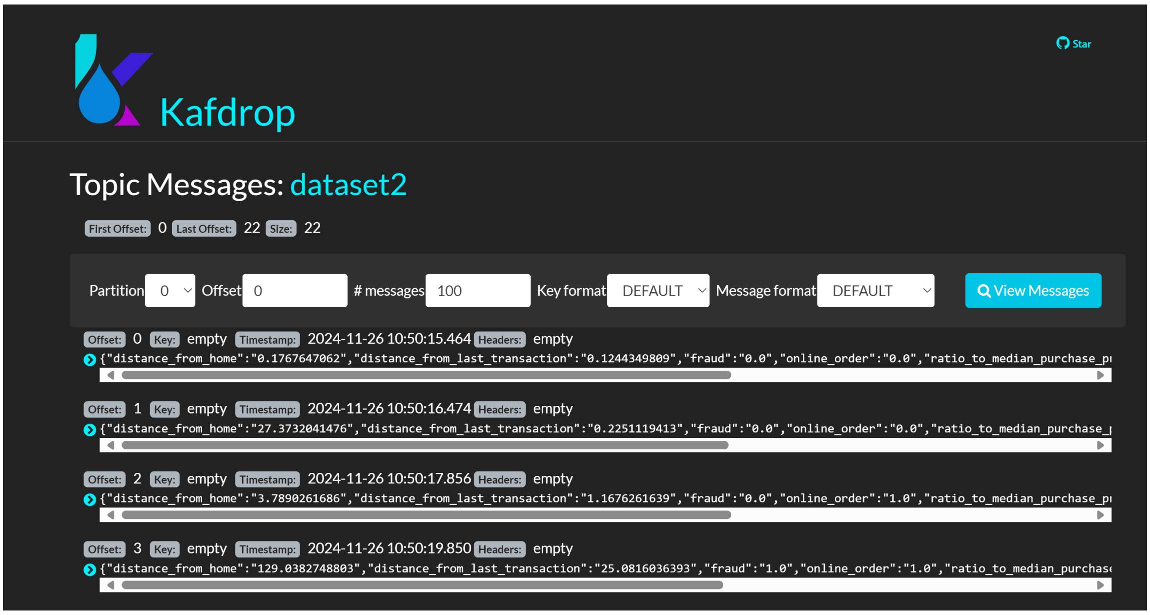
Topic Messages: dataset1

First Offset: 0 Last Offset: 33 Size: 33

Partition 0 Offset 0 # messages 100 Key format DEFAULT Message format DEFAULT

```
Offset: 0 Key: empty Timestamp: 2024-11-26 10:50:15.463 Headers: empty
{"amount":"5709.29","isFlaggedFraud":"0","isFraud":"0","nameDest":"M179854581","nameOrig":"C1793131339","newbalanceDest":"0.0","newbalanceOrig":"33

Offset: 1 Key: empty Timestamp: 2024-11-26 10:50:16.474 Headers: empty
{"amount":"87274.87","isFlaggedFraud":"0","isFraud":"0","nameDest":"C1746090198","nameOrig":"C899044766","newbalanceDest":"0.0","newbalanceOrig":"9

Offset: 2 Key: empty Timestamp: 2024-11-26 10:50:17.846 Headers: empty
{"amount":"10990.93","isFlaggedFraud":"0","isFraud":"0","nameDest":"M475505653","nameOrig":"C1377243490","newbalanceDest":"0.0","newbalanceOrig":"0

Offset: 3 Key: empty Timestamp: 2024-11-26 10:50:19.858 Headers: empty
```

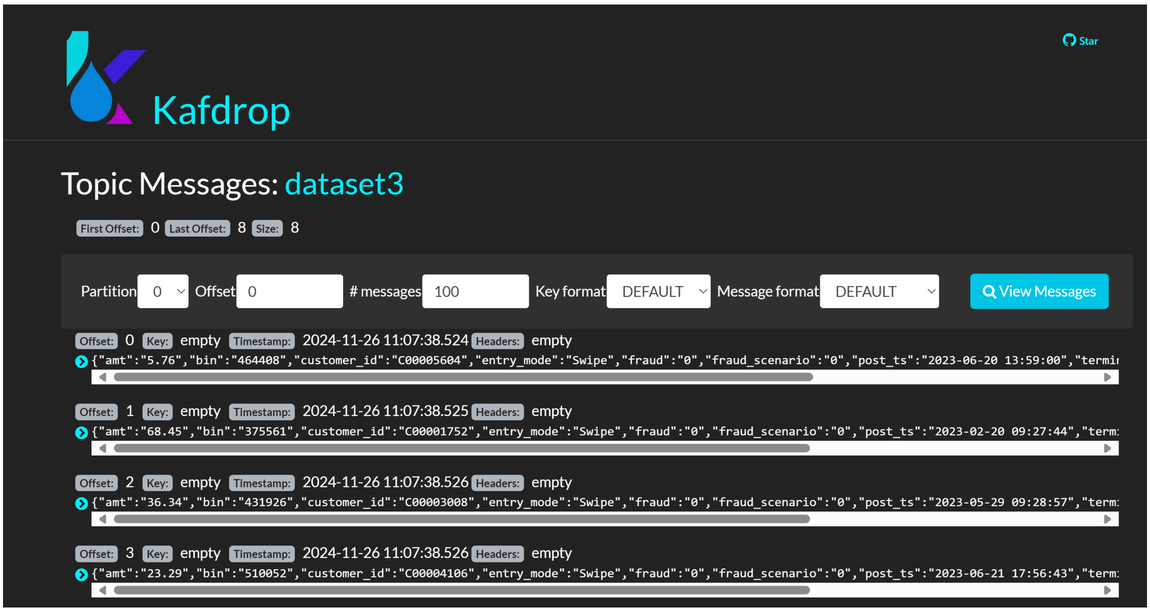
Figure 2: Kafka Dataset1



Topic Messages: dataset2

```
First Offset: 0 Last Offset: 22 Size: 22

Partition 0  Offset 0  # messages 100  Key format DEFAULT  Message format DEFAULT  View Messages

Offset: 0 Key: empty Timestamp: 2024-11-26 10:50:15.464 Headers: empty
{"distance_from_home":"0.1767647062","distance_from_last_transaction":"0.1244349809","fraud":"0.0","online_order":"0.0","ratio_to_median_purchase_p

Offset: 1 Key: empty Timestamp: 2024-11-26 10:50:16.474 Headers: empty
{"distance_from_home":"27.3732041476","distance_from_last_transaction":"0.2251119413","fraud":"0.0","online_order":"0.0","ratio_to_median_purchase_

Offset: 2 Key: empty Timestamp: 2024-11-26 10:50:17.856 Headers: empty
{"distance_from_home":"3.7890261686","distance_from_last_transaction":"1.1676261639","fraud":"0.0","online_order":"1.0","ratio_to_median_purchase_p

Offset: 3 Key: empty Timestamp: 2024-11-26 10:50:19.850 Headers: empty
{"distance_from_home":"129.0382748803","distance_from_last_transaction":"25.0816036393","fraud":"1.0","online_order":"1.0","ratio_to_median_purchase
```

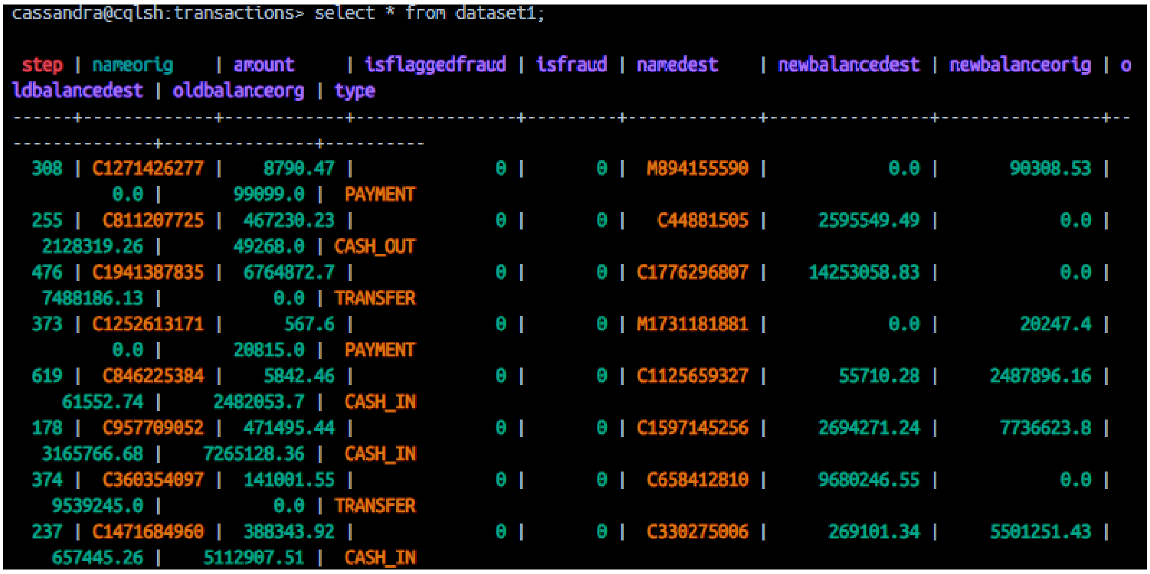
Figure 3: Kafka Dataset2



Topic Messages: dataset3

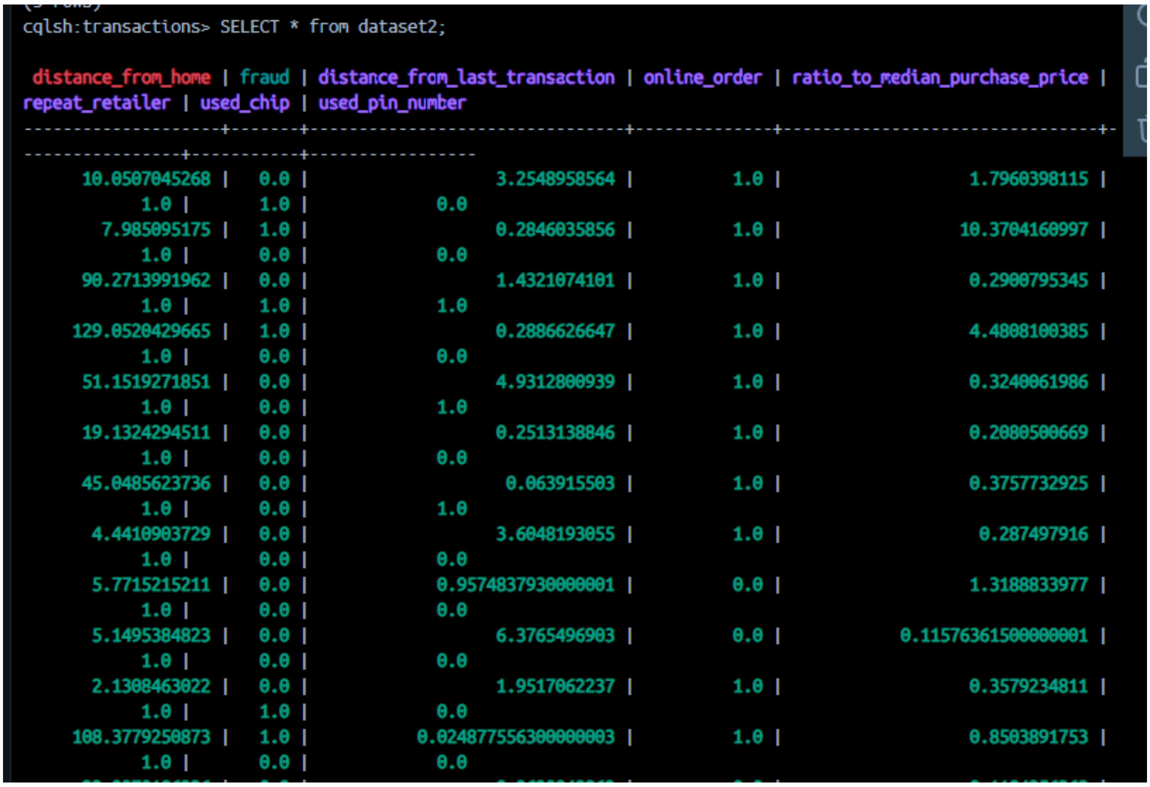
```
First Offset: 0 Last Offset: 8 Size: 8

Partition 0  Offset 0  # messages 100  Key format DEFAULT  Message format DEFAULT  View Messages

Offset: 0 Key: empty Timestamp: 2024-11-26 11:07:38.524 Headers: empty
{"amt":"5.76","bin":"464408","customer_id":"C00005604","entry_mode":"Swipe","fraud":"0","fraud_scenario":"0","post_ts":"2023-06-20 13:59:00","termi

Offset: 1 Key: empty Timestamp: 2024-11-26 11:07:38.525 Headers: empty
{"amt":"68.45","bin":"375561","customer_id":"C00001752","entry_mode":"Swipe","fraud":"0","fraud_scenario":"0","post_ts":"2023-02-20 09:27:44","term

Offset: 2 Key: empty Timestamp: 2024-11-26 11:07:38.526 Headers: empty
{"amt":"36.34","bin":"431926","customer_id":"C00003008","entry_mode":"Swipe","fraud":"0","fraud_scenario":"0","post_ts":"2023-05-29 09:28:57","term

Offset: 3 Key: empty Timestamp: 2024-11-26 11:07:38.526 Headers: empty
{"amt":"23.29","bin":"510052","customer_id":"C00004106","entry_mode":"Swipe","fraud":"0","fraud_scenario":"0","post_ts":"2023-06-21 17:56:43","term
```

Figure 4: Kafka Dataset3



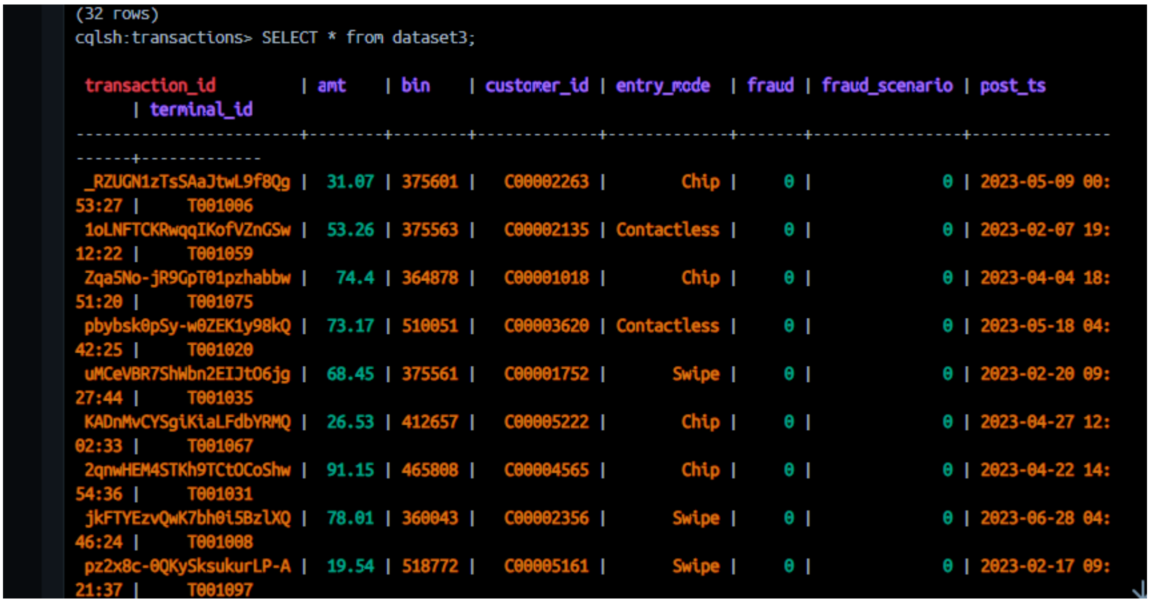
```
cassandra@cqlsh:transactions> select * from dataset1;

 step | nameorig    | amount     | isflaggedfraud | isfraud | namedest    | newbalancedest | newbalanceorig | o
ldbalancedest | oldbalanceorg | type
------+-------------+------------+----------------+---------+-------------+----------------+----------------+--
--------------+---------------+---------
  308 | C1271426277 |    8790.47 |              0 |       0 |  M894155590 |            0.0 |       90308.53 |
          0.0 |       99099.0 |  PAYMENT
  255 |  C811207725 |  467230.23 |              0 |       0 |   C44881505 |     2595549.49 |            0.0 |
   2128319.26 |       49268.0 | CASH_OUT
  476 | C1941387835 |  6764872.7 |              0 |       0 | C1776296807 |    14253058.83 |            0.0 |
   7488186.13 |           0.0 | TRANSFER
  373 | C1252613171 |      567.6 |              0 |       0 | M1731181881 |            0.0 |        20247.4 |
          0.0 |       20815.0 |  PAYMENT
  619 |  C846225384 |    5842.46 |              0 |       0 | C1125659327 |       55710.28 |     2487896.16 |
     61552.74 |     2482053.7 |  CASH_IN
  178 |  C957709052 |  471495.44 |              0 |       0 | C1597145256 |     2694271.24 |      7736623.8 |
   3165766.68 |    7265128.36 |  CASH_IN
  374 |  C360354097 |  141001.55 |              0 |       0 |  C658412810 |     9680246.55 |            0.0 |
    9539245.0 |           0.0 | TRANSFER
  237 | C1471684960 |  388343.92 |              0 |       0 |  C330275006 |      269101.34 |     5501251.43 |
    657445.26 |    5112907.51 |  CASH_IN
```

Figure 5: Cassandra Dataset1



```
cqlsh:transactions> SELECT * from dataset2;

 distance_from_home | fraud | distance_from_last_transaction | online_order | ratio_to_median_purchase_price |
repeat_retailer | used_chip | used_pin_number
--------------------+-------+--------------------------------+--------------+--------------------------------+-
----------------+-----------+-----------------
      10.0507045268 |   0.0 |                   3.2548958564 |          1.0 |                   1.7960398115 |
            1.0 |       1.0 |             0.0
       7.985095175 |   1.0 |                   0.2846035856 |          1.0 |                  10.3704160997 |
            1.0 |       0.0 |             0.0
      90.2713991962 |   0.0 |                   1.4321074101 |          1.0 |                   0.2900795345 |
            1.0 |       1.0 |             1.0
     129.0520429665 |   1.0 |                   0.2886626647 |          1.0 |                   4.4808100385 |
            1.0 |       0.0 |             0.0
      51.1519271851 |   0.0 |                   4.9312800939 |          1.0 |                   0.3240061986 |
            1.0 |       0.0 |             1.0
      19.1324294511 |   0.0 |                   0.2513138846 |          1.0 |                   0.2080500669 |
            1.0 |       0.0 |             0.0
      45.0485623736 |   0.0 |                    0.063915503 |          1.0 |                   0.3757732925 |
            1.0 |       0.0 |             1.0
       4.4410903729 |   0.0 |                   3.6048193055 |          1.0 |                    0.287497916 |
            1.0 |       0.0 |             0.0
       5.7715215211 |   0.0 |             0.9574837930000001 |          0.0 |                   1.3188833977 |
            1.0 |       0.0 |             0.0
       5.1495384823 |   0.0 |                   6.3765496903 |          0.0 |            0.11576361500000001 |
            1.0 |       0.0 |             0.0
       2.1308463022 |   0.0 |                   1.9517062237 |          1.0 |                   0.3579234811 |
            1.0 |       1.0 |             0.0
     108.3779250873 |   1.0 |           0.024877556300000003 |          1.0 |                   0.8503891753 |
            1.0 |       0.0 |             0.0
```

Figure 6: Cassandra Dataset2

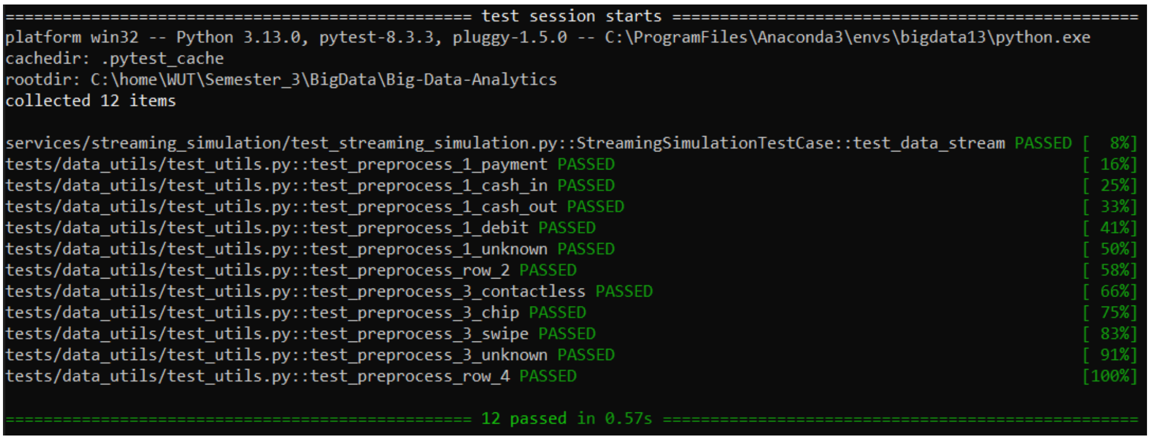


```
(32 rows)
cqlsh:transactions> SELECT * from dataset3;

 transaction_id         | amt    | bin    | customer_id | entry_mode  | fraud | fraud_scenario | post_ts
      | terminal_id
------------------------+--------+--------+------------+------------+-------+---------------+--------------
------+-------------
 _RZUGN1zTsSAaJtwL9f8Qg |  31.07 | 375601 |   C00002263 |        Chip |     0 |              0 | 2023-05-09 00:
53:27 |     T001006
 1oLNFTCKRwqqIKofVZnGSw |  53.26 | 375563 |   C00002135 | Contactless |     0 |              0 | 2023-02-07 19:
12:22 |     T001059
 Zqa5No-jR9GpT01pzhabbw |   74.4 | 364878 |   C00001018 |        Chip |     0 |              0 | 2023-04-04 18:
51:20 |     T001075
 pbybsk0pSy-w0ZEK1y98kQ |  73.17 | 510051 |   C00003620 | Contactless |     0 |              0 | 2023-05-18 04:
42:25 |     T001020
 uMCeVBR7ShWbn2EIJtO6jg |  68.45 | 375561 |   C00001752 |       Swipe |     0 |              0 | 2023-02-20 09:
27:44 |     T001035
 KADnMvCYSgiKiaLFdbYRMQ |  26.53 | 412657 |   C00005222 |        Chip |     0 |              0 | 2023-04-27 12:
02:33 |     T001067
 2qnwHEM4STKh9TCtOCoShw |  91.15 | 465808 |   C00004565 |        Chip |     0 |              0 | 2023-04-22 14:
54:36 |     T001031
 jkFTYEzvQwK7bh0i5BzlXQ |  78.01 | 360043 |   C00002356 |       Swipe |     0 |              0 | 2023-06-28 04:
46:24 |     T001008
 pz2x8c-0QKySksukurLP-A |  19.54 | 518772 |   C00005161 |       Swipe |     0 |              0 | 2023-02-17 09:
21:37 |     T001097
```

Figure 7: Cassandra Dataset3

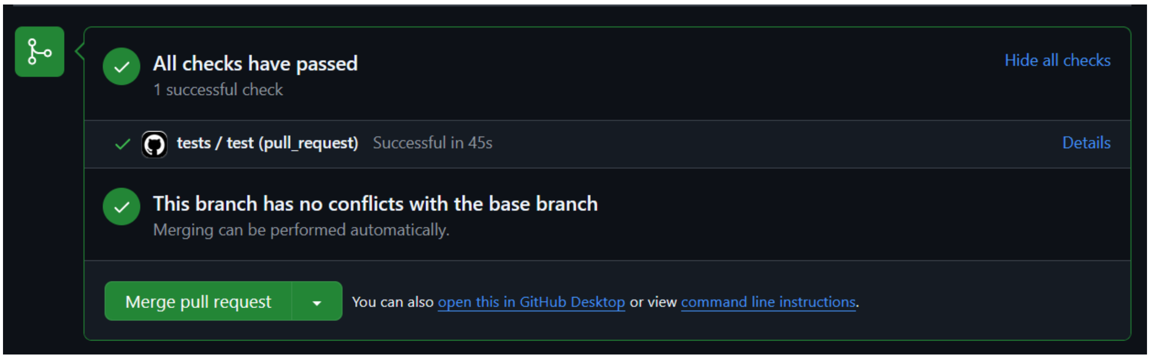
Test objective	Steps	Expected Result	Actual Result
Verify correct data pre-processing of dataset 1	Run 'pytest' from the root folder	Feature 'type' is correctly transformed into numeric value (5 cases); Feature 'is-Merchant' is correctly prepared (2 cases)	PASSED. The screenshot is provided in Fig. 3
Verify correct data pre-processing of dataset 2	Run 'pytest' from the root folder	Numeric boolean values are transformed to int from float (4 cases)	PASSED. The screenshot is provided in Fig. 3
Verify correct data pre-processing of dataset 3	Run 'pytest' from the root folder	Feature 'entry_mode' is correctly transformed into numeric value (4 cases); Unnecessary features are omitted.	PASSED. The screenshot is provided in Fig. 3
Verify correct data pre-processing of dataset 4	Run 'pytest' from the root folder	Features 'Amount', 'Class' are renamed to 'amount' and 'is-Fraud'; Extra features are removed	PASSED. The screenshot is provided in Fig. 3

Table 2: Data pre-processing tests



```
================================================= test session starts =================================================
platform win32 -- Python 3.13.0, pytest-8.3.3, pluggy-1.5.0 -- C:\ProgramFiles\Anaconda3\envs\bigdata13\python.exe
cachedir: .pytest_cache
rootdir: C:\home\WUT\Semester_3\BigData\Big-Data-Analytics
collected 12 items

services/streaming_simulation/test_streaming_simulation.py::StreamingSimulationTestCase::test_data_stream PASSED [  8%]
tests/data_utils/test_utils.py::test_preprocess_1_payment PASSED                                                 [ 16%]
tests/data_utils/test_utils.py::test_preprocess_1_cash_in PASSED                                                 [ 25%]
tests/data_utils/test_utils.py::test_preprocess_1_cash_out PASSED                                                [ 33%]
tests/data_utils/test_utils.py::test_preprocess_1_debit PASSED                                                   [ 41%]
tests/data_utils/test_utils.py::test_preprocess_1_unknown PASSED                                                 [ 50%]
tests/data_utils/test_utils.py::test_preprocess_row_2 PASSED                                                     [ 58%]
tests/data_utils/test_utils.py::test_preprocess_3_contactless PASSED                                             [ 66%]
tests/data_utils/test_utils.py::test_preprocess_3_chip PASSED                                                    [ 75%]
tests/data_utils/test_utils.py::test_preprocess_3_swipe PASSED                                                   [ 83%]
tests/data_utils/test_utils.py::test_preprocess_3_unknown PASSED                                                 [ 91%]
tests/data_utils/test_utils.py::test_preprocess_row_4 PASSED                                                     [100%]

================================================= 12 passed in 0.57s ==================================================
```

Figure 8: Unit testing result



✓ All checks have passed

1 successful check

✓ tests / test (pull_request) Successful in 45s

✓ This branch has no conflicts with the base branch

Merging can be performed automatically.

Hide all checks
Details
Merge pull request ▾
You can also open this in GitHub Desktop or view command line instructions.

Figure 9: GitHub checks before merge