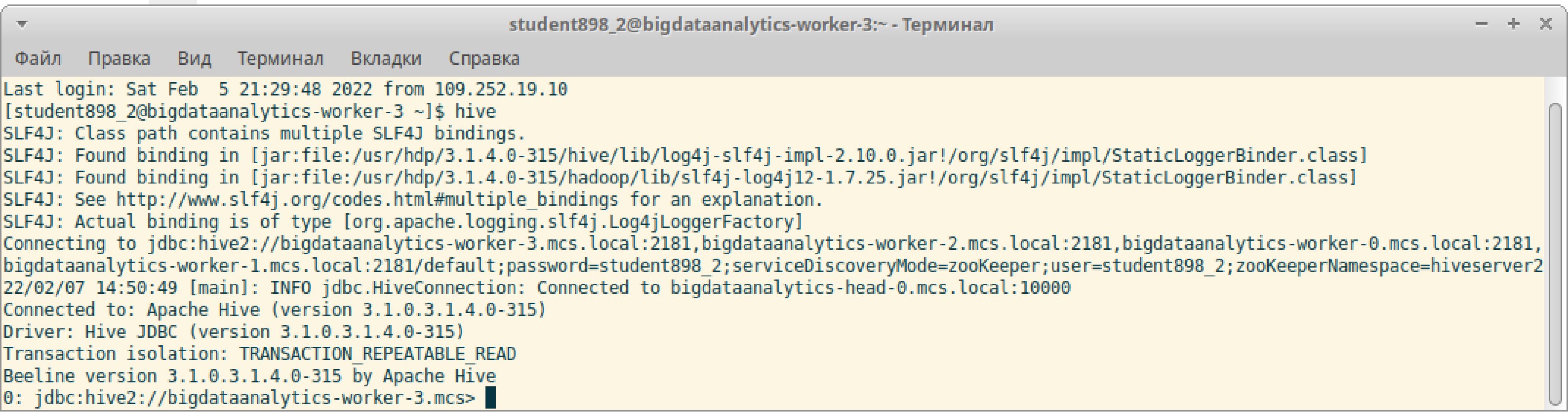
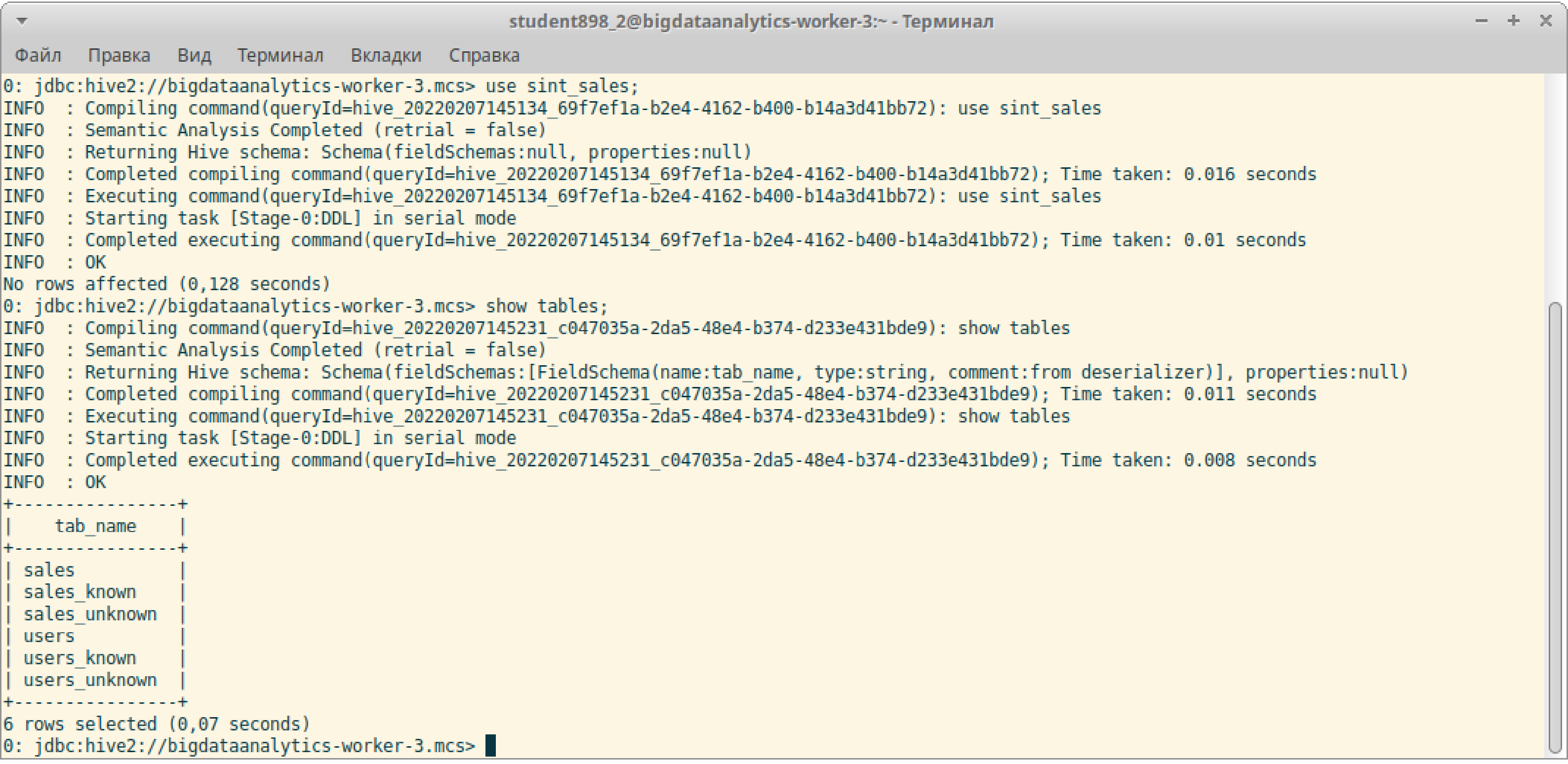
8. Spark Streaming + Spark ML + Cassandra. Применение ML-модели в режиме реального времени

hive


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл Правка Вид Терминал Вкладки Справка

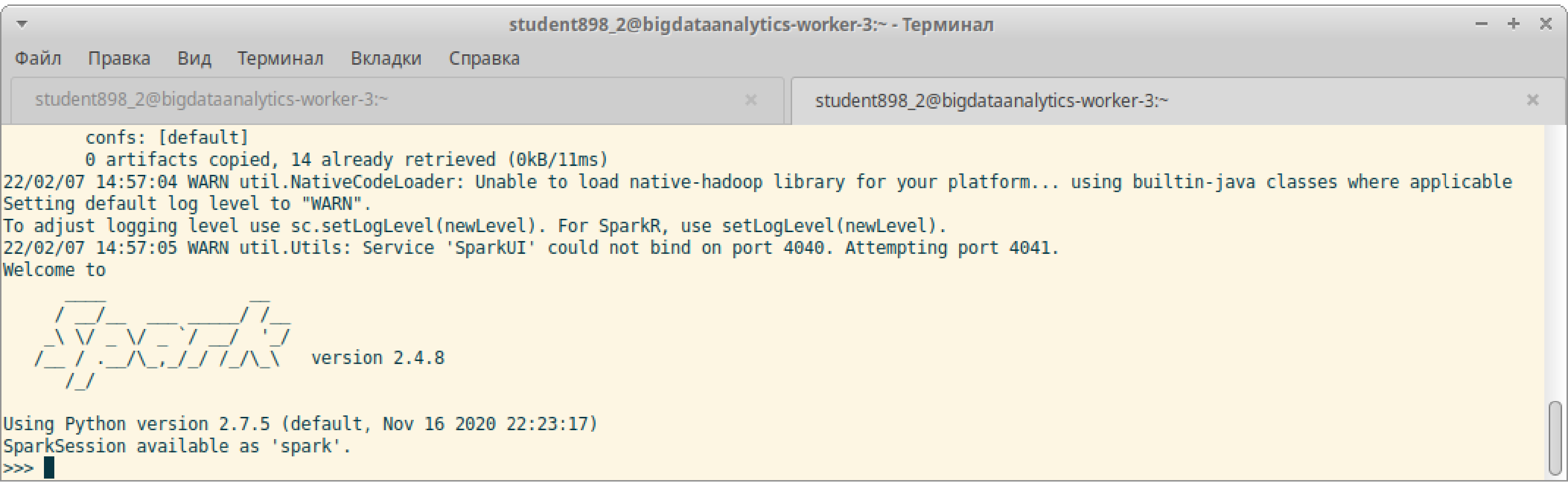
```
Last login: Sat Feb  5 21:29:48 2022 from 109.252.19.10
[student898_2@bigdataanalytics-worker-3 ~]$ hive
SLF4J: Class path contains multiple SLF4J bindings.
SLF4J: Found binding in [jar:file:/usr/hdp/3.1.4.0-315/hive/lib/log4j-slf4j-impl-2.10.0.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/hdp/3.1.4.0-315/hadoop/lib/slf4j-log4j12-1.7.25.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: See http://www.slf4j.org/codes.html#multiple_bindings for an explanation.
SLF4J: Actual binding is of type [org.apache.logging.slf4j.Log4jLoggerFactory]
Connecting to jdbc:hive2://bigdataanalytics-worker-3.mcs.local:2181,bigdataanalytics-worker-2.mcs.local:2181,bigdataanalytics-worker-0.mcs.local:2181,
bigdataanalytics-worker-1.mcs.local:2181/default;password=student898_2;serviceDiscoveryMode=zooKeeper;user=student898_2;zooKeeperNamespace=hiveserver2
22/02/07 14:50:49 [main]: INFO jdbc.HiveConnection: Connected to bigdataanalytics-head-0.mcs.local:10000
Connected to: Apache Hive (version 3.1.0.3.1.4.0-315)
Driver: Hive JDBC (version 3.1.0.3.1.4.0-315)
Transaction isolation: TRANSACTION_REPEATABLE_READ
Beeline version 3.1.0.3.1.4.0-315 by Apache Hive
0: jdbc:hive2://bigdataanalytics-worker-3.mcs>
```

use sint_sales;
show tables;


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл Правка Вид Терминал Вкладки Справка

```
0: jdbc:hive2://bigdataanalytics-worker-3.mcs> use sint_sales;
INFO  : Compiling command(queryId=hive_20220207145134_69f7ef1a-b2e4-4162-b400-b14a3d41bb72): use sint_sales
INFO  : Semantic Analysis Completed (retrial = false)
INFO  : Returning Hive schema: Schema(fieldSchemas:null, properties:null)
INFO  : Completed compiling command(queryId=hive_20220207145134_69f7ef1a-b2e4-4162-b400-b14a3d41bb72); Time taken: 0.016 seconds
INFO  : Executing command(queryId=hive_20220207145134_69f7ef1a-b2e4-4162-b400-b14a3d41bb72): use sint_sales
INFO  : Starting task [Stage-0:DDL] in serial mode
INFO  : Completed executing command(queryId=hive_20220207145134_69f7ef1a-b2e4-4162-b400-b14a3d41bb72); Time taken: 0.01 seconds
INFO  : OK
No rows affected (0,128 seconds)
0: jdbc:hive2://bigdataanalytics-worker-3.mcs> show tables;
INFO  : Compiling command(queryId=hive_20220207145231_c047035a-2da5-48e4-b374-d233e431bde9): show tables
INFO  : Semantic Analysis Completed (retrial = false)
INFO  : Returning Hive schema: Schema(fieldSchemas:[FieldSchema(name:tab_name, type:string, comment:from deserializer)], properties:null)
INFO  : Completed compiling command(queryId=hive_20220207145231_c047035a-2da5-48e4-b374-d233e431bde9); Time taken: 0.011 seconds
INFO  : Executing command(queryId=hive_20220207145231_c047035a-2da5-48e4-b374-d233e431bde9): show tables
INFO  : Starting task [Stage-0:DDL] in serial mode
INFO  : Completed executing command(queryId=hive_20220207145231_c047035a-2da5-48e4-b374-d233e431bde9); Time taken: 0.008 seconds
INFO  : OK
+----------------+
|    tab_name    |
+----------------+
| sales          |
| sales_known    |
| sales_unknown  |
| users          |
| users_known    |
| users_unknown  |
+----------------+
6 rows selected (0,07 seconds)
0: jdbc:hive2://bigdataanalytics-worker-3.mcs>
```

/opt/spark-2.4.8/bin/pyspark --packages org.apache.spark:spark-sql-kafka-0-10_2.11:2.4.5,com.datastax.spark:spark-cassandra-connector_2.11:2.4.2


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл
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student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~

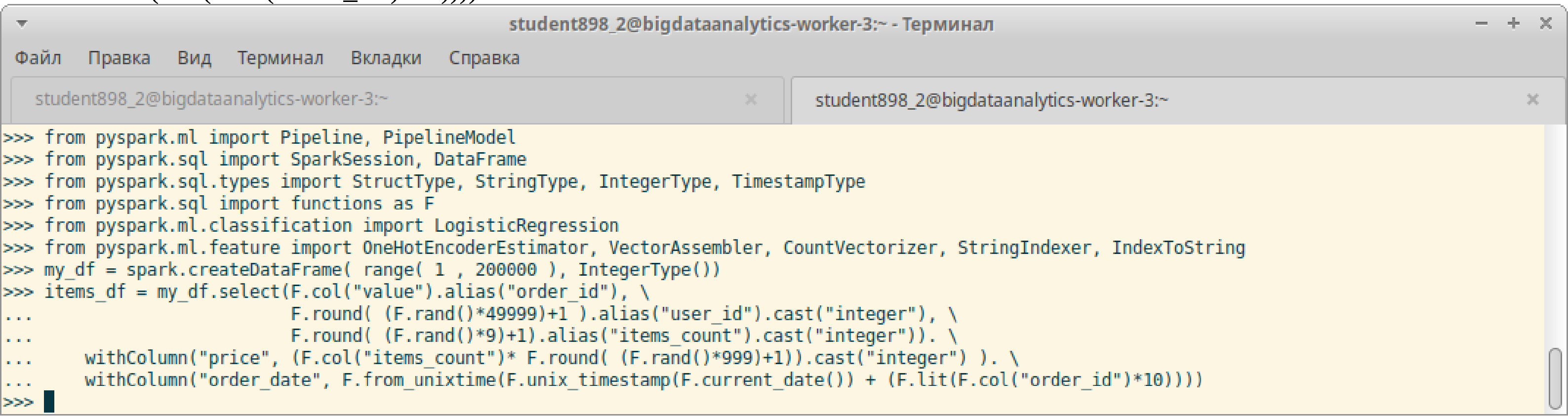
```
        confs: [default]
        0 artifacts copied, 14 already retrieved (0kB/11ms)
22/02/07 14:57:04 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
Setting default log level to "WARN".
To adjust logging level use sc.setLogLevel(newLevel). For SparkR, use setLogLevel(newLevel).
22/02/07 14:57:05 WARN util.Utils: Service 'SparkUI' could not bind on port 4040. Attempting port 4041.
Welcome to
      ____              __
     / __/__  ___ _____/ /__
    _\ \/ _ \/ _ `/ __/  '_/
   /__ / .__/\_,_/_/ /_/\_\   version 2.4.8
      /_/

Using Python version 2.7.5 (default, Nov 16 2020 22:23:17)
SparkSession available as 'spark'.
>>> 
```

```
from pyspark.ml import Pipeline, PipelineModel
from pyspark.sql import SparkSession, DataFrame
from pyspark.sql.types import StructType, StringType, IntegerType, TimestampType
from pyspark.sql import functions as F
from pyspark.ml.classification import LogisticRegression
from pyspark.ml.feature import OneHotEncoderEstimator, VectorAssembler, CountVectorizer, StringIndexer,
IndexToString

my_df = spark.createDataFrame( range( 1 , 200000 ), IntegerType())

items_df = my_df.select(F.col("value").alias("order_id"), \
                        F.round( (F.rand()*49999)+1 ).alias("user_id").cast("integer"), \
                        F.round( (F.rand()*9)+1).alias("items_count").cast("integer")). \
    withColumn("price", (F.col("items_count")* F.round( (F.rand()*999)+1)).cast("integer") ). \
    withColumn("order_date", F.from_unixtime(F.unix_timestamp(F.current_date()) +
(F.lit(F.col("order_id")*10))))
```


student898_2@bigdataanalytics-worker-3:~ - Терминал
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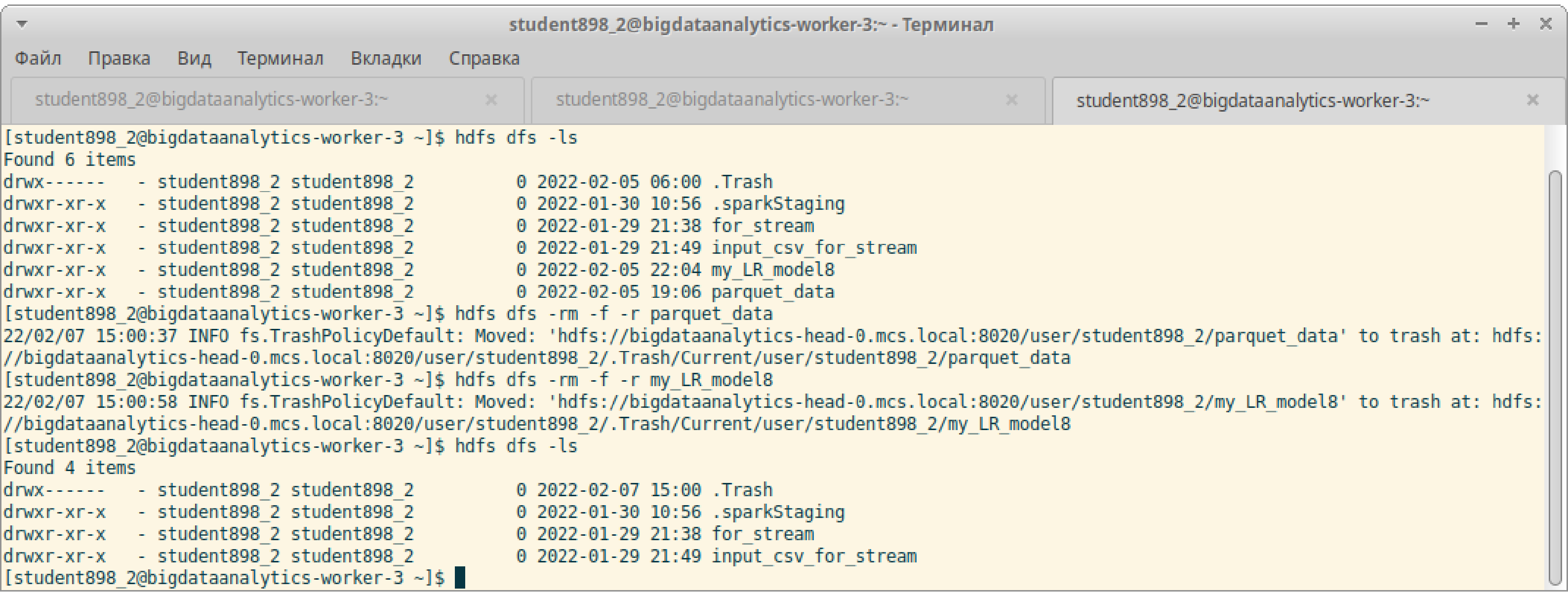
student898_2@bigdataanalytics-worker-3:~

```
>>> from pyspark.ml import Pipeline, PipelineModel
>>> from pyspark.sql import SparkSession, DataFrame
>>> from pyspark.sql.types import StructType, StringType, IntegerType, TimestampType
>>> from pyspark.sql import functions as F
>>> from pyspark.ml.classification import LogisticRegression
>>> from pyspark.ml.feature import OneHotEncoderEstimator, VectorAssembler, CountVectorizer, StringIndexer, IndexToString
>>> my_df = spark.createDataFrame( range( 1 , 200000 ), IntegerType())
>>> items_df = my_df.select(F.col("value").alias("order_id"), \
...                     F.round( (F.rand()*49999)+1 ).alias("user_id").cast("integer"), \
...                     F.round( (F.rand()*9)+1).alias("items_count").cast("integer")). \
...     withColumn("price", (F.col("items_count")* F.round( (F.rand()*999)+1)).cast("integer") ). \
...     withColumn("order_date", F.from_unixtime(F.unix_timestamp(F.current_date()) + (F.lit(F.col("order_id")*10))))
>>> 
```

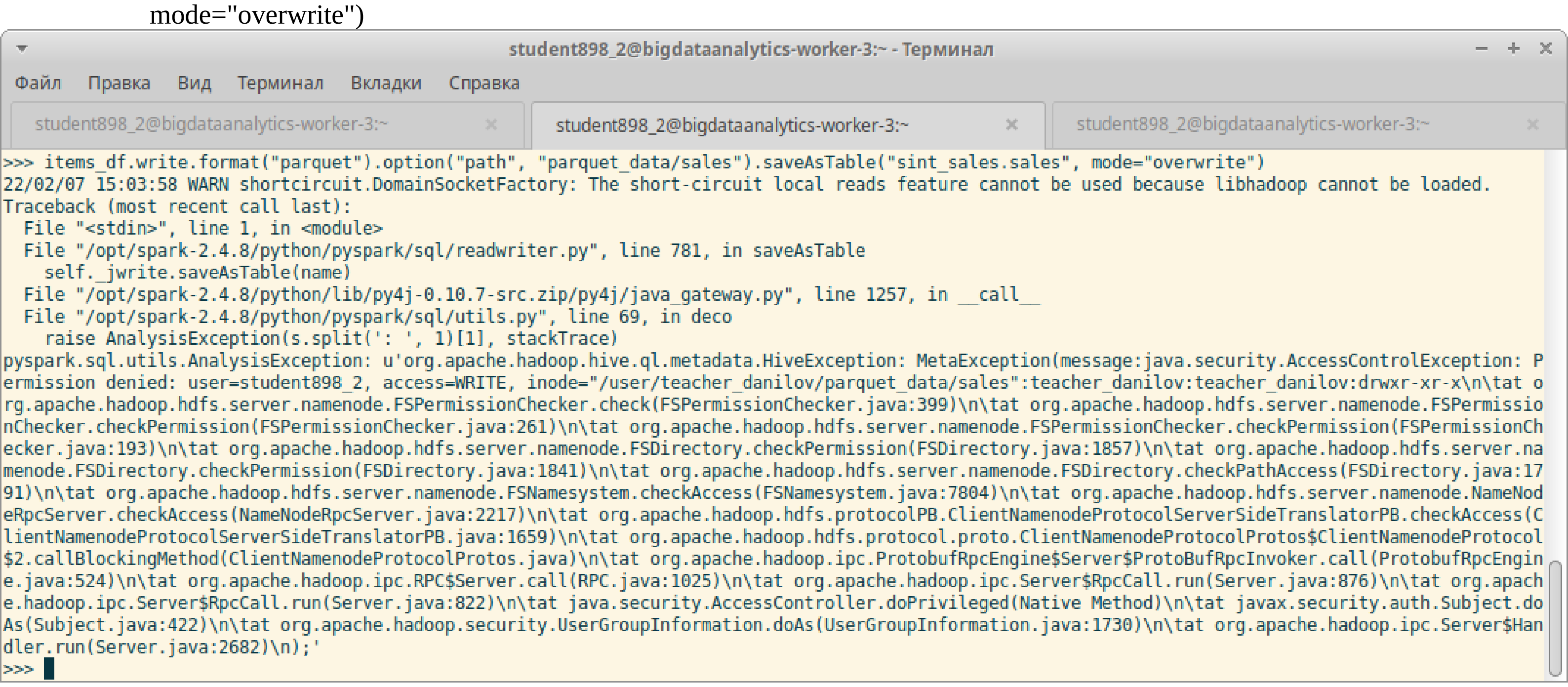
```
hdfs dfs -ls
hdfs dfs -rm -f -r parquet_data
hdfs dfs -rm -f -r my_LR_model8
hdfs dfs -ls
```



student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл Правка Вид Терминал Вкладки Справка
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~

```
[student898_2@bigdataanalytics-worker-3 ~]$ hdfs dfs -ls
Found 6 items
drwx------   - student898_2 student898_2          0 2022-02-05 06:00 .Trash
drwxr-xr-x   - student898_2 student898_2          0 2022-01-30 10:56 .sparkStaging
drwxr-xr-x   - student898_2 student898_2          0 2022-01-29 21:38 for_stream
drwxr-xr-x   - student898_2 student898_2          0 2022-01-29 21:49 input_csv_for_stream
drwxr-xr-x   - student898_2 student898_2          0 2022-02-05 22:04 my_LR_model8
drwxr-xr-x   - student898_2 student898_2          0 2022-02-05 19:06 parquet_data
[student898_2@bigdataanalytics-worker-3 ~]$ hdfs dfs -rm -f -r parquet_data
22/02/07 15:00:37 INFO fs.TrashPolicyDefault: Moved: 'hdfs://bigdataanalytics-head-0.mcs.local:8020/user/student898_2/parquet_data' to trash at: hdfs:
//bigdataanalytics-head-0.mcs.local:8020/user/student898_2/.Trash/Current/user/student898_2/parquet_data
[student898_2@bigdataanalytics-worker-3 ~]$ hdfs dfs -rm -f -r my_LR_model8
22/02/07 15:00:58 INFO fs.TrashPolicyDefault: Moved: 'hdfs://bigdataanalytics-head-0.mcs.local:8020/user/student898_2/my_LR_model8' to trash at: hdfs:
//bigdataanalytics-head-0.mcs.local:8020/user/student898_2/.Trash/Current/user/student898_2/my_LR_model8
[student898_2@bigdataanalytics-worker-3 ~]$ hdfs dfs -ls
Found 4 items
drwx------   - student898_2 student898_2          0 2022-02-07 15:00 .Trash
drwxr-xr-x   - student898_2 student898_2          0 2022-01-30 10:56 .sparkStaging
drwxr-xr-x   - student898_2 student898_2          0 2022-01-29 21:38 for_stream
drwxr-xr-x   - student898_2 student898_2          0 2022-01-29 21:49 input_csv_for_stream
[student898_2@bigdataanalytics-worker-3 ~]$ 
```

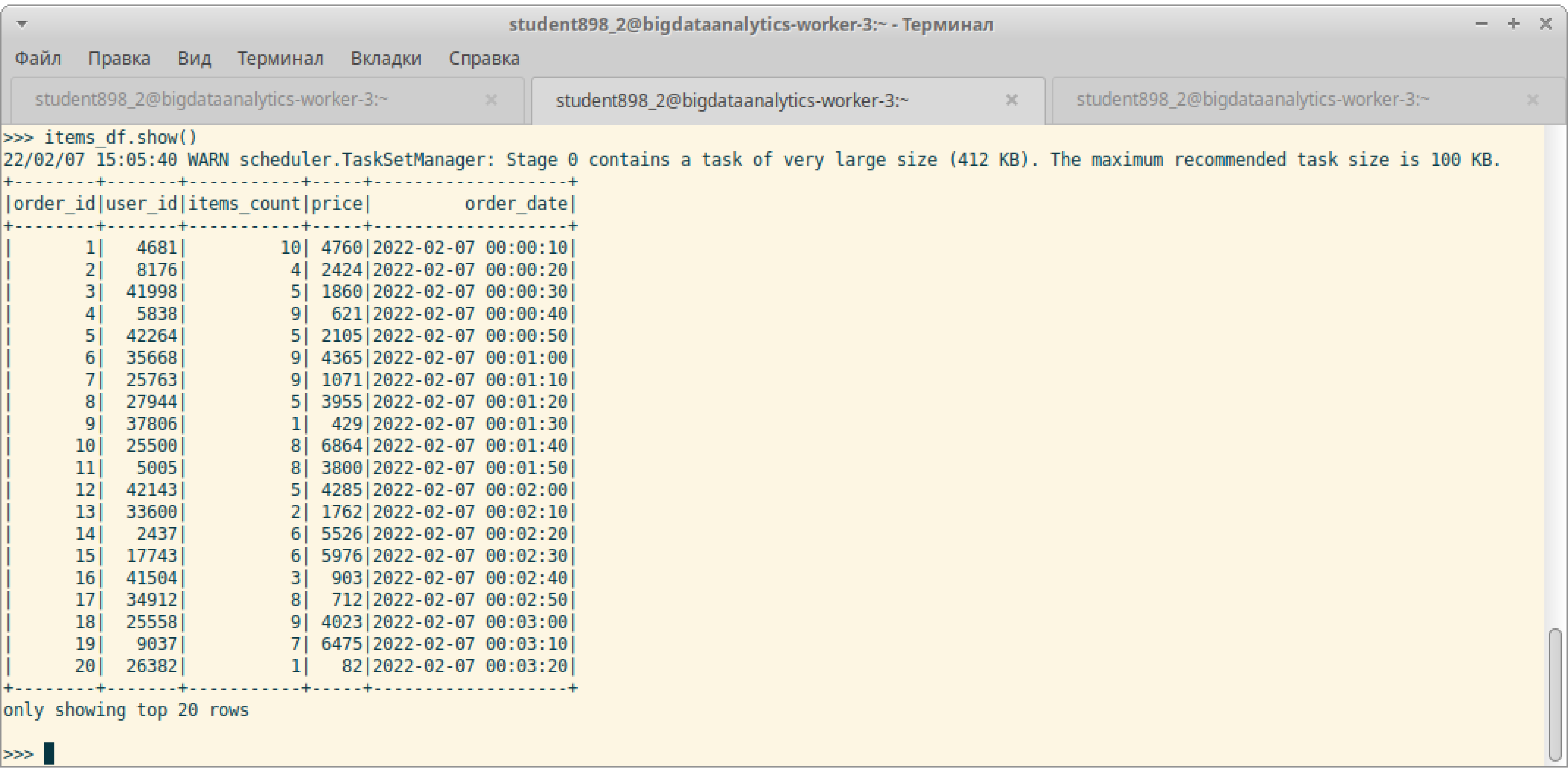
items_df.write.format("parquet").option("path", "parquet_data/sales").saveAsTable("sint_sales.sales", mode="overwrite")



student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл Правка Вид Терминал Вкладки Справка
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~

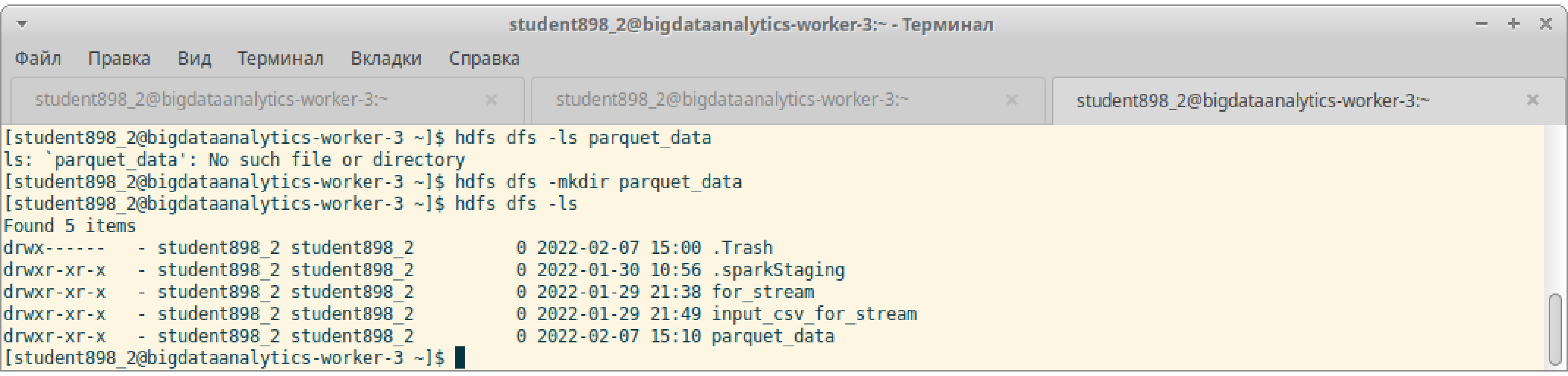
```
>>> items_df.write.format("parquet").option("path", "parquet_data/sales").saveAsTable("sint_sales.sales", mode="overwrite")
22/02/07 15:03:58 WARN shortcircuit.DomainSocketFactory: The short-circuit local reads feature cannot be used because libhadoop cannot be loaded.
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
  File "/opt/spark-2.4.8/python/pyspark/sql/readwriter.py", line 781, in saveAsTable
    self._jwrite.saveAsTable(name)
  File "/opt/spark-2.4.8/python/lib/py4j-0.10.7-src.zip/py4j/java_gateway.py", line 1257, in __call__
  File "/opt/spark-2.4.8/python/pyspark/sql/utils.py", line 69, in deco
    raise AnalysisException(s.split(': ', 1)[1], stackTrace)
pyspark.sql.utils.AnalysisException: u'org.apache.hadoop.hive.ql.metadata.HiveException: MetaException(message:java.security.AccessControlException: P
ermission denied: user=student898_2, access=WRITE, inode="/user/teacher_danilov/parquet_data/sales":teacher_danilov:teacher_danilov:drwxr-xr-x\n\tat o
rg.apache.hadoop.hdfs.server.namenode.FSPermissionChecker.check(FSPermissionChecker.java:399)\n\tat org.apache.hadoop.hdfs.server.namenode.FSPermissio
nChecker.checkPermission(FSPermissionChecker.java:261)\n\tat org.apache.hadoop.hdfs.server.namenode.FSPermissionChecker.checkPermission(FSPermissionCh
ecker.java:193)\n\tat org.apache.hadoop.hdfs.server.namenode.FSDirectory.checkPermission(FSDirectory.java:1857)\n\tat org.apache.hadoop.hdfs.server.na
menode.FSDirectory.checkPermission(FSDirectory.java:1841)\n\tat org.apache.hadoop.hdfs.server.namenode.FSDirectory.checkPathAccess(FSDirectory.java:17
91)\n\tat org.apache.hadoop.hdfs.server.namenode.FSNamesystem.checkAccess(FSNamesystem.java:7804)\n\tat org.apache.hadoop.hdfs.server.namenode.NameNod
eRpcServer.checkAccess(NameNodeRpcServer.java:2217)\n\tat org.apache.hadoop.hdfs.protocolPB.ClientNamenodeProtocolServerSideTranslatorPB.checkAccess(C
lientNamenodeProtocolServerSideTranslatorPB.java:1659)\n\tat org.apache.hadoop.hdfs.protocol.proto.ClientNamenodeProtocolProtos$ClientNamenodeProtocol
$2.callBlockingMethod(ClientNamenodeProtocolProtos.java)\n\tat org.apache.hadoop.ipc.ProtobufRpcEngine$Server$ProtoBufRpcInvoker.call(ProtobufRpcEngin
e.java:524)\n\tat org.apache.hadoop.ipc.RPC$Server.call(RPC.java:1025)\n\tat org.apache.hadoop.ipc.Server$RpcCall.run(Server.java:876)\n\tat org.apach
e.hadoop.ipc.Server$RpcCall.run(Server.java:822)\n\tat java.security.AccessController.doPrivileged(Native Method)\n\tat javax.security.auth.Subject.do
As(Subject.java:422)\n\tat org.apache.hadoop.security.UserGroupInformation.doAs(UserGroupInformation.java:1730)\n\tat org.apache.hadoop.ipc.Server$Han
dler.run(Server.java:2682)\n);'
>>> 
```

items_df.show()


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл Правка Вид Терминал Вкладки Справка
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~

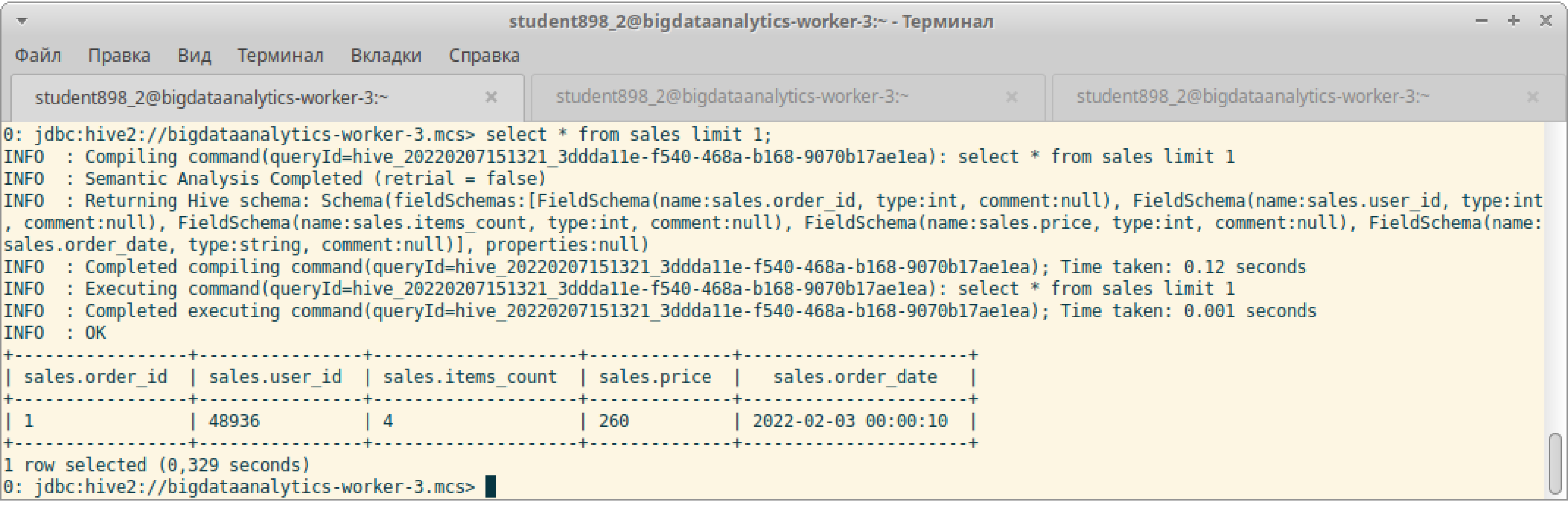
```
>>> items_df.show()
22/02/07 15:05:40 WARN scheduler.TaskSetManager: Stage 0 contains a task of very large size (412 KB). The maximum recommended task size is 100 KB.
+--------+-------+-----------+-----+-------------------+
|order_id|user_id|items_count|price|         order_date|
+--------+-------+-----------+-----+-------------------+
|       1|   4681|         10| 4760|2022-02-07 00:00:10|
|       2|   8176|          4| 2424|2022-02-07 00:00:20|
|       3|  41998|          5| 1860|2022-02-07 00:00:30|
|       4|   5838|          9|  621|2022-02-07 00:00:40|
|       5|  42264|          5| 2105|2022-02-07 00:00:50|
|       6|  35668|          9| 4365|2022-02-07 00:01:00|
|       7|  25763|          9| 1071|2022-02-07 00:01:10|
|       8|  27944|          5| 3955|2022-02-07 00:01:20|
|       9|  37806|          1|  429|2022-02-07 00:01:30|
|      10|  25500|          8| 6864|2022-02-07 00:01:40|
|      11|   5005|          8| 3800|2022-02-07 00:01:50|
|      12|  42143|          5| 4285|2022-02-07 00:02:00|
|      13|  33600|          2| 1762|2022-02-07 00:02:10|
|      14|   2437|          6| 5526|2022-02-07 00:02:20|
|      15|  17743|          6| 5976|2022-02-07 00:02:30|
|      16|  41504|          3|  903|2022-02-07 00:02:40|
|      17|  34912|          8|  712|2022-02-07 00:02:50|
|      18|  25558|          9| 4023|2022-02-07 00:03:00|
|      19|   9037|          7| 6475|2022-02-07 00:03:10|
|      20|  26382|          1|   82|2022-02-07 00:03:20|
+--------+-------+-----------+-----+-------------------+
only showing top 20 rows

>>>
```

hdfs dfs -ls parquet_data
hdfs dfs -mkdir parquet_data
hdfs dfs -ls


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл Правка Вид Терминал Вкладки Справка
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~

```
[student898_2@bigdataanalytics-worker-3 ~]$ hdfs dfs -ls parquet_data
ls: `parquet_data': No such file or directory
[student898_2@bigdataanalytics-worker-3 ~]$ hdfs dfs -mkdir parquet_data
[student898_2@bigdataanalytics-worker-3 ~]$ hdfs dfs -ls
Found 5 items
drwx------   - student898_2 student898_2          0 2022-02-07 15:00 .Trash
drwxr-xr-x   - student898_2 student898_2          0 2022-01-30 10:56 .sparkStaging
drwxr-xr-x   - student898_2 student898_2          0 2022-01-29 21:38 for_stream
drwxr-xr-x   - student898_2 student898_2          0 2022-01-29 21:49 input_csv_for_stream
drwxr-xr-x   - student898_2 student898_2          0 2022-02-07 15:10 parquet_data
[student898_2@bigdataanalytics-worker-3 ~]$
```

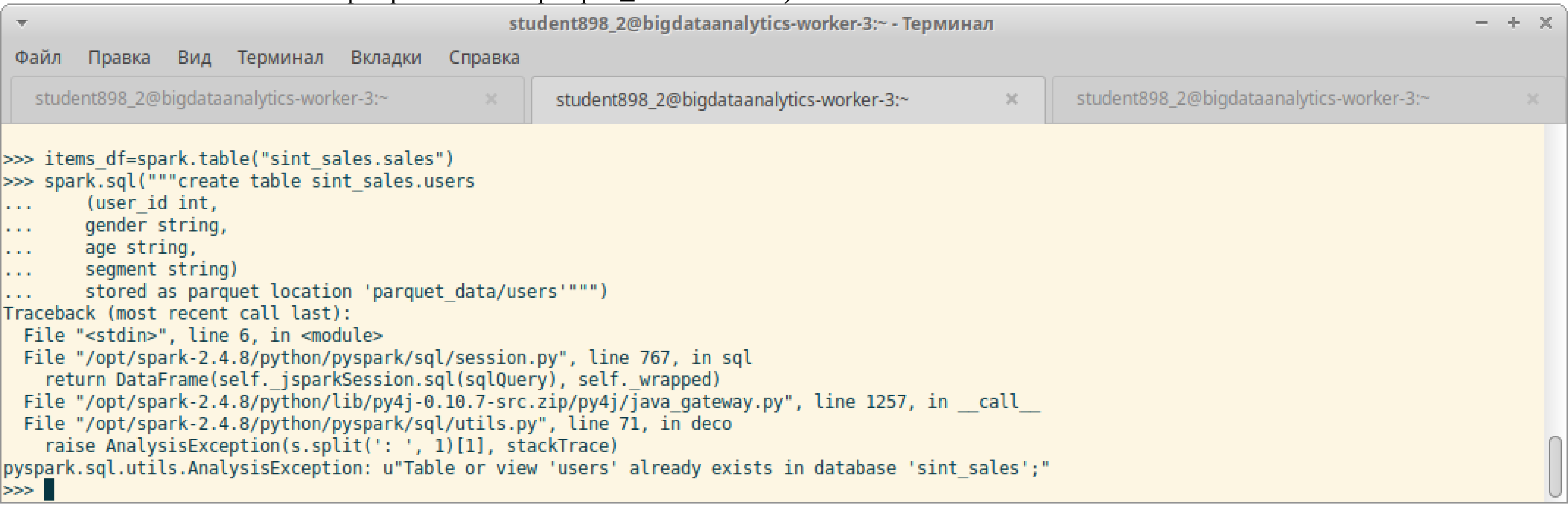
select * from sales limit 1;


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл Правка Вид Терминал Вкладки Справка
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~

```
0: jdbc:hive2://bigdataanalytics-worker-3.mcs> select * from sales limit 1;
INFO  : Compiling command(queryId=hive_20220207151321_3ddda11e-f540-468a-b168-9070b17ae1ea): select * from sales limit 1
INFO  : Semantic Analysis Completed (retrial = false)
INFO  : Returning Hive schema: Schema(fieldSchemas:[FieldSchema(name:sales.order_id, type:int, comment:null), FieldSchema(name:sales.user_id, type:int
, comment:null), FieldSchema(name:sales.items_count, type:int, comment:null), FieldSchema(name:sales.price, type:int, comment:null), FieldSchema(name:
sales.order_date, type:string, comment:null)], properties:null)
INFO  : Completed compiling command(queryId=hive_20220207151321_3ddda11e-f540-468a-b168-9070b17ae1ea); Time taken: 0.12 seconds
INFO  : Executing command(queryId=hive_20220207151321_3ddda11e-f540-468a-b168-9070b17ae1ea): select * from sales limit 1
INFO  : Completed executing command(queryId=hive_20220207151321_3ddda11e-f540-468a-b168-9070b17ae1ea); Time taken: 0.001 seconds
INFO  : OK
+-----------------+----------------+--------------------+--------------+----------------------+
| sales.order_id  | sales.user_id  | sales.items_count  | sales.price  |   sales.order_date   |
+-----------------+----------------+--------------------+--------------+----------------------+
| 1               | 48936          | 4                  | 260          | 2022-02-03 00:00:10  |
+-----------------+----------------+--------------------+--------------+----------------------+
1 row selected (0,329 seconds)
0: jdbc:hive2://bigdataanalytics-worker-3.mcs>
```

items_df=spark.table("sint_sales.sales")
spark.sql("""create table sint_sales.users

```
(user_id int,
gender string,
age string,
segment string)
stored as parquet location 'parquet_data/users'""")
```


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл
Правка
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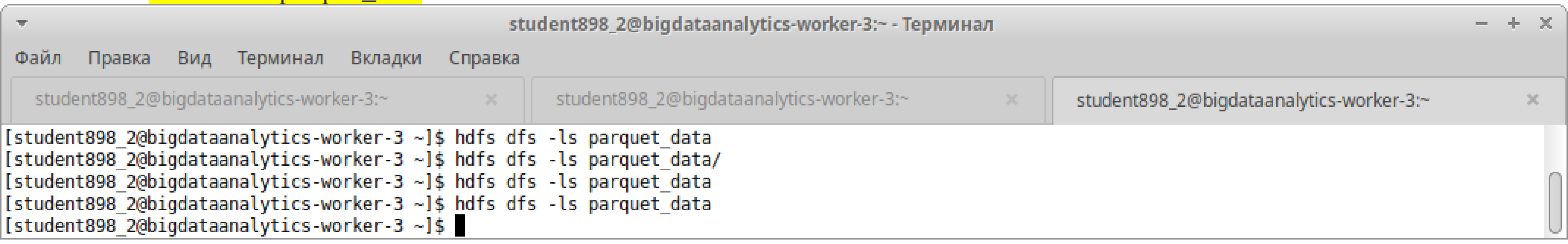
Терминал
Вкладки
Справка
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~

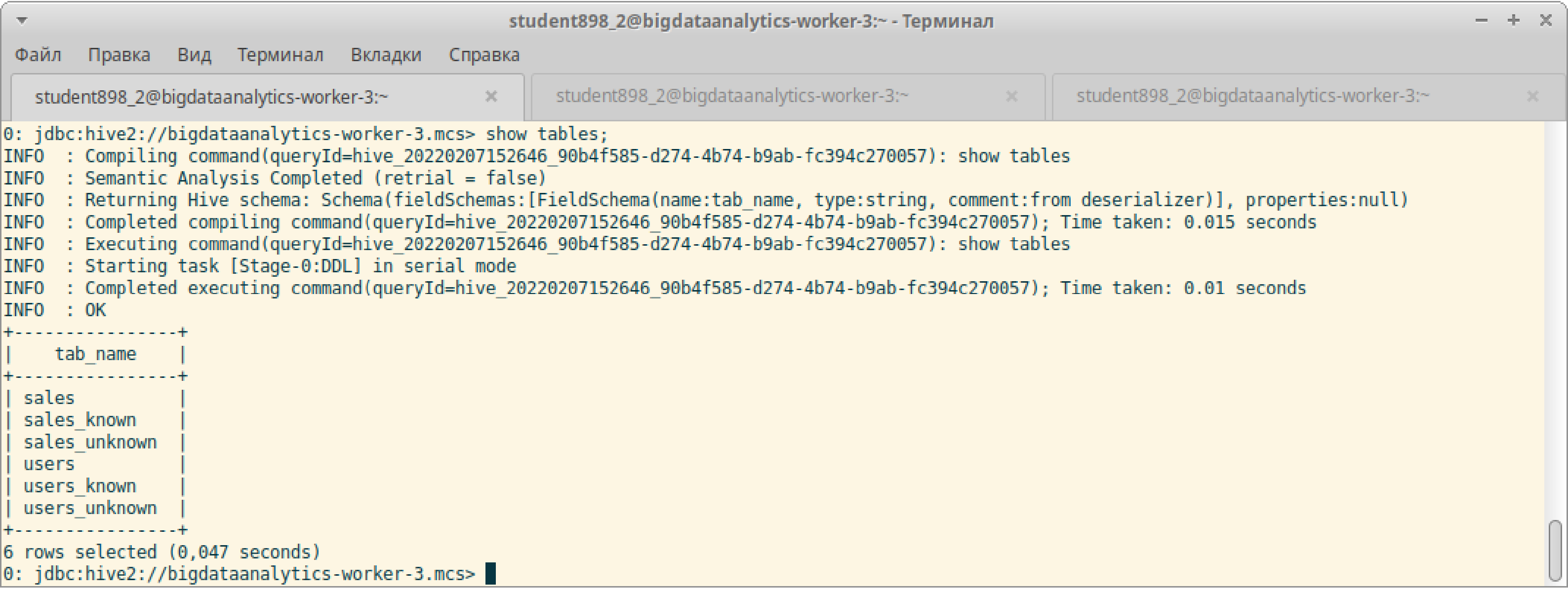
```
>>> items_df=spark.table("sint_sales.sales")
>>> spark.sql("""create table sint_sales.users
...     (user_id int,
...     gender string,
...     age string,
...     segment string)
...     stored as parquet location 'parquet_data/users'""")
Traceback (most recent call last):
  File "<stdin>", line 6, in <module>
  File "/opt/spark-2.4.8/python/pyspark/sql/session.py", line 767, in sql
    return DataFrame(self._jsparkSession.sql(sqlQuery), self._wrapped)
  File "/opt/spark-2.4.8/python/lib/py4j-0.10.7-src.zip/py4j/java_gateway.py", line 1257, in __call__
  File "/opt/spark-2.4.8/python/pyspark/sql/utils.py", line 71, in deco
    raise AnalysisException(s.split(': ', 1)[1], stackTrace)
pyspark.sql.utils.AnalysisException: u"Table or view 'users' already exists in database 'sint_sales';"
>>> 
```

hdfs dfs -ls parquet_data


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл
Правка
Вид
Терминал
Вкладки
Справка
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~

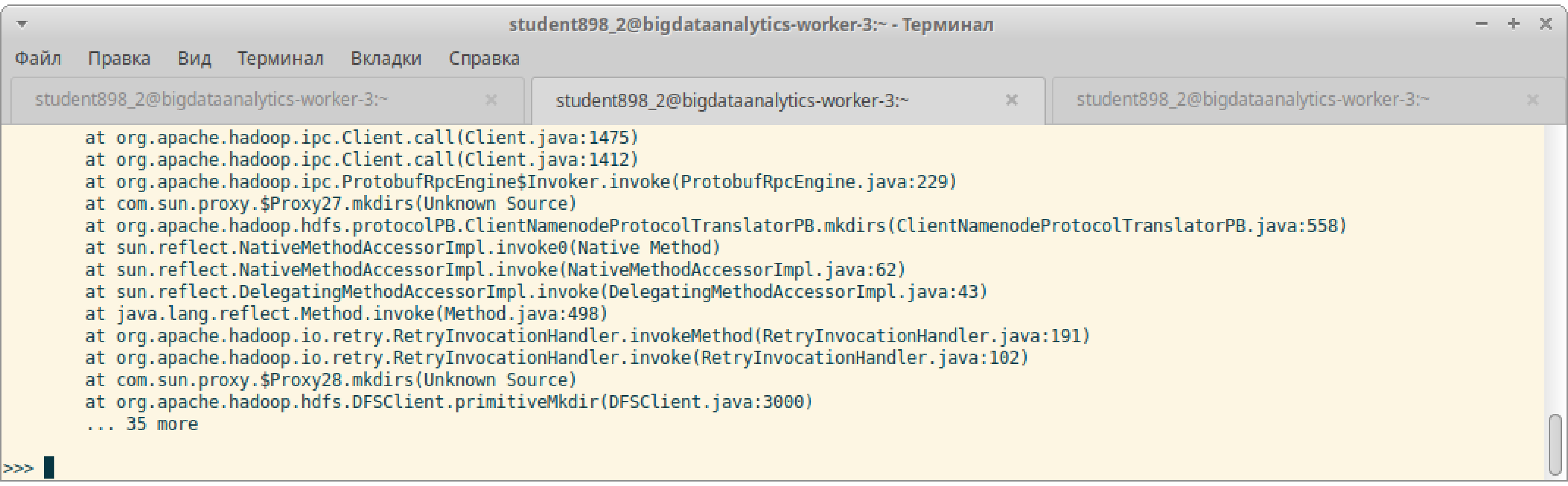
```
[student898_2@bigdataanalytics-worker-3 ~]$ hdfs dfs -ls parquet_data
[student898_2@bigdataanalytics-worker-3 ~]$ hdfs dfs -ls parquet_data/
[student898_2@bigdataanalytics-worker-3 ~]$ hdfs dfs -ls parquet_data
[student898_2@bigdataanalytics-worker-3 ~]$ hdfs dfs -ls parquet_data
[student898_2@bigdataanalytics-worker-3 ~]$ 
```

show tables;


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл
Правка
Вид
Терминал
Вкладки
Справка
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~

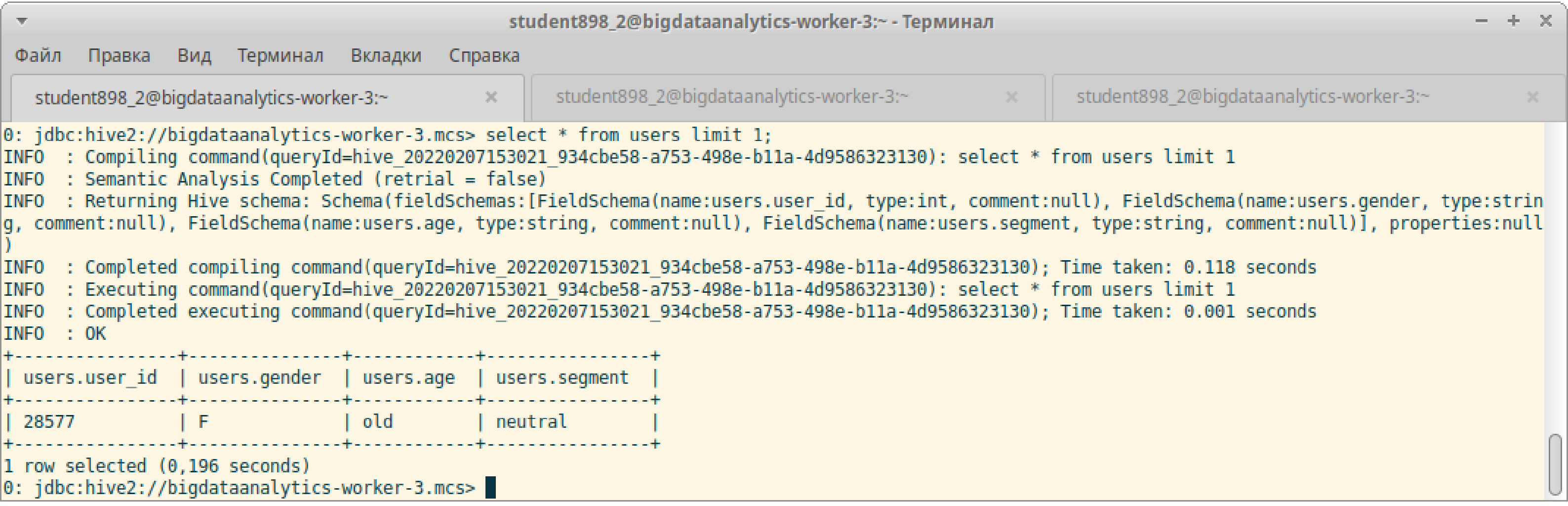
```
0: jdbc:hive2://bigdataanalytics-worker-3.mcs> show tables;
INFO  : Compiling command(queryId=hive_20220207152646_90b4f585-d274-4b74-b9ab-fc394c270057): show tables
INFO  : Semantic Analysis Completed (retrial = false)
INFO  : Returning Hive schema: Schema(fieldSchemas:[FieldSchema(name:tab_name, type:string, comment:from deserializer)], properties:null)
INFO  : Completed compiling command(queryId=hive_20220207152646_90b4f585-d274-4b74-b9ab-fc394c270057); Time taken: 0.015 seconds
INFO  : Executing command(queryId=hive_20220207152646_90b4f585-d274-4b74-b9ab-fc394c270057): show tables
INFO  : Starting task [Stage-0:DDL] in serial mode
INFO  : Completed executing command(queryId=hive_20220207152646_90b4f585-d274-4b74-b9ab-fc394c270057); Time taken: 0.01 seconds
INFO  : OK
+----------------+
|    tab_name    |
+----------------+
| sales          |
| sales_known    |
| sales_unknown  |
| users          |
| users_known    |
| users_unknown  |
+----------------+
6 rows selected (0,047 seconds)
0: jdbc:hive2://bigdataanalytics-worker-3.mcs> 
```

```
spark.sql("""insert into sint_sales.users
        select user_id, case when pmod( user_id, 2 )=0 then 'M' else 'F' end,
        case when pmod(user_id, 3 )=0 then 'young' when pmod(user_id, 3 )=1 then 'midage' else 'old' end ,
        case when s>23 then 'happy' when s>15 then 'neutral' else 'shy' end
        from (
        select sum(items_count) s, user_id from sint_sales.sales group by user_id ) t""")
```


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл Правка Вид Терминал Вкладки Справка
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~

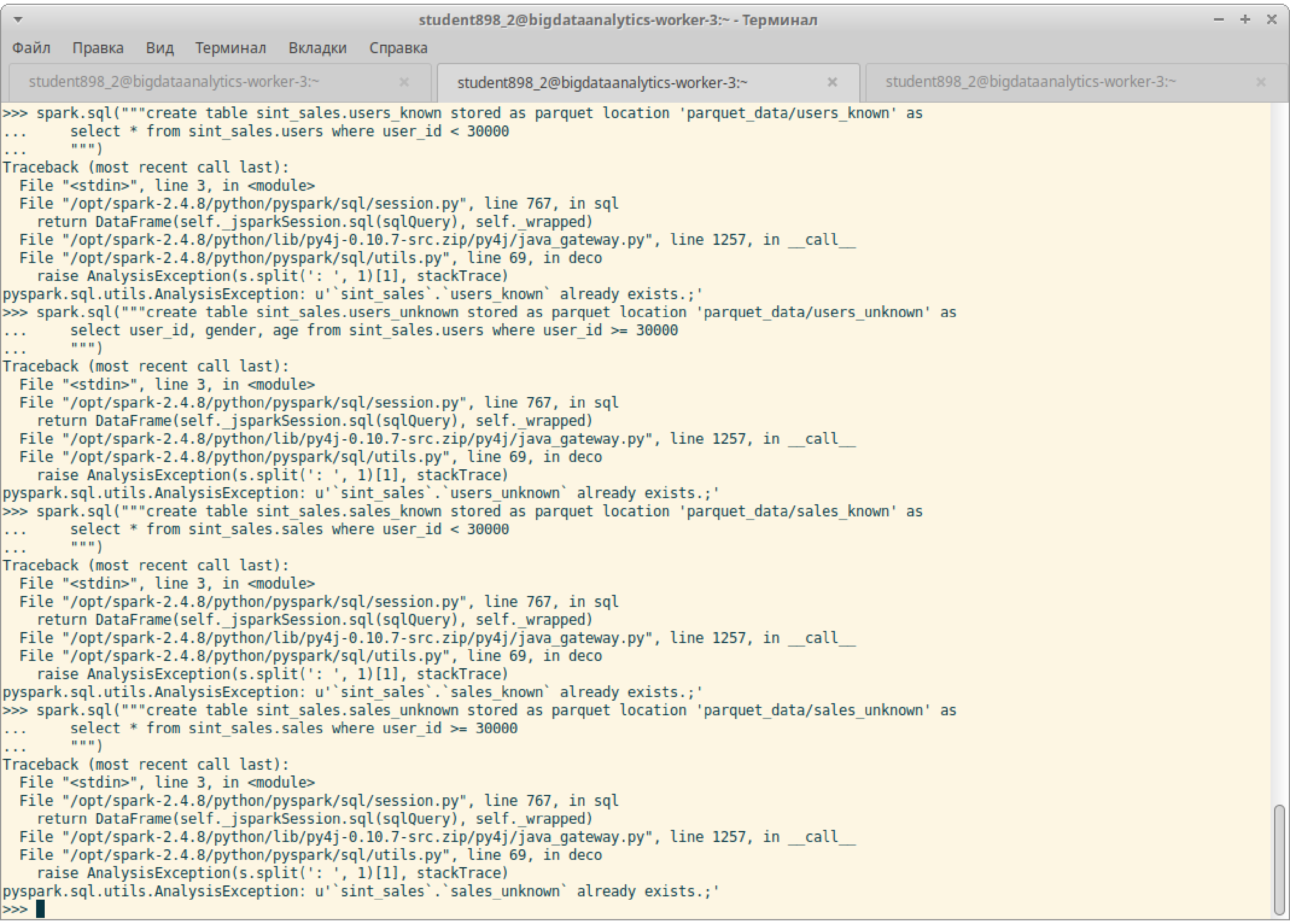
```
        at org.apache.hadoop.ipc.Client.call(Client.java:1475)
        at org.apache.hadoop.ipc.Client.call(Client.java:1412)
        at org.apache.hadoop.ipc.ProtobufRpcEngine$Invoker.invoke(ProtobufRpcEngine.java:229)
        at com.sun.proxy.$Proxy27.mkdirs(Unknown Source)
        at org.apache.hadoop.hdfs.protocolPB.ClientNamenodeProtocolTranslatorPB.mkdirs(ClientNamenodeProtocolTranslatorPB.java:558)
        at sun.reflect.NativeMethodAccessorImpl.invoke0(Native Method)
        at sun.reflect.NativeMethodAccessorImpl.invoke(NativeMethodAccessorImpl.java:62)
        at sun.reflect.DelegatingMethodAccessorImpl.invoke(DelegatingMethodAccessorImpl.java:43)
        at java.lang.reflect.Method.invoke(Method.java:498)
        at org.apache.hadoop.io.retry.RetryInvocationHandler.invokeMethod(RetryInvocationHandler.java:191)
        at org.apache.hadoop.io.retry.RetryInvocationHandler.invoke(RetryInvocationHandler.java:102)
        at com.sun.proxy.$Proxy28.mkdirs(Unknown Source)
        at org.apache.hadoop.hdfs.DFSClient.primitiveMkdir(DFSClient.java:3000)
        ... 35 more

>>> 
```

select * from users limit 1;


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл Правка Вид Терминал Вкладки Справка
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~

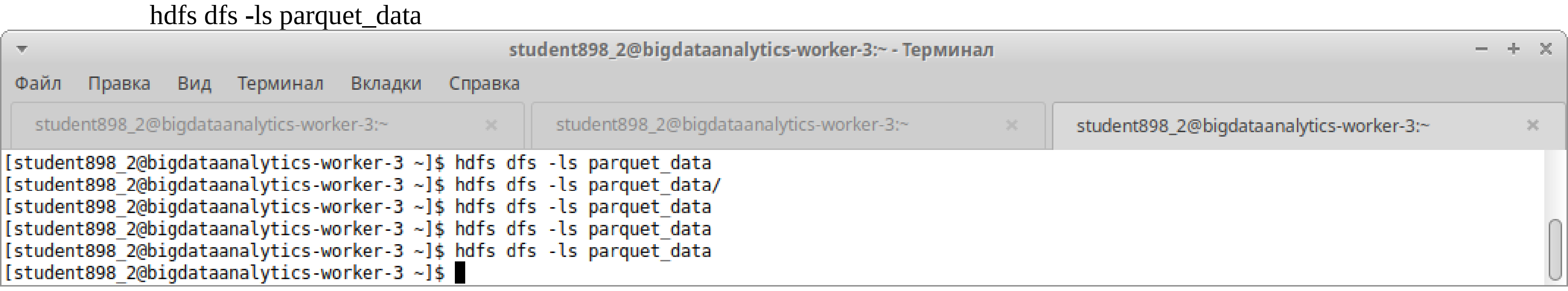
```
0: jdbc:hive2://bigdataanalytics-worker-3.mcs> select * from users limit 1;
INFO  : Compiling command(queryId=hive_20220207153021_934cbe58-a753-498e-b11a-4d9586323130): select * from users limit 1
INFO  : Semantic Analysis Completed (retrial = false)
INFO  : Returning Hive schema: Schema(fieldSchemas:[FieldSchema(name:users.user_id, type:int, comment:null), FieldSchema(name:users.gender, type:strin
g, comment:null), FieldSchema(name:users.age, type:string, comment:null), FieldSchema(name:users.segment, type:string, comment:null)], properties:null
)
INFO  : Completed compiling command(queryId=hive_20220207153021_934cbe58-a753-498e-b11a-4d9586323130); Time taken: 0.118 seconds
INFO  : Executing command(queryId=hive_20220207153021_934cbe58-a753-498e-b11a-4d9586323130): select * from users limit 1
INFO  : Completed executing command(queryId=hive_20220207153021_934cbe58-a753-498e-b11a-4d9586323130); Time taken: 0.001 seconds
INFO  : OK
+----------------+---------------+------------+----------------+
| users.user_id  | users.gender  | users.age  | users.segment  |
+----------------+---------------+------------+----------------+
| 28577          | F             | old        | neutral        |
+----------------+---------------+------------+----------------+
1 row selected (0,196 seconds)
0: jdbc:hive2://bigdataanalytics-worker-3.mcs> 
```

```
spark.sql("""create table sint_sales.users_known stored as parquet location 'parquet_data/users_known' as
        select * from sint_sales.users where user_id < 30000
        """)
spark.sql("""create table sint_sales.users_unknown stored as parquet location 'parquet_data/users_unknown' as
        select user_id, gender, age from sint_sales.users where user_id >= 30000
        """)
spark.sql("""create table sint_sales.sales_known stored as parquet location 'parquet_data/sales_known' as
        select * from sint_sales.sales where user_id < 30000
        """)
spark.sql("""create table sint_sales.sales_unknown stored as parquet location 'parquet_data/sales_unknown' as
        select * from sint_sales.sales where user_id >= 30000
        """)
```


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл
Правка
Вид
Терминал
Вкладки
Справка
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~

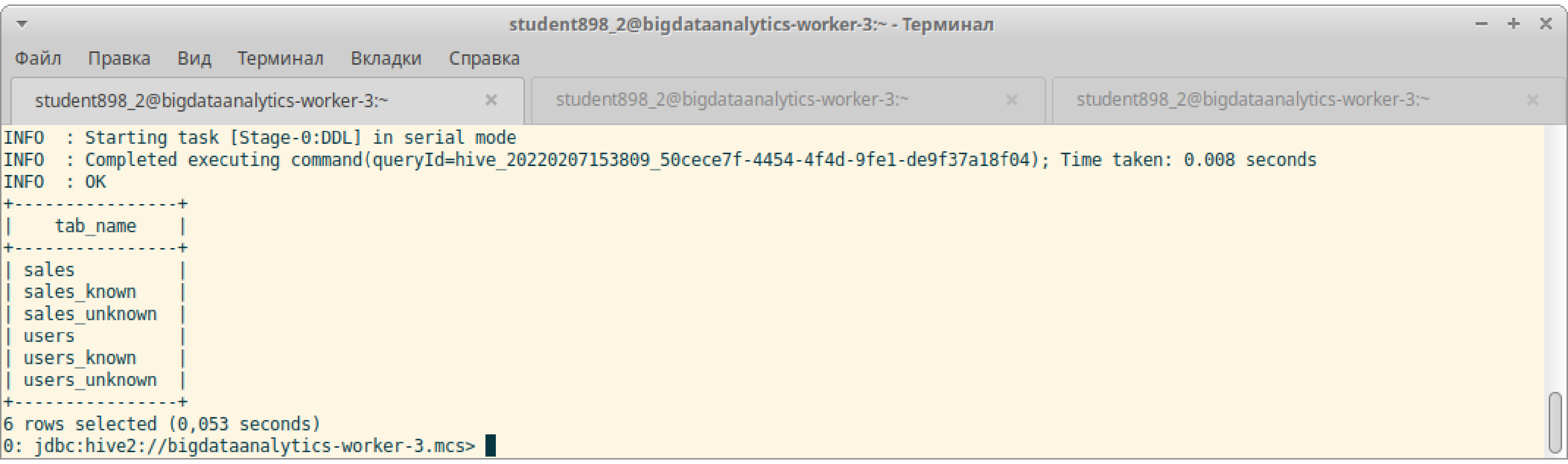
```
>>> spark.sql("""create table sint_sales.users_known stored as parquet location 'parquet_data/users_known' as
...     select * from sint_sales.users where user_id < 30000
...     """)
Traceback (most recent call last):
  File "<stdin>", line 3, in <module>
  File "/opt/spark-2.4.8/python/pyspark/sql/session.py", line 767, in sql
    return DataFrame(self._jsparkSession.sql(sqlQuery), self._wrapped)
  File "/opt/spark-2.4.8/python/lib/py4j-0.10.7-src.zip/py4j/java_gateway.py", line 1257, in __call__
  File "/opt/spark-2.4.8/python/pyspark/sql/utils.py", line 69, in deco
    raise AnalysisException(s.split(': ', 1)[1], stackTrace)
pyspark.sql.utils.AnalysisException: u'`sint_sales`.`users_known` already exists.;'
>>> spark.sql("""create table sint_sales.users_unknown stored as parquet location 'parquet_data/users_unknown' as
...     select user_id, gender, age from sint_sales.users where user_id >= 30000
...     """)
Traceback (most recent call last):
  File "<stdin>", line 3, in <module>
  File "/opt/spark-2.4.8/python/pyspark/sql/session.py", line 767, in sql
    return DataFrame(self._jsparkSession.sql(sqlQuery), self._wrapped)
  File "/opt/spark-2.4.8/python/lib/py4j-0.10.7-src.zip/py4j/java_gateway.py", line 1257, in __call__
  File "/opt/spark-2.4.8/python/pyspark/sql/utils.py", line 69, in deco
    raise AnalysisException(s.split(': ', 1)[1], stackTrace)
pyspark.sql.utils.AnalysisException: u'`sint_sales`.`users_unknown` already exists.;'
>>> spark.sql("""create table sint_sales.sales_known stored as parquet location 'parquet_data/sales_known' as
...     select * from sint_sales.sales where user_id < 30000
...     """)
Traceback (most recent call last):
  File "<stdin>", line 3, in <module>
  File "/opt/spark-2.4.8/python/pyspark/sql/session.py", line 767, in sql
    return DataFrame(self._jsparkSession.sql(sqlQuery), self._wrapped)
  File "/opt/spark-2.4.8/python/lib/py4j-0.10.7-src.zip/py4j/java_gateway.py", line 1257, in __call__
  File "/opt/spark-2.4.8/python/pyspark/sql/utils.py", line 69, in deco
    raise AnalysisException(s.split(': ', 1)[1], stackTrace)
pyspark.sql.utils.AnalysisException: u'`sint_sales`.`sales_known` already exists.;'
>>> spark.sql("""create table sint_sales.sales_unknown stored as parquet location 'parquet_data/sales_unknown' as
...     select * from sint_sales.sales where user_id >= 30000
...     """)
Traceback (most recent call last):
  File "<stdin>", line 3, in <module>
  File "/opt/spark-2.4.8/python/pyspark/sql/session.py", line 767, in sql
    return DataFrame(self._jsparkSession.sql(sqlQuery), self._wrapped)
  File "/opt/spark-2.4.8/python/lib/py4j-0.10.7-src.zip/py4j/java_gateway.py", line 1257, in __call__
  File "/opt/spark-2.4.8/python/pyspark/sql/utils.py", line 69, in deco
    raise AnalysisException(s.split(': ', 1)[1], stackTrace)
pyspark.sql.utils.AnalysisException: u'`sint_sales`.`sales_unknown` already exists.;'
>>> 
```

hdfs dfs -ls parquet_data


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл
Правка
Вид
Терминал
Вкладки
Справка
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~

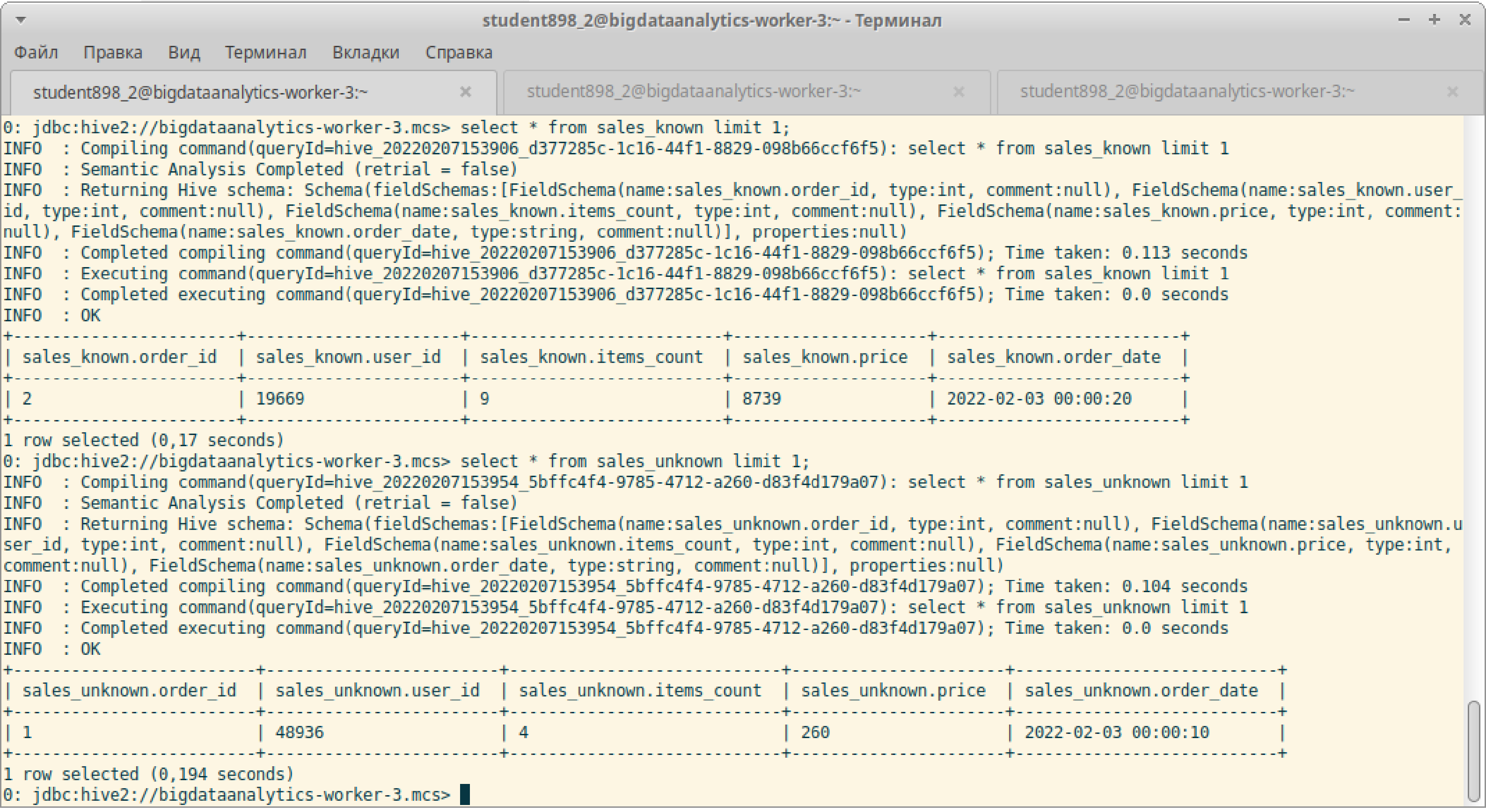
```
[student898_2@bigdataanalytics-worker-3 ~]$ hdfs dfs -ls parquet_data
[student898_2@bigdataanalytics-worker-3 ~]$ hdfs dfs -ls parquet_data/
[student898_2@bigdataanalytics-worker-3 ~]$ hdfs dfs -ls parquet_data
[student898_2@bigdataanalytics-worker-3 ~]$ hdfs dfs -ls parquet_data
[student898_2@bigdataanalytics-worker-3 ~]$ hdfs dfs -ls parquet_data
[student898_2@bigdataanalytics-worker-3 ~]$ 
```

show tables;


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл Правка Вид Терминал Вкладки Справка
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~

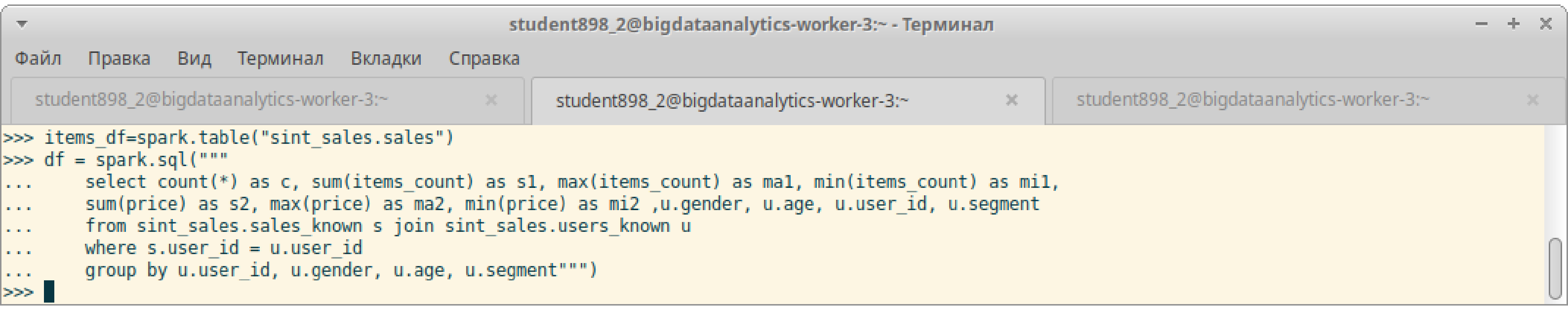
```
INFO  : Starting task [Stage-0:DDL] in serial mode
INFO  : Completed executing command(queryId=hive_20220207153809_50cece7f-4454-4f4d-9fe1-de9f37a18f04); Time taken: 0.008 seconds
INFO  : OK
+----------------+
|    tab_name    |
+----------------+
| sales          |
| sales_known    |
| sales_unknown  |
| users          |
| users_known    |
| users_unknown  |
+----------------+
6 rows selected (0,053 seconds)
0: jdbc:hive2://bigdataanalytics-worker-3.mcs>
```

```
select * from sales_known limit 1;
select * from sales_unknown limit 1;
```


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл Правка Вид Терминал Вкладки Справка
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~

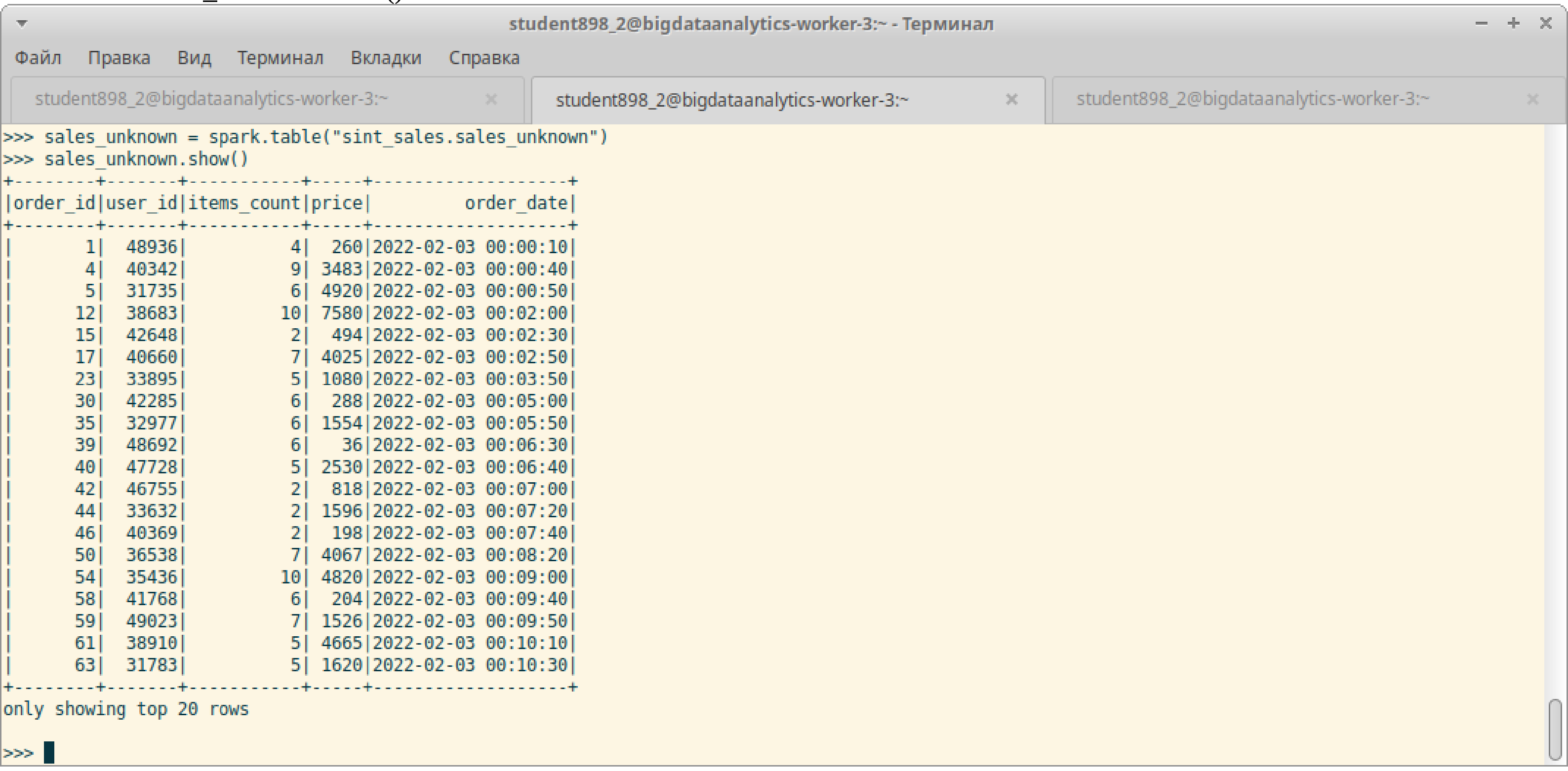
```
0: jdbc:hive2://bigdataanalytics-worker-3.mcs> select * from sales_known limit 1;
INFO  : Compiling command(queryId=hive_20220207153906_d377285c-1c16-44f1-8829-098b66ccf6f5): select * from sales_known limit 1
INFO  : Semantic Analysis Completed (retrial = false)
INFO  : Returning Hive schema: Schema(fieldSchemas:[FieldSchema(name:sales_known.order_id, type:int, comment:null), FieldSchema(name:sales_known.user_
id, type:int, comment:null), FieldSchema(name:sales_known.items_count, type:int, comment:null), FieldSchema(name:sales_known.price, type:int, comment:
null), FieldSchema(name:sales_known.order_date, type:string, comment:null)], properties:null)
INFO  : Completed compiling command(queryId=hive_20220207153906_d377285c-1c16-44f1-8829-098b66ccf6f5); Time taken: 0.113 seconds
INFO  : Executing command(queryId=hive_20220207153906_d377285c-1c16-44f1-8829-098b66ccf6f5): select * from sales_known limit 1
INFO  : Completed executing command(queryId=hive_20220207153906_d377285c-1c16-44f1-8829-098b66ccf6f5); Time taken: 0.0 seconds
INFO  : OK
+-----------------------+----------------------+--------------------------+--------------------+------------------------+
| sales_known.order_id  | sales_known.user_id  | sales_known.items_count  | sales_known.price  | sales_known.order_date  |
+-----------------------+----------------------+--------------------------+--------------------+------------------------+
| 2                     | 19669                | 9                        | 8739               | 2022-02-03 00:00:20    |
+-----------------------+----------------------+--------------------------+--------------------+------------------------+
1 row selected (0,17 seconds)
0: jdbc:hive2://bigdataanalytics-worker-3.mcs> select * from sales_unknown limit 1;
INFO  : Compiling command(queryId=hive_20220207153954_5bffc4f4-9785-4712-a260-d83f4d179a07): select * from sales_unknown limit 1
INFO  : Semantic Analysis Completed (retrial = false)
INFO  : Returning Hive schema: Schema(fieldSchemas:[FieldSchema(name:sales_unknown.order_id, type:int, comment:null), FieldSchema(name:sales_unknown.u
ser_id, type:int, comment:null), FieldSchema(name:sales_unknown.items_count, type:int, comment:null), FieldSchema(name:sales_unknown.price, type:int,
comment:null), FieldSchema(name:sales_unknown.order_date, type:string, comment:null)], properties:null)
INFO  : Completed compiling command(queryId=hive_20220207153954_5bffc4f4-9785-4712-a260-d83f4d179a07); Time taken: 0.104 seconds
INFO  : Executing command(queryId=hive_20220207153954_5bffc4f4-9785-4712-a260-d83f4d179a07): select * from sales_unknown limit 1
INFO  : Completed executing command(queryId=hive_20220207153954_5bffc4f4-9785-4712-a260-d83f4d179a07); Time taken: 0.0 seconds
INFO  : OK
+-------------------------+------------------------+----------------------------+----------------------+--------------------------+
| sales_unknown.order_id  | sales_unknown.user_id  | sales_unknown.items_count  | sales_unknown.price  | sales_unknown.order_date  |
+-------------------------+------------------------+----------------------------+----------------------+--------------------------+
| 1                       | 48936                  | 4                          | 260                  | 2022-02-03 00:00:10      |
+-------------------------+------------------------+----------------------------+----------------------+--------------------------+
1 row selected (0,194 seconds)
0: jdbc:hive2://bigdataanalytics-worker-3.mcs>
```

```
items_df=spark.table("sint_sales.sales")
df = spark.sql("""
        select count(*) as c, sum(items_count) as s1, max(items_count) as ma1, min(items_count) as mi1,
        sum(price) as s2, max(price) as ma2, min(price) as mi2 ,u.gender, u.age, u.user_id, u.segment
        from sint_sales.sales_known s join sint_sales.users_known u
        where s.user_id = u.user_id
        group by u.user_id, u.gender, u.age, u.segment""")
```


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл
Правка
Вид
Терминал
Вкладки
Справка
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~

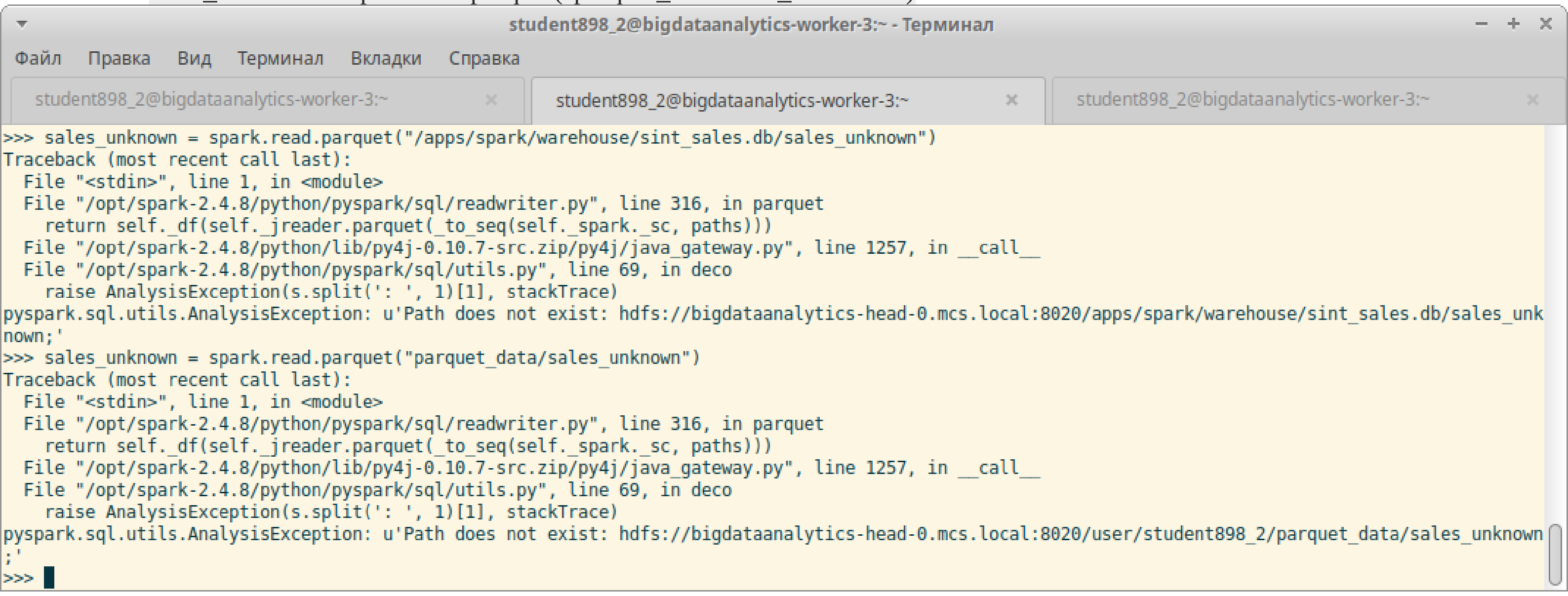
```
>>> items_df=spark.table("sint_sales.sales")
>>> df = spark.sql("""
...     select count(*) as c, sum(items_count) as s1, max(items_count) as ma1, min(items_count) as mi1,
...     sum(price) as s2, max(price) as ma2, min(price) as mi2 ,u.gender, u.age, u.user_id, u.segment
...     from sint_sales.sales_known s join sint_sales.users_known u
...     where s.user_id = u.user_id
...     group by u.user_id, u.gender, u.age, u.segment""")
>>> 
```

sales_unknown = spark.table("sint_sales.sales_unknown")
sales_unknown.show()


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл
Правка
Вид
Терминал
Вкладки
Справка
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~

```
>>> sales_unknown = spark.table("sint_sales.sales_unknown")
>>> sales_unknown.show()
+--------+-------+-----------+-----+-------------------+
|order_id|user_id|items_count|price|         order_date|
+--------+-------+-----------+-----+-------------------+
|       1|  48936|          4|  260|2022-02-03 00:00:10|
|       4|  40342|          9| 3483|2022-02-03 00:00:40|
|       5|  31735|          6| 4920|2022-02-03 00:00:50|
|      12|  38683|         10| 7580|2022-02-03 00:02:00|
|      15|  42648|          2|  494|2022-02-03 00:02:30|
|      17|  40660|          7| 4025|2022-02-03 00:02:50|
|      23|  33895|          5| 1080|2022-02-03 00:03:50|
|      30|  42285|          6|  288|2022-02-03 00:05:00|
|      35|  32977|          6| 1554|2022-02-03 00:05:50|
|      39|  48692|          6|   36|2022-02-03 00:06:30|
|      40|  47728|          5| 2530|2022-02-03 00:06:40|
|      42|  46755|          2|  818|2022-02-03 00:07:00|
|      44|  33632|          2| 1596|2022-02-03 00:07:20|
|      46|  40369|          2|  198|2022-02-03 00:07:40|
|      50|  36538|          7| 4067|2022-02-03 00:08:20|
|      54|  35436|         10| 4820|2022-02-03 00:09:00|
|      58|  41768|          6|  204|2022-02-03 00:09:40|
|      59|  49023|          7| 1526|2022-02-03 00:09:50|
|      61|  38910|          5| 4665|2022-02-03 00:10:10|
|      63|  31783|          5| 1620|2022-02-03 00:10:30|
+--------+-------+-----------+-----+-------------------+
only showing top 20 rows

>>> 
```

sales_unknown = spark.read.parquet("/apps/spark/warehouse/sint_sales.db/sales_unknown")
sales_unknown = spark.read.parquet("parquet_data/sales_unknown")


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл
Правка
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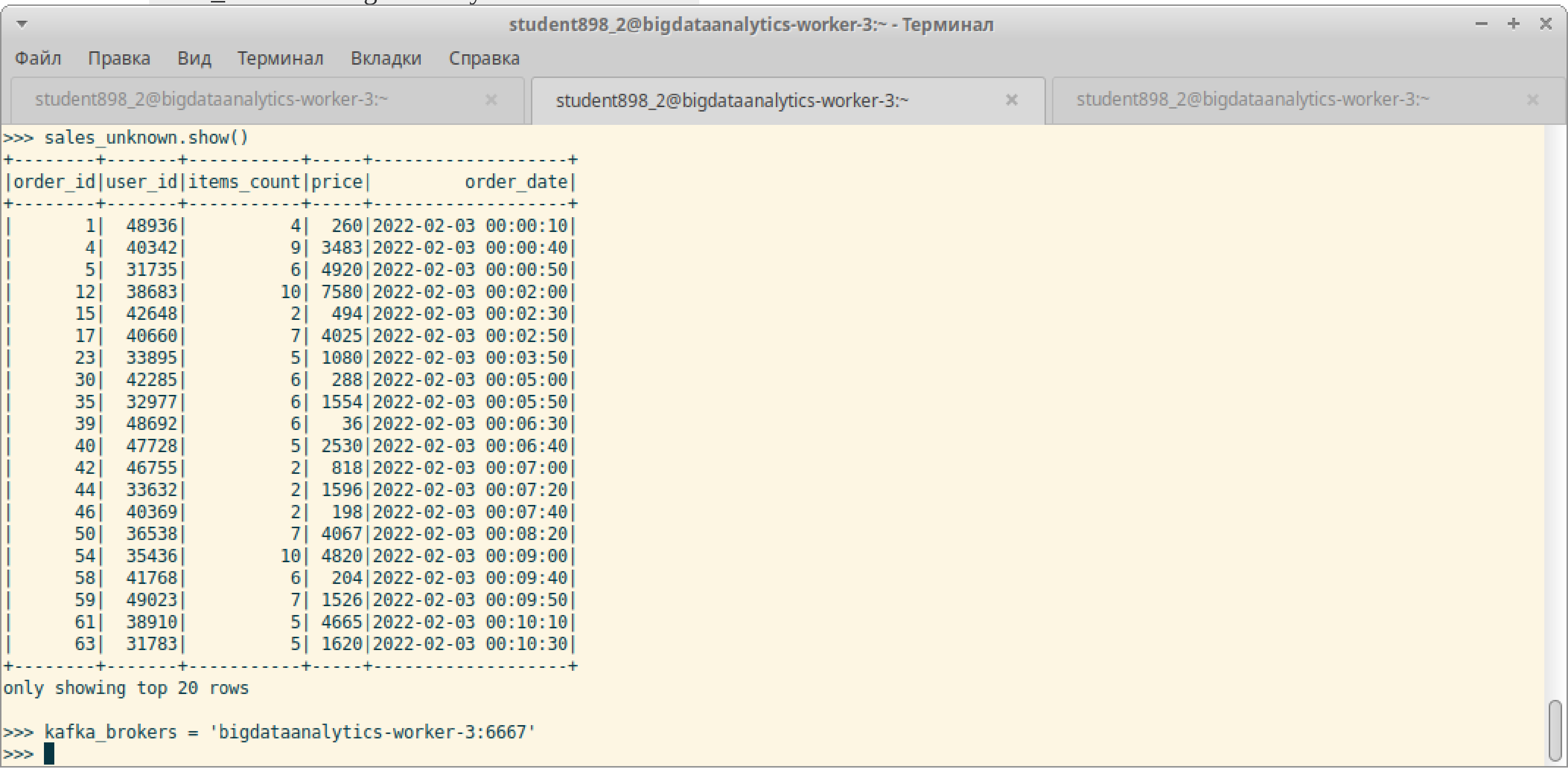
Терминал
Вкладки
Справка
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~

```
>>> sales_unknown = spark.read.parquet("/apps/spark/warehouse/sint_sales.db/sales_unknown")
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
  File "/opt/spark-2.4.8/python/pyspark/sql/readwriter.py", line 316, in parquet
    return self._df(self._jreader.parquet(_to_seq(self._spark._sc, paths)))
  File "/opt/spark-2.4.8/python/lib/py4j-0.10.7-src.zip/py4j/java_gateway.py", line 1257, in __call__
  File "/opt/spark-2.4.8/python/pyspark/sql/utils.py", line 69, in deco
    raise AnalysisException(s.split(': ', 1)[1], stackTrace)
pyspark.sql.utils.AnalysisException: u'Path does not exist: hdfs://bigdataanalytics-head-0.mcs.local:8020/apps/spark/warehouse/sint_sales.db/sales_unk
nown;'
>>> sales_unknown = spark.read.parquet("parquet_data/sales_unknown")
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
  File "/opt/spark-2.4.8/python/pyspark/sql/readwriter.py", line 316, in parquet
    return self._df(self._jreader.parquet(_to_seq(self._spark._sc, paths)))
  File "/opt/spark-2.4.8/python/lib/py4j-0.10.7-src.zip/py4j/java_gateway.py", line 1257, in __call__
  File "/opt/spark-2.4.8/python/pyspark/sql/utils.py", line 69, in deco
    raise AnalysisException(s.split(': ', 1)[1], stackTrace)
pyspark.sql.utils.AnalysisException: u'Path does not exist: hdfs://bigdataanalytics-head-0.mcs.local:8020/user/student898_2/parquet_data/sales_unknown
;'
>>> 
```

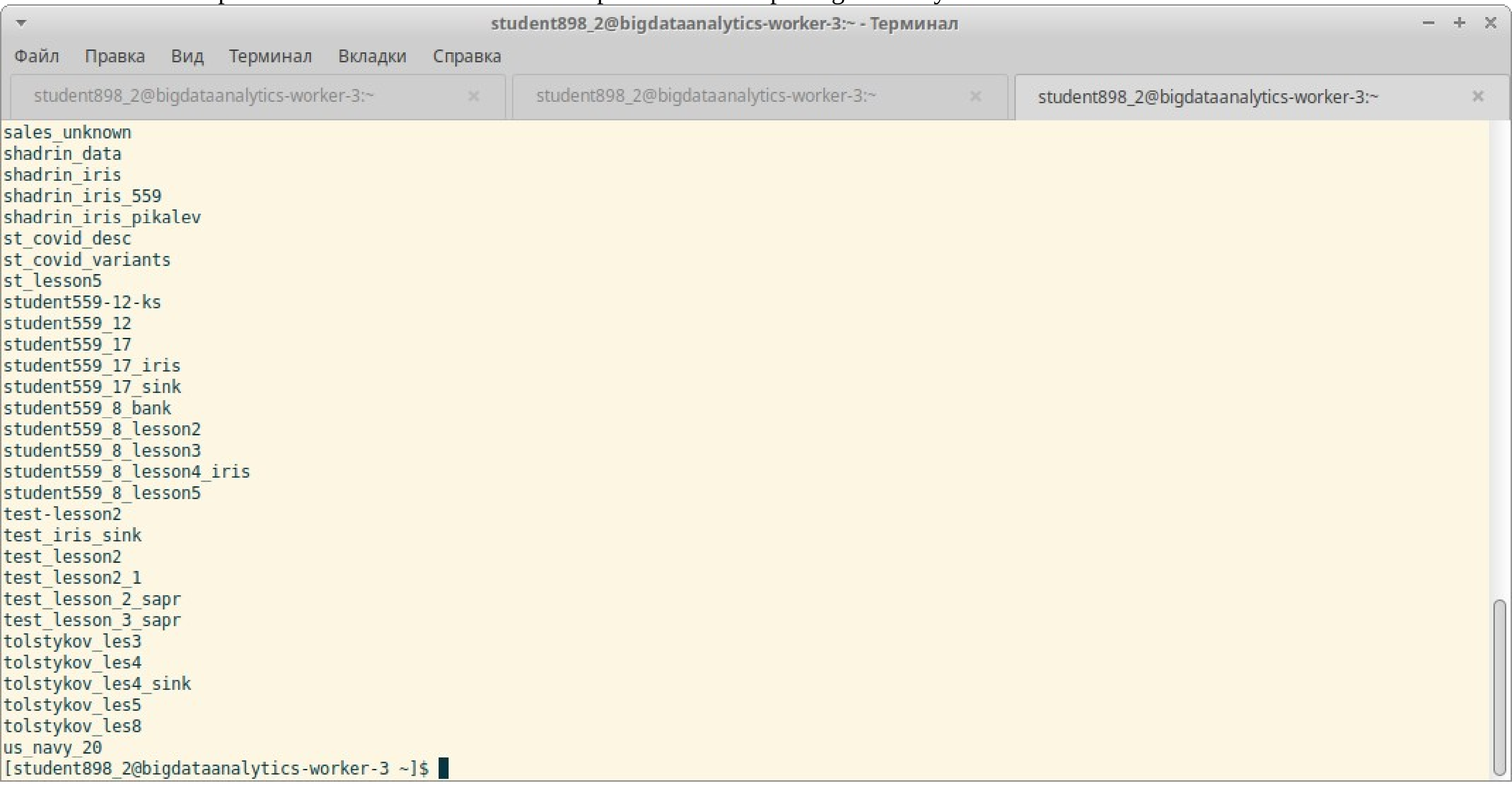
sales_unknown.show()

```
kafka_brokers = 'bigdataanalytics-worker-3:6667'
```


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл
Правка
Вид
Терминал
Вкладки
Справка
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~

```
>>> sales_unknown.show()
+--------+-------+-----------+-----+-------------------+
|order_id|user_id|items_count|price|         order_date|
+--------+-------+-----------+-----+-------------------+
|       1|  48936|          4|  260|2022-02-03 00:00:10|
|       4|  40342|          9| 3483|2022-02-03 00:00:40|
|       5|  31735|          6| 4920|2022-02-03 00:00:50|
|      12|  38683|         10| 7580|2022-02-03 00:02:00|
|      15|  42648|          2|  494|2022-02-03 00:02:30|
|      17|  40660|          7| 4025|2022-02-03 00:02:50|
|      23|  33895|          5| 1080|2022-02-03 00:03:50|
|      30|  42285|          6|  288|2022-02-03 00:05:00|
|      35|  32977|          6| 1554|2022-02-03 00:05:50|
|      39|  48692|          6|   36|2022-02-03 00:06:30|
|      40|  47728|          5| 2530|2022-02-03 00:06:40|
|      42|  46755|          2|  818|2022-02-03 00:07:00|
|      44|  33632|          2| 1596|2022-02-03 00:07:20|
|      46|  40369|          2|  198|2022-02-03 00:07:40|
|      50|  36538|          7| 4067|2022-02-03 00:08:20|
|      54|  35436|         10| 4820|2022-02-03 00:09:00|
|      58|  41768|          6|  204|2022-02-03 00:09:40|
|      59|  49023|          7| 1526|2022-02-03 00:09:50|
|      61|  38910|          5| 4665|2022-02-03 00:10:10|
|      63|  31783|          5| 1620|2022-02-03 00:10:30|
+--------+-------+-----------+-----+-------------------+
only showing top 20 rows

>>> kafka_brokers = 'bigdataanalytics-worker-3:6667'
>>> 
```

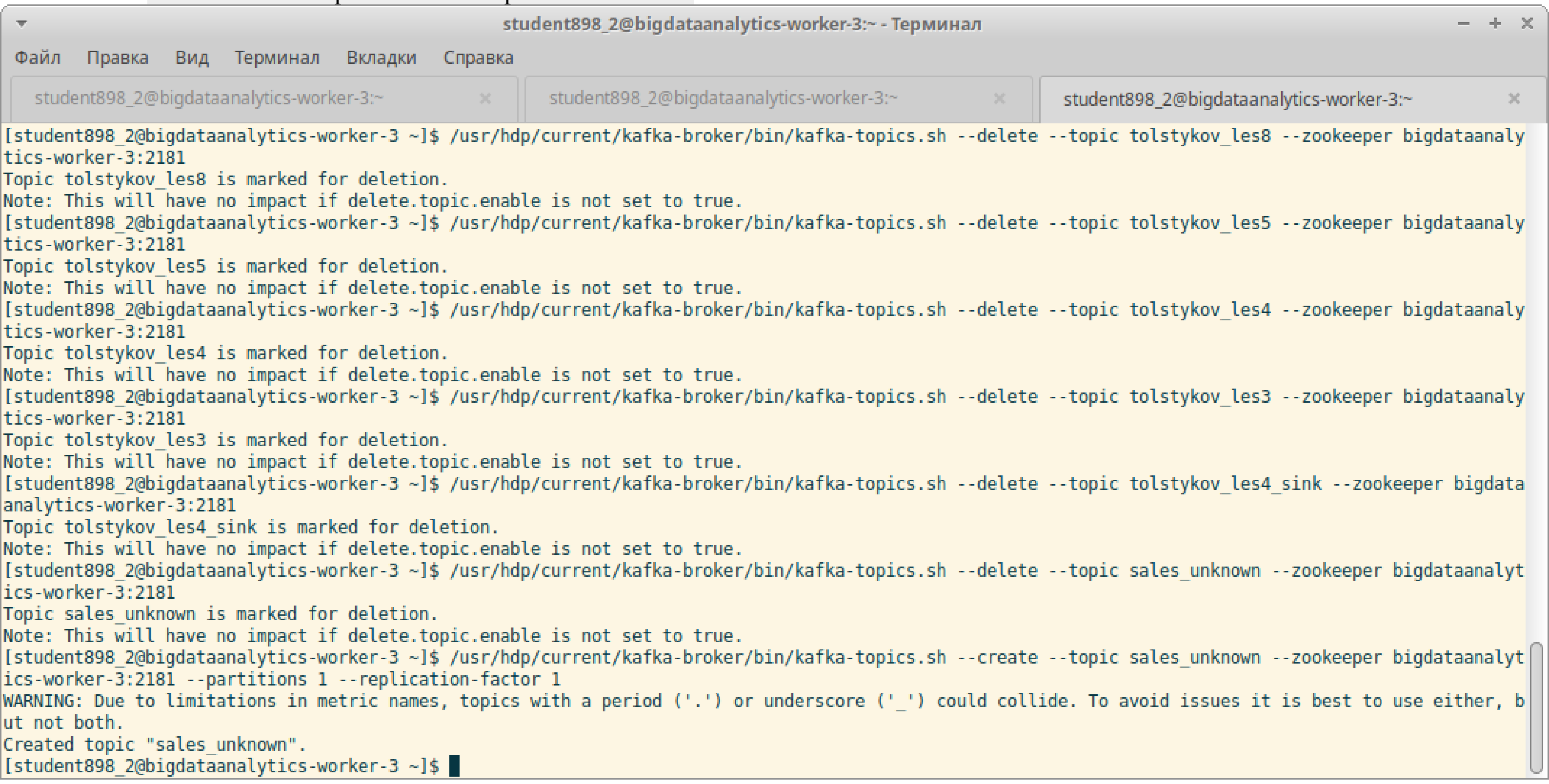
```
/usr/hdp/current/kafka-broker/bin/kafka-topics.sh --zookeeper bigdataanalytics-worker-3:2181 —list
```


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл
Правка
Вид
Терминал
Вкладки
Справка
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~

```
sales_unknown
shadrin_data
shadrin_iris
shadrin_iris_559
shadrin_iris_pikalev
st_covid_desc
st_covid_variants
st_lesson5
student559-12-ks
student559_12
student559_17
student559_17_iris
student559_17_sink
student559_8_bank
student559_8_lesson2
student559_8_lesson3
student559_8_lesson4_iris
student559_8_lesson5
test-lesson2
test_iris_sink
test_lesson2
test_lesson2_1
test_lesson_2_sapr
test_lesson_3_sapr
tolstykov_les3
tolstykov_les4
tolstykov_les4_sink
tolstykov_les5
tolstykov_les8
us_navy_20
[student898_2@bigdataanalytics-worker-3 ~]$ 
```

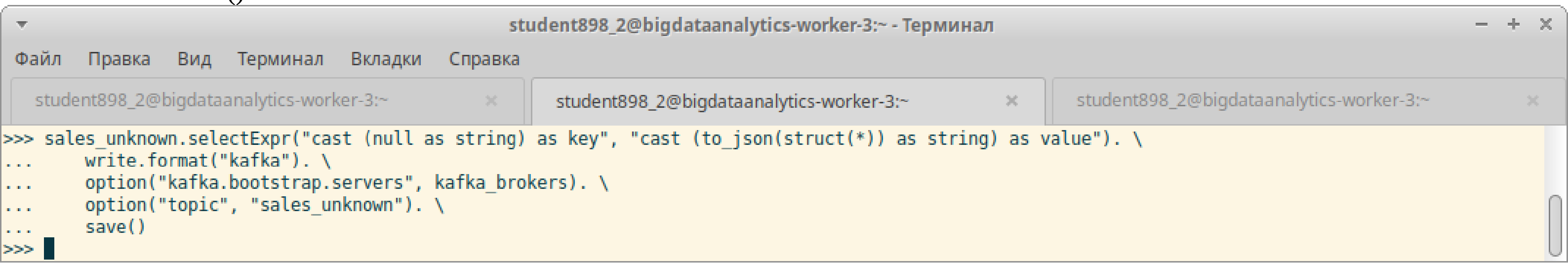
```
/usr/hdp/current/kafka-broker/bin/kafka-topics.sh --delete --topic tolstykov_les8 --zookeeper bigdataanalytics-worker-3:2181
/usr/hdp/current/kafka-broker/bin/kafka-topics.sh --delete --topic tolstykov_les5 --zookeeper bigdataanalytics-worker-3:2181
/usr/hdp/current/kafka-broker/bin/kafka-topics.sh --delete --topic tolstykov_les4 --zookeeper bigdataanalytics-worker-3:2181
```

```
/usr/hdp/current/kafka-broker/bin/kafka-topics.sh --delete --topic tolstykov_les3 --zookeeper bigdataanalytics-worker-3:2181
/usr/hdp/current/kafka-broker/bin/kafka-topics.sh --delete --topic tolstykov_les4_sink --zookeeper bigdataanalytics-worker-3:2181
/usr/hdp/current/kafka-broker/bin/kafka-topics.sh --delete --topic sales_unknown --zookeeper bigdataanalytics-worker-3:2181
/usr/hdp/current/kafka-broker/bin/kafka-topics.sh --create --topic sales_unknown --zookeeper bigdataanalytics-worker-3:2181 --partitions 1 --replication-factor 1
```


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл
Правка
Вид
Терминал
Вкладки
Справка
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~

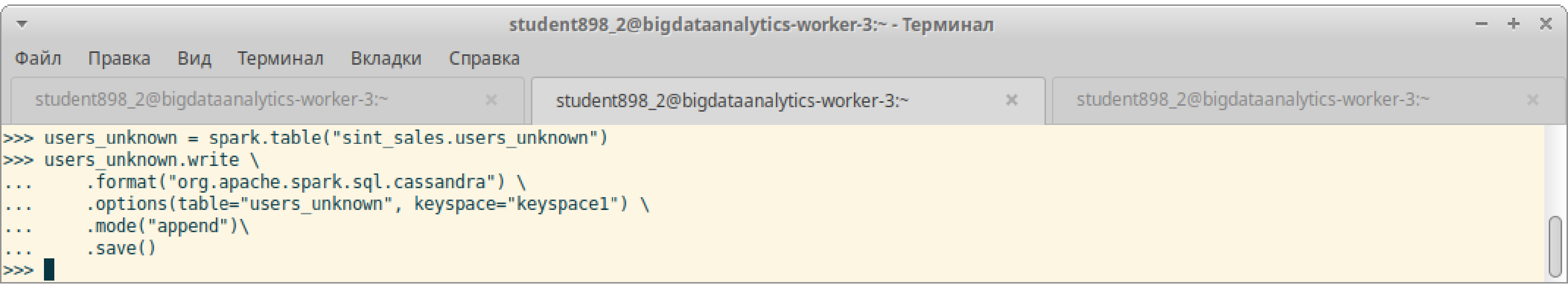
```
[student898_2@bigdataanalytics-worker-3 ~]$ /usr/hdp/current/kafka-broker/bin/kafka-topics.sh --delete --topic tolstykov_les8 --zookeeper bigdataanaly
tics-worker-3:2181
Topic tolstykov_les8 is marked for deletion.
Note: This will have no impact if delete.topic.enable is not set to true.
[student898_2@bigdataanalytics-worker-3 ~]$ /usr/hdp/current/kafka-broker/bin/kafka-topics.sh --delete --topic tolstykov_les5 --zookeeper bigdataanaly
tics-worker-3:2181
Topic tolstykov_les5 is marked for deletion.
Note: This will have no impact if delete.topic.enable is not set to true.
[student898_2@bigdataanalytics-worker-3 ~]$ /usr/hdp/current/kafka-broker/bin/kafka-topics.sh --delete --topic tolstykov_les4 --zookeeper bigdataanaly
tics-worker-3:2181
Topic tolstykov_les4 is marked for deletion.
Note: This will have no impact if delete.topic.enable is not set to true.
[student898_2@bigdataanalytics-worker-3 ~]$ /usr/hdp/current/kafka-broker/bin/kafka-topics.sh --delete --topic tolstykov_les3 --zookeeper bigdataanaly
tics-worker-3:2181
Topic tolstykov_les3 is marked for deletion.
Note: This will have no impact if delete.topic.enable is not set to true.
[student898_2@bigdataanalytics-worker-3 ~]$ /usr/hdp/current/kafka-broker/bin/kafka-topics.sh --delete --topic tolstykov_les4_sink --zookeeper bigdata
analytics-worker-3:2181
Topic tolstykov_les4_sink is marked for deletion.
Note: This will have no impact if delete.topic.enable is not set to true.
[student898_2@bigdataanalytics-worker-3 ~]$ /usr/hdp/current/kafka-broker/bin/kafka-topics.sh --delete --topic sales_unknown --zookeeper bigdataanalyt
ics-worker-3:2181
Topic sales_unknown is marked for deletion.
Note: This will have no impact if delete.topic.enable is not set to true.
[student898_2@bigdataanalytics-worker-3 ~]$ /usr/hdp/current/kafka-broker/bin/kafka-topics.sh --create --topic sales_unknown --zookeeper bigdataanalyt
ics-worker-3:2181 --partitions 1 --replication-factor 1
WARNING: Due to limitations in metric names, topics with a period ('.') or underscore ('_') could collide. To avoid issues it is best to use either, b
ut not both.
Created topic "sales_unknown".
[student898_2@bigdataanalytics-worker-3 ~]$ 
```

```
sales_unknown.selectExpr("cast (null as string) as key", "cast (to_json(struct(*)) as string) as value"). \
    write.format("kafka"). \
    option("kafka.bootstrap.servers", kafka_brokers). \
    option("topic", "sales_unknown"). \
    save()
```


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл
Правка
Вид
Терминал
Вкладки
Справка
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~

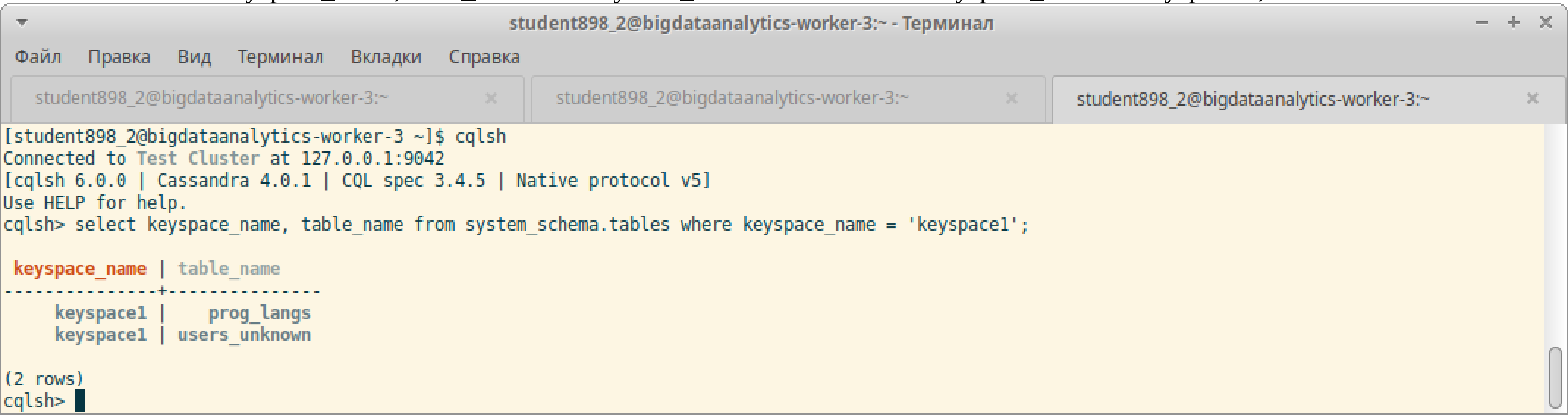
```
>>> sales_unknown.selectExpr("cast (null as string) as key", "cast (to_json(struct(*)) as string) as value"). \
...     write.format("kafka"). \
...     option("kafka.bootstrap.servers", kafka_brokers). \
...     option("topic", "sales_unknown"). \
...     save()
>>> 
```

```
users_unknown = spark.table("sint_sales.users_unknown")
users_unknown.write \
    .format("org.apache.spark.sql.cassandra") \
    .options(table="users_unknown", keyspace="keyspace1") \
    .mode("append")\
    .save()
```


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл
Правка
Вид
Терминал
Вкладки
Справка
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~

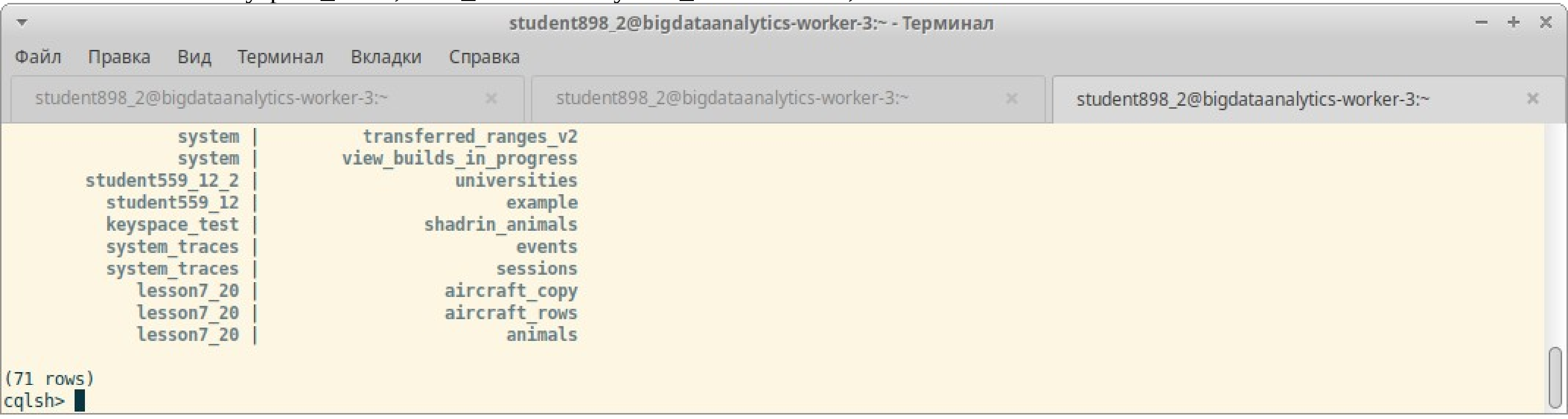
```
>>> users_unknown = spark.table("sint_sales.users_unknown")
>>> users_unknown.write \
...     .format("org.apache.spark.sql.cassandra") \
...     .options(table="users_unknown", keyspace="keyspace1") \
...     .mode("append")\
...     .save()
>>> 
```

cqlsh
select keyspace_name, table_name from system_schema.tables where keyspace_name = 'keyspace1';


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл
Правка
Вид
Терминал
Вкладки
Справка
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~

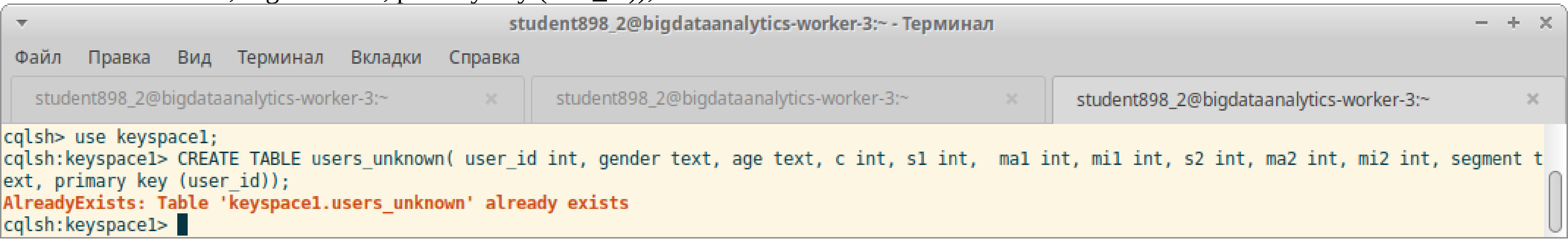
```
[student898_2@bigdataanalytics-worker-3 ~]$ cqlsh
Connected to Test Cluster at 127.0.0.1:9042
[cqlsh 6.0.0 | Cassandra 4.0.1 | CQL spec 3.4.5 | Native protocol v5]
Use HELP for help.
cqlsh> select keyspace_name, table_name from system_schema.tables where keyspace_name = 'keyspace1';

 keyspace_name | table_name
---------------+---------------
     keyspace1 |    prog_langs
     keyspace1 | users_unknown

(2 rows)
cqlsh> 
```

select keyspace_name, table_name from system_schema.tables;


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл
Правка
Вид
Терминал
Вкладки
Справка
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~

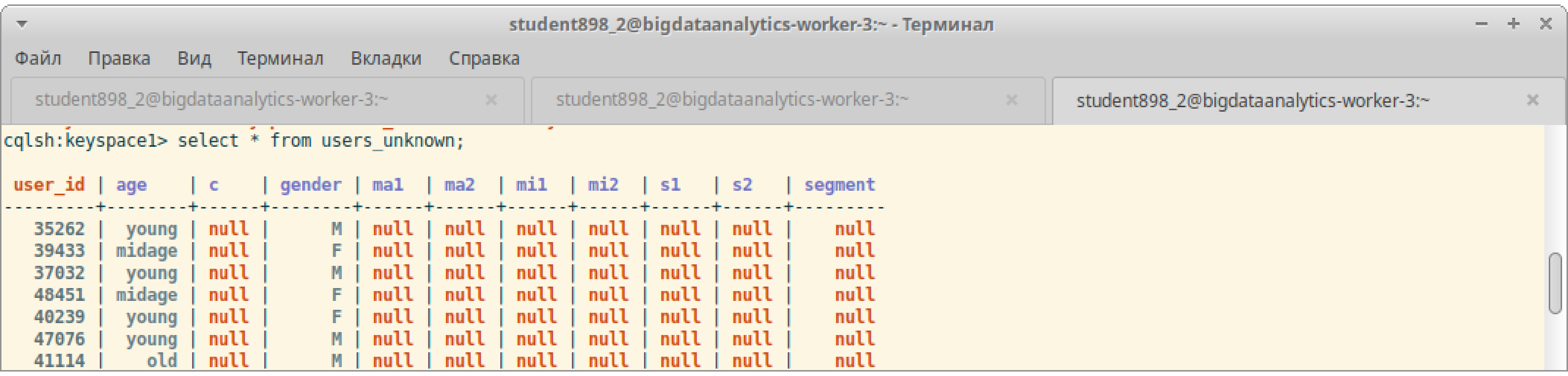
```
                 system |         transferred_ranges_v2
                 system |        view_builds_in_progress
        student559_12_2 |                  universities
          student559_12 |                       example
          keyspace_test |                shadrin_animals
          system_traces |                        events
          system_traces |                      sessions
             lesson7_20 |                 aircraft_copy
             lesson7_20 |                 aircraft_rows
             lesson7_20 |                       animals

(71 rows)
cqlsh> 
```

use keyspace1;
CREATE TABLE users_unknown(user_id int, gender text, age text, c int, s1 int, ma1 int, mi1 int, s2 int, ma2 int, mi2 int, segment text, primary key (user_id));


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл
Правка
Вид
Терминал
Вкладки
Справка
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~

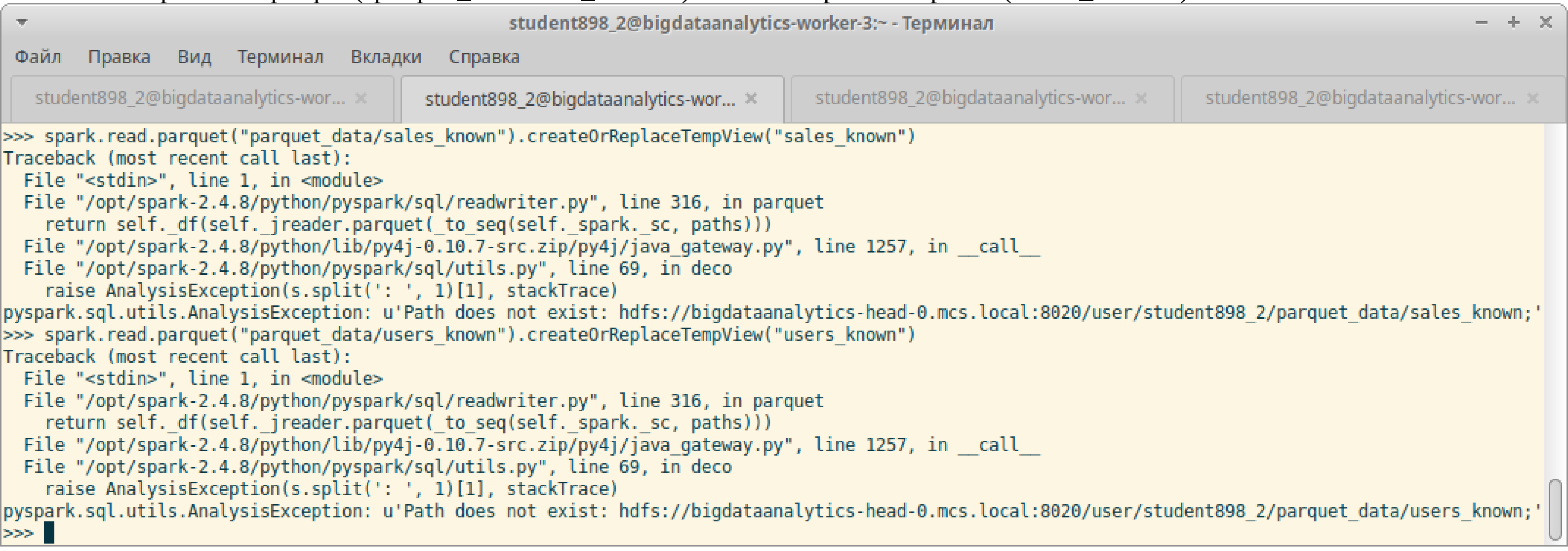
```
cqlsh> use keyspace1;
cqlsh:keyspace1> CREATE TABLE users_unknown( user_id int, gender text, age text, c int, s1 int,  ma1 int, mi1 int, s2 int, ma2 int, mi2 int, segment t
ext, primary key (user_id));
AlreadyExists: Table 'keyspace1.users_unknown' already exists
cqlsh:keyspace1> 
```

select * from users_unknown;


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл Правка Вид Терминал Вкладки Справка
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~
student898_2@bigdataanalytics-worker-3:~

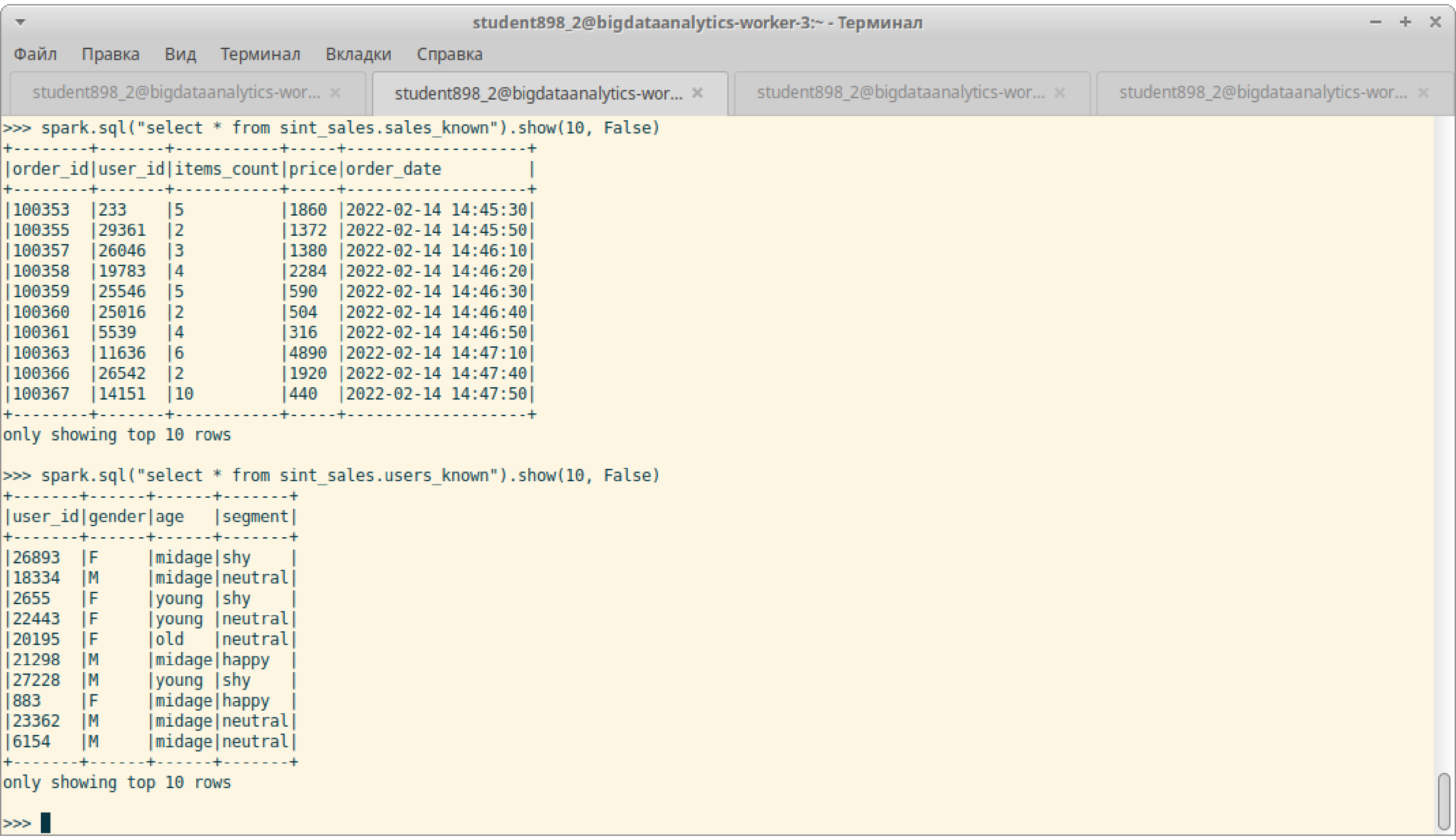
```
cqlsh:keyspace1> select * from users_unknown;

 user_id | age    | c    | gender | ma1  | ma2  | mi1  | mi2  | s1   | s2   | segment
---------+--------+------+--------+------+------+------+------+------+------+---------
   35262 |  young | null |      M | null | null | null | null | null | null |    null
   39433 | midage | null |      F | null | null | null | null | null | null |    null
   37032 |  young | null |      M | null | null | null | null | null | null |    null
   48451 | midage | null |      F | null | null | null | null | null | null |    null
   40239 |  young | null |      F | null | null | null | null | null | null |    null
   47076 |  young | null |      M | null | null | null | null | null | null |    null
   41114 |    old | null |      M | null | null | null | null | null | null |    null
```

hdfs dfs -ls parquet_data
spark.read.parquet("parquet_data/sales_known").createOrReplaceTempView("sales_known")
spark.read.parquet("parquet_data/users_known").createOrReplaceTempView("users_known")


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл Правка Вид Терминал Вкладки Справка
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...

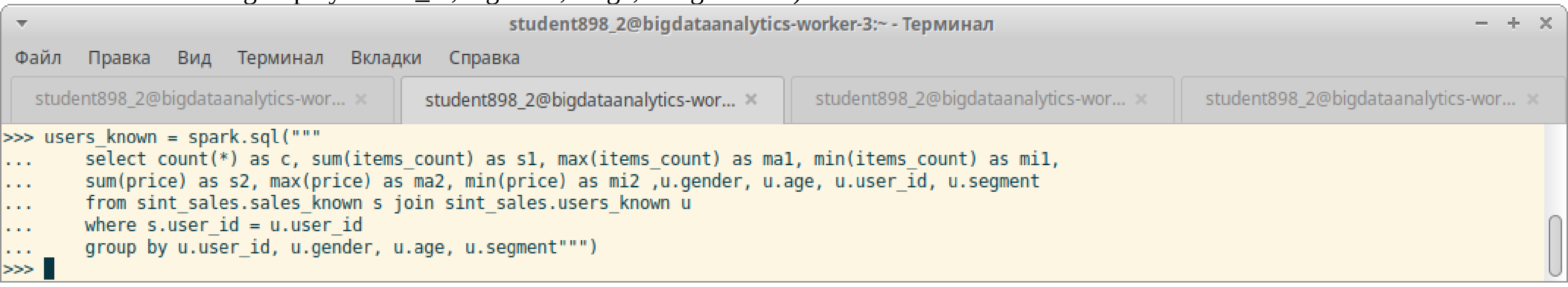
```
>>> spark.read.parquet("parquet_data/sales_known").createOrReplaceTempView("sales_known")
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
  File "/opt/spark-2.4.8/python/pyspark/sql/readwriter.py", line 316, in parquet
    return self._df(self._jreader.parquet(_to_seq(self._spark._sc, paths)))
  File "/opt/spark-2.4.8/python/lib/py4j-0.10.7-src.zip/py4j/java_gateway.py", line 1257, in __call__
  File "/opt/spark-2.4.8/python/pyspark/sql/utils.py", line 69, in deco
    raise AnalysisException(s.split(': ', 1)[1], stackTrace)
pyspark.sql.utils.AnalysisException: u'Path does not exist: hdfs://bigdataanalytics-head-0.mcs.local:8020/user/student898_2/parquet_data/sales_known;'
>>> spark.read.parquet("parquet_data/users_known").createOrReplaceTempView("users_known")
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
  File "/opt/spark-2.4.8/python/pyspark/sql/readwriter.py", line 316, in parquet
    return self._df(self._jreader.parquet(_to_seq(self._spark._sc, paths)))
  File "/opt/spark-2.4.8/python/lib/py4j-0.10.7-src.zip/py4j/java_gateway.py", line 1257, in __call__
  File "/opt/spark-2.4.8/python/pyspark/sql/utils.py", line 69, in deco
    raise AnalysisException(s.split(': ', 1)[1], stackTrace)
pyspark.sql.utils.AnalysisException: u'Path does not exist: hdfs://bigdataanalytics-head-0.mcs.local:8020/user/student898_2/parquet_data/users_known;'
>>> 
```

spark.sql("select * from sint_sales.sales_known").show(10, False)
spark.sql("select * from sint_sales.users_known").show(10, False)


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл Правка Вид Терминал Вкладки Справка
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...

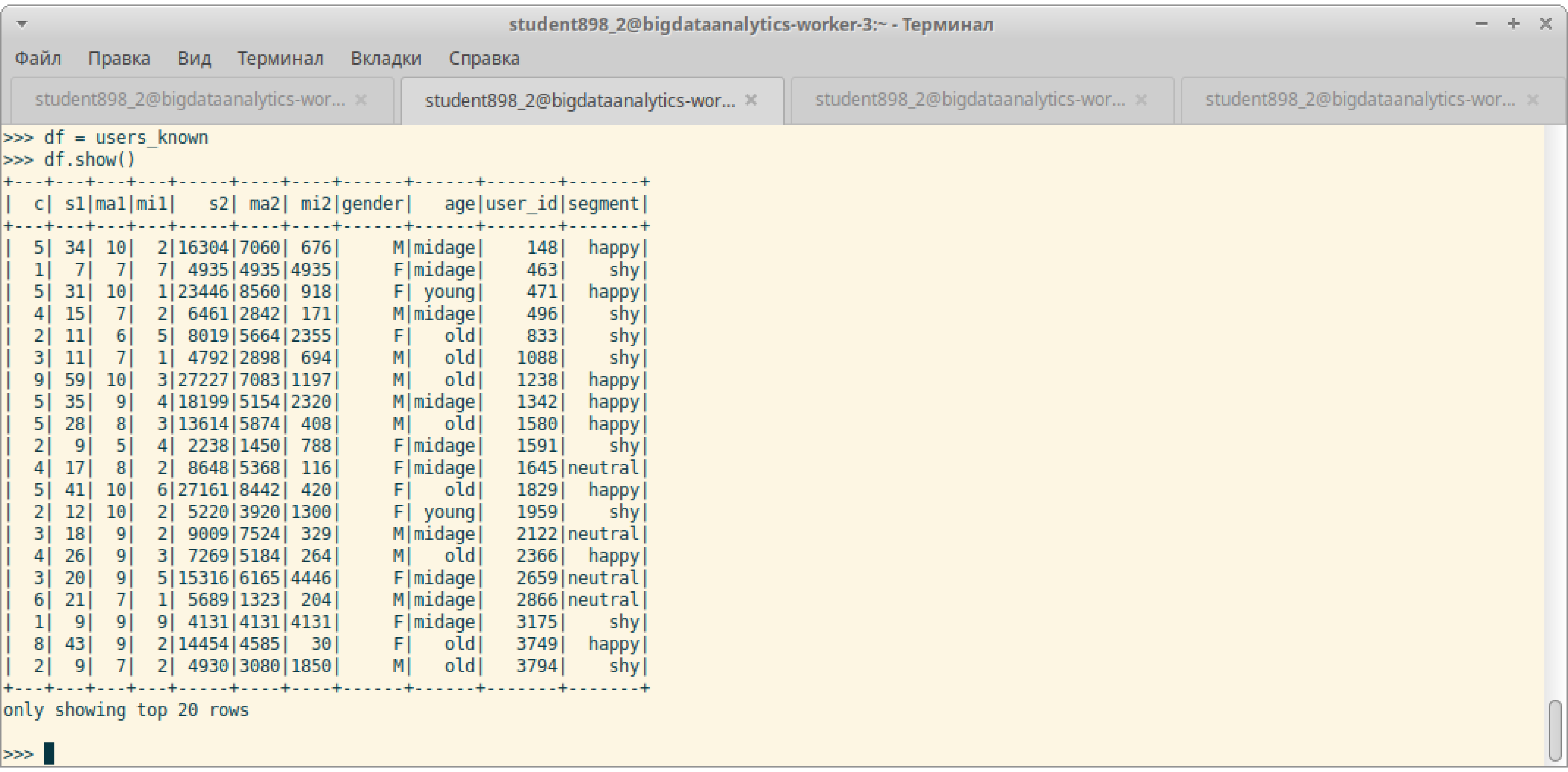
```
>>> spark.sql("select * from sint_sales.sales_known").show(10, False)
+--------+-------+-----------+-----+-------------------+
|order_id|user_id|items_count|price|order_date         |
+--------+-------+-----------+-----+-------------------+
|100353  |233    |5          |1860 |2022-02-14 14:45:30|
|100355  |29361  |2          |1372 |2022-02-14 14:45:50|
|100357  |26046  |3          |1380 |2022-02-14 14:46:10|
|100358  |19783  |4          |2284 |2022-02-14 14:46:20|
|100359  |25546  |5          |590  |2022-02-14 14:46:30|
|100360  |25016  |2          |504  |2022-02-14 14:46:40|
|100361  |5539   |4          |316  |2022-02-14 14:46:50|
|100363  |11636  |6          |4890 |2022-02-14 14:47:10|
|100366  |26542  |2          |1920 |2022-02-14 14:47:40|
|100367  |14151  |10         |440  |2022-02-14 14:47:50|
+--------+-------+-----------+-----+-------------------+
only showing top 10 rows

>>> spark.sql("select * from sint_sales.users_known").show(10, False)
+-------+------+------+-------+
|user_id|gender|age   |segment|
+-------+------+------+-------+
|26893  |F     |midage|shy    |
|18334  |M     |midage|neutral|
|2655   |F     |young |shy    |
|22443  |F     |young |neutral|
|20195  |F     |old   |neutral|
|21298  |M     |midage|happy  |
|27228  |M     |young |shy    |
|883    |F     |midage|happy  |
|23362  |M     |midage|neutral|
|6154   |M     |midage|neutral|
+-------+------+------+-------+
only showing top 10 rows

>>> 
```

```
users_known = spark.sql("""
        select count(*) as c, sum(items_count) as s1, max(items_count) as ma1, min(items_count) as mi1,
        sum(price) as s2, max(price) as ma2, min(price) as mi2 ,u.gender, u.age, u.user_id, u.segment
        from sint_sales.sales_known s join sint_sales.users_known u
        where s.user_id = u.user_id
        group by u.user_id, u.gender, u.age, u.segment""")
```


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл Правка Вид Терминал Вкладки Справка
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...

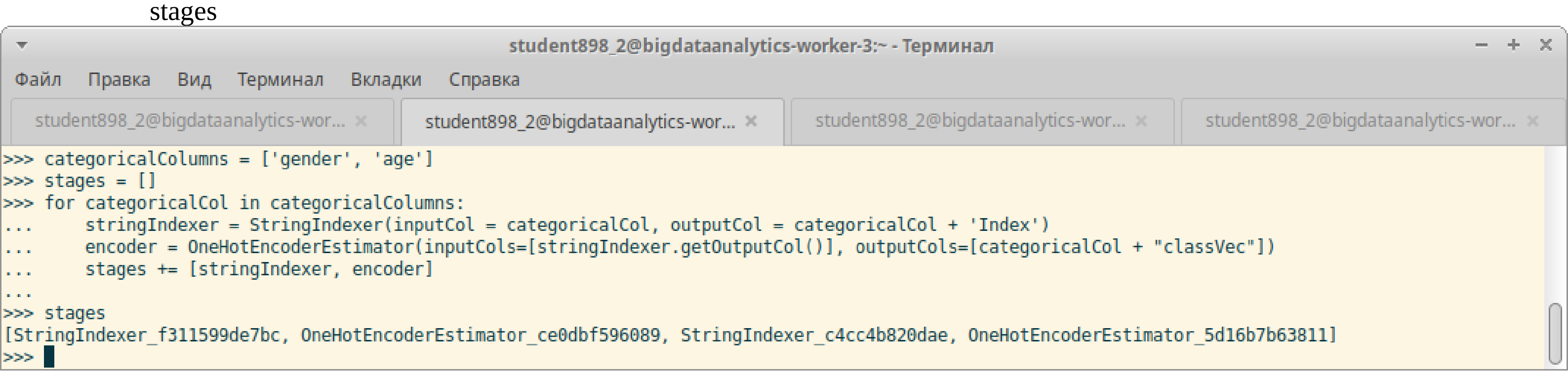
```
>>> users_known = spark.sql("""
...     select count(*) as c, sum(items_count) as s1, max(items_count) as ma1, min(items_count) as mi1,
...     sum(price) as s2, max(price) as ma2, min(price) as mi2 ,u.gender, u.age, u.user_id, u.segment
...     from sint_sales.sales_known s join sint_sales.users_known u
...     where s.user_id = u.user_id
...     group by u.user_id, u.gender, u.age, u.segment""")
>>> 
```

```
df = users_known
df.show()
```


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл
Правка
Вид
Терминал
Вкладки
Справка
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...

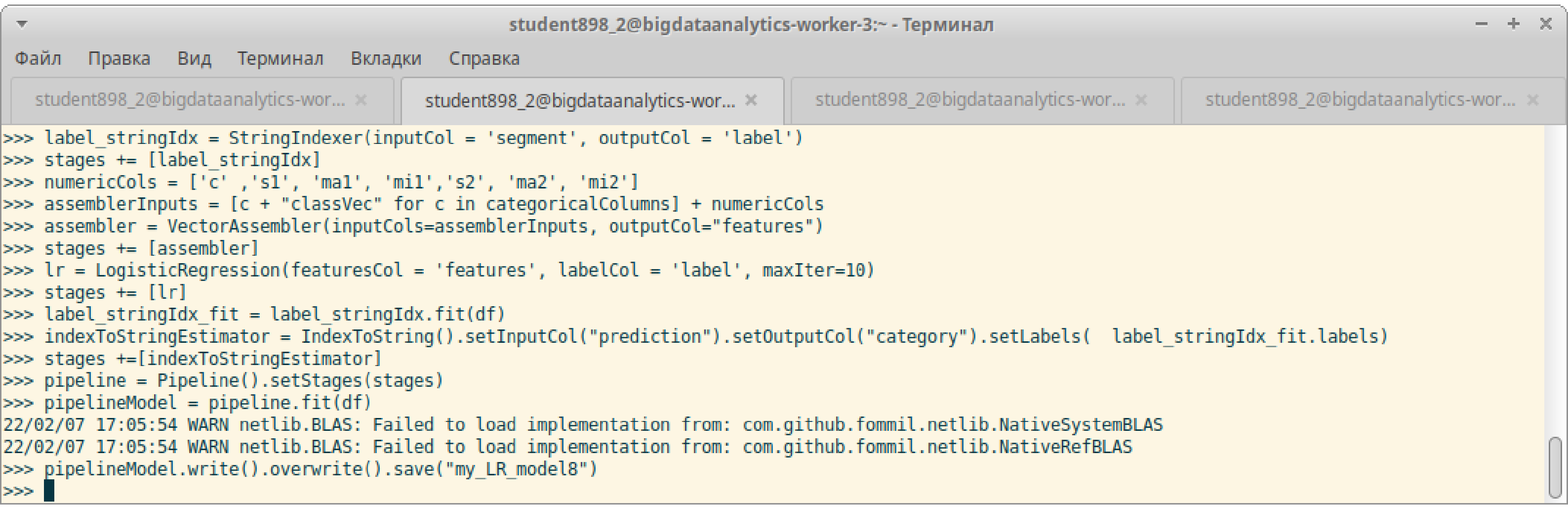
```
>>> df = users_known
>>> df.show()
+---+---+---+---+-----+----+----+------+------+-------+-------+
|  c| s1|ma1|mi1|   s2| ma2| mi2|gender|   age|user_id|segment|
+---+---+---+---+-----+----+----+------+------+-------+-------+
|  5| 34| 10|  2|16304|7060| 676|     M|midage|    148|  happy|
|  1|  7|  7|  7| 4935|4935|4935|     F|midage|    463|    shy|
|  5| 31| 10|  1|23446|8560| 918|     F| young|    471|  happy|
|  4| 15|  7|  2| 6461|2842| 171|     M|midage|    496|    shy|
|  2| 11|  6|  5| 8019|5664|2355|     F|   old|    833|    shy|
|  3| 11|  7|  1| 4792|2898| 694|     M|   old|   1088|    shy|
|  9| 59| 10|  3|27227|7083|1197|     M|   old|   1238|  happy|
|  5| 35|  9|  4|18199|5154|2320|     M|midage|   1342|  happy|
|  5| 28|  8|  3|13614|5874| 408|     M|   old|   1580|  happy|
|  2|  9|  5|  4| 2238|1450| 788|     F|midage|   1591|    shy|
|  4| 17|  8|  2| 8648|5368| 116|     F|midage|   1645|neutral|
|  5| 41| 10|  6|27161|8442| 420|     F|   old|   1829|  happy|
|  2| 12| 10|  2| 5220|3920|1300|     F| young|   1959|    shy|
|  3| 18|  9|  2| 9009|7524| 329|     M|midage|   2122|neutral|
|  4| 26|  9|  3| 7269|5184| 264|     M|   old|   2366|  happy|
|  3| 20|  9|  5|15316|6165|4446|     F|midage|   2659|neutral|
|  6| 21|  7|  1| 5689|1323| 204|     M|midage|   2866|neutral|
|  1|  9|  9|  9| 4131|4131|4131|     F|midage|   3175|    shy|
|  8| 43|  9|  2|14454|4585|  30|     F|   old|   3749|  happy|
|  2|  9|  7|  2| 4930|3080|1850|     M|   old|   3794|    shy|
+---+---+---+---+-----+----+----+------+------+-------+-------+
only showing top 20 rows

>>> 
```

```
categoricalColumns = ['gender', 'age']
stages = []
for categoricalCol in categoricalColumns:
        stringIndexer = StringIndexer(inputCol = categoricalCol, outputCol = categoricalCol + 'Index')
        encoder = OneHotEncoderEstimator(inputCols=[stringIndexer.getOutputCol()], outputCols=[categoricalCol + "classVec"])
        stages += [stringIndexer, encoder]
stages
```


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл
Правка
Вид
Терминал
Вкладки
Справка
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...

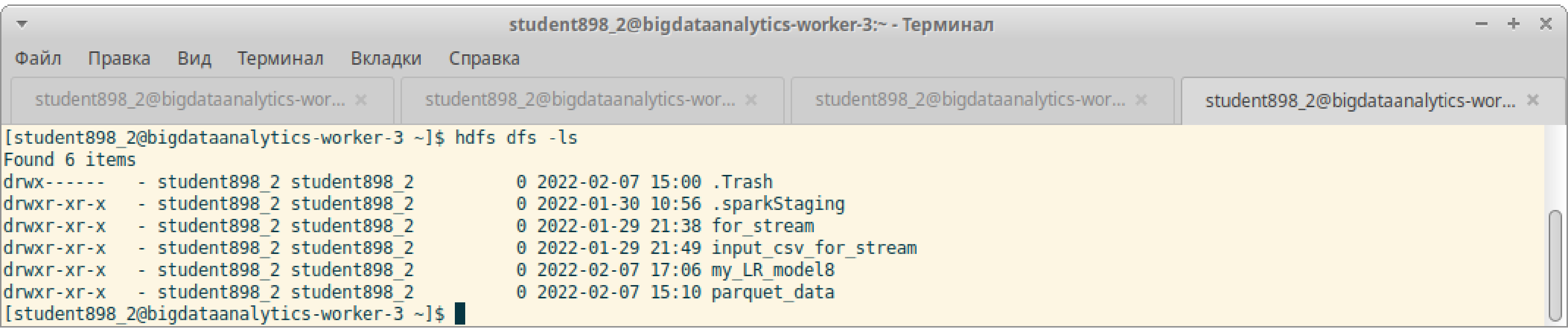
```
>>> categoricalColumns = ['gender', 'age']
>>> stages = []
>>> for categoricalCol in categoricalColumns:
...     stringIndexer = StringIndexer(inputCol = categoricalCol, outputCol = categoricalCol + 'Index')
...     encoder = OneHotEncoderEstimator(inputCols=[stringIndexer.getOutputCol()], outputCols=[categoricalCol + "classVec"])
...     stages += [stringIndexer, encoder]
...
>>> stages
[StringIndexer_f311599de7bc, OneHotEncoderEstimator_ce0dbf596089, StringIndexer_c4cc4b820dae, OneHotEncoderEstimator_5d16b7b63811]
>>> 
```

```
label_stringIdx = StringIndexer(inputCol = 'segment', outputCol = 'label')
stages += [label_stringIdx]
numericCols = ['c' ,'s1', 'ma1', 'mi1','s2', 'ma2', 'mi2']
assemblerInputs = [c + "classVec" for c in categoricalColumns] + numericCols
assembler = VectorAssembler(inputCols=assemblerInputs, outputCol="features")
stages += [assembler]
lr = LogisticRegression(featuresCol = 'features', labelCol = 'label', maxIter=10)
stages += [lr]
label_stringIdx_fit = label_stringIdx.fit(df)
indexToStringEstimator = IndexToString().setInputCol("prediction").setOutputCol("category").setLabels(  label_stringIdx_fit.labels)
stages +=[indexToStringEstimator]
pipeline = Pipeline().setStages(stages)
pipelineModel = pipeline.fit(df)
pipelineModel.write().overwrite().save("my_LR_model8")
```


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл Правка Вид Терминал Вкладки Справка
student898_2@bigdataanalytics-wor...

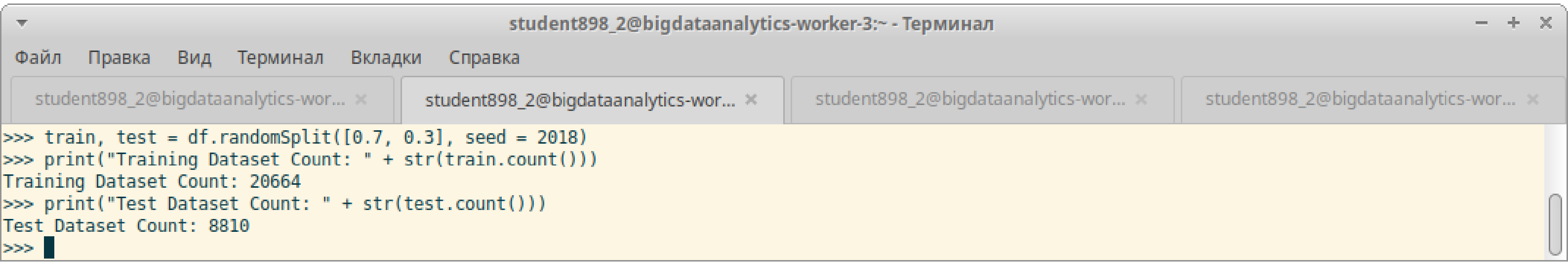
```
>>> label_stringIdx = StringIndexer(inputCol = 'segment', outputCol = 'label')
>>> stages += [label_stringIdx]
>>> numericCols = ['c' ,'s1', 'ma1', 'mi1','s2', 'ma2', 'mi2']
>>> assemblerInputs = [c + "classVec" for c in categoricalColumns] + numericCols
>>> assembler = VectorAssembler(inputCols=assemblerInputs, outputCol="features")
>>> stages += [assembler]
>>> lr = LogisticRegression(featuresCol = 'features', labelCol = 'label', maxIter=10)
>>> stages += [lr]
>>> label_stringIdx_fit = label_stringIdx.fit(df)
>>> indexToStringEstimator = IndexToString().setInputCol("prediction").setOutputCol("category").setLabels(  label_stringIdx_fit.labels)
>>> stages +=[indexToStringEstimator]
>>> pipeline = Pipeline().setStages(stages)
>>> pipelineModel = pipeline.fit(df)
22/02/07 17:05:54 WARN netlib.BLAS: Failed to load implementation from: com.github.fommil.netlib.NativeSystemBLAS
22/02/07 17:05:54 WARN netlib.BLAS: Failed to load implementation from: com.github.fommil.netlib.NativeRefBLAS
>>> pipelineModel.write().overwrite().save("my_LR_model8")
>>> 
```

hdfs dfs -ls


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл Правка Вид Терминал Вкладки Справка
student898_2@bigdataanalytics-wor...

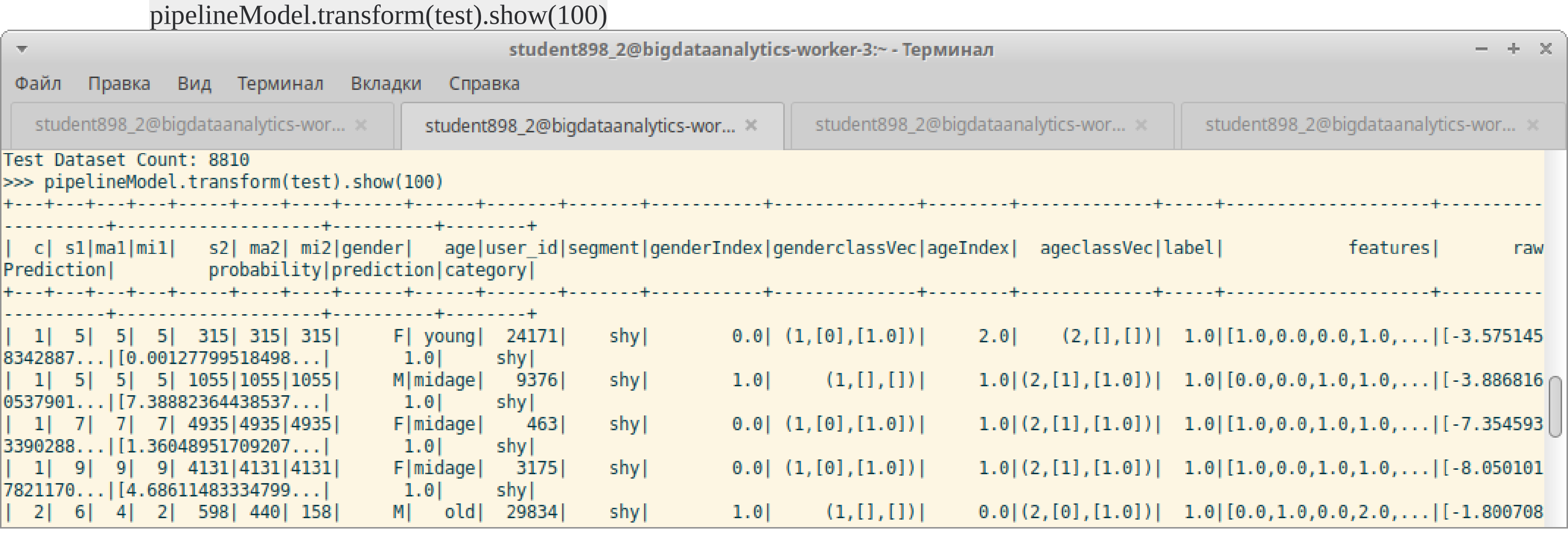
```
[student898_2@bigdataanalytics-worker-3 ~]$ hdfs dfs -ls
Found 6 items
drwx------   - student898_2 student898_2          0 2022-02-07 15:00 .Trash
drwxr-xr-x   - student898_2 student898_2          0 2022-01-30 10:56 .sparkStaging
drwxr-xr-x   - student898_2 student898_2          0 2022-01-29 21:38 for_stream
drwxr-xr-x   - student898_2 student898_2          0 2022-01-29 21:49 input_csv_for_stream
drwxr-xr-x   - student898_2 student898_2          0 2022-02-07 17:06 my_LR_model8
drwxr-xr-x   - student898_2 student898_2          0 2022-02-07 15:10 parquet_data
[student898_2@bigdataanalytics-worker-3 ~]$ 
```

train, test = df.randomSplit([0.7, 0.3], seed = 2018)
print("Training Dataset Count: " + str(train.count()))
print("Test Dataset Count: " + str(test.count()))


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл Правка Вид Терминал Вкладки Справка
student898_2@bigdataanalytics-wor...

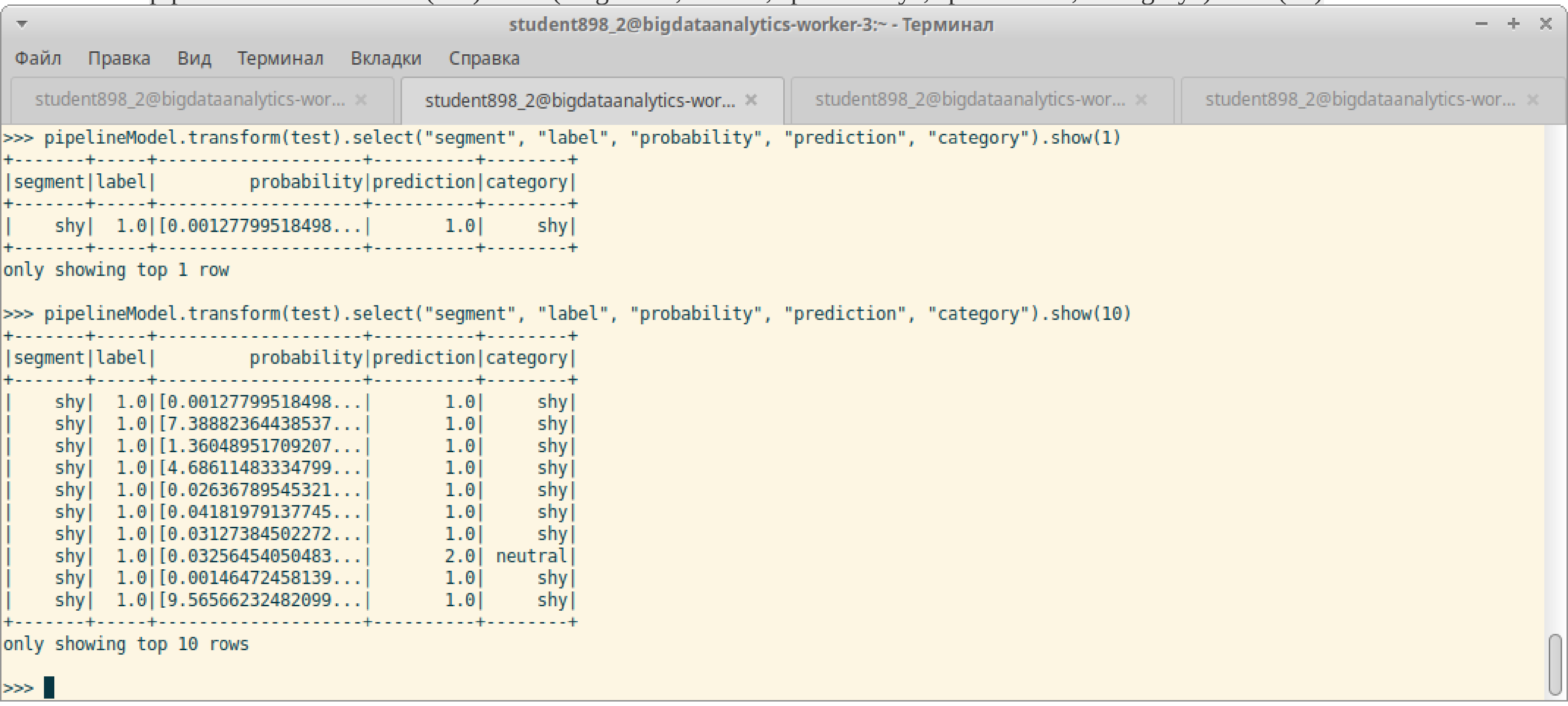
```
>>> train, test = df.randomSplit([0.7, 0.3], seed = 2018)
>>> print("Training Dataset Count: " + str(train.count()))
Training Dataset Count: 20664
>>> print("Test Dataset Count: " + str(test.count()))
Test Dataset Count: 8810
>>> 
```

pipelineModel.transform(test).show(100)


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл Правка Вид Терминал Вкладки Справка
student898_2@bigdataanalytics-wor...

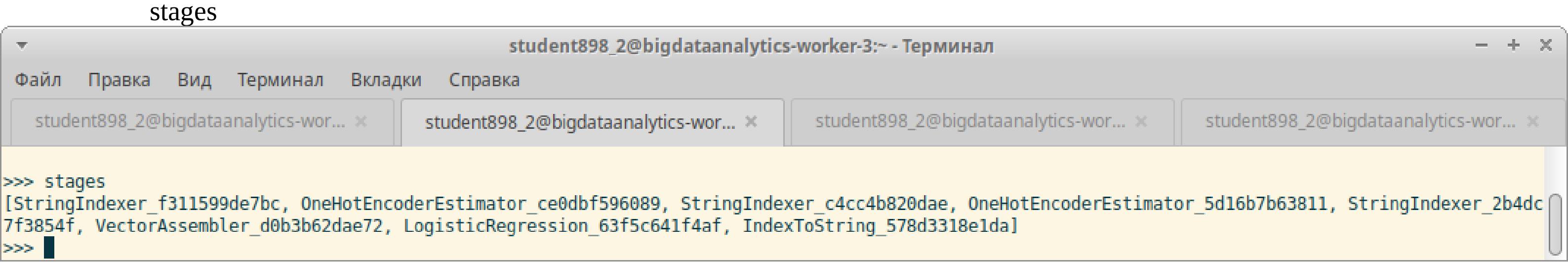
```
Test Dataset Count: 8810
>>> pipelineModel.transform(test).show(100)
+---+---+---+---+-----+----+----+------+------+-------+-------+-----------+--------------+--------+-------------+-----+--------------------+----------
----------+--------------------+----------+--------+
|  c| s1|ma1|mi1|   s2| ma2| mi2|gender|   age|user_id|segment|genderIndex|genderclassVec|ageIndex|  ageclassVec|label|            features|       raw
Prediction|         probability|prediction|category|
+---+---+---+---+-----+----+----+------+------+-------+-------+-----------+--------------+--------+-------------+-----+--------------------+----------
----------+--------------------+----------+--------+
|  1|  5|  5|  5|  315| 315| 315|     F| young|  24171|    shy|        0.0| (1,[0],[1.0])|     2.0|    (2,[],[])|  1.0|[1.0,0.0,0.0,1.0,...|[-3.575145
8342887...|[0.00127799518498...|       1.0|     shy|
|  1|  5|  5|  5| 1055|1055|1055|     M|midage|   9376|    shy|        1.0|     (1,[],[])|     1.0|(2,[1],[1.0])|  1.0|[0.0,0.0,1.0,1.0,...|[-3.886816
0537901...|[7.38882364438537...|       1.0|     shy|
|  1|  7|  7|  7| 4935|4935|4935|     F|midage|    463|    shy|        0.0| (1,[0],[1.0])|     1.0|(2,[1],[1.0])|  1.0|[1.0,0.0,1.0,1.0,...|[-7.354593
3390288...|[1.36048951709207...|       1.0|     shy|
|  1|  9|  9|  9| 4131|4131|4131|     F|midage|   3175|    shy|        0.0| (1,[0],[1.0])|     1.0|(2,[1],[1.0])|  1.0|[1.0,0.0,1.0,1.0,...|[-8.050101
7821170...|[4.68611483334799...|       1.0|     shy|
|  2|  6|  4|  2|  598| 440| 158|     M|   old|  29834|    shy|        1.0|     (1,[],[])|     0.0|(2,[0],[1.0])|  1.0|[0.0,1.0,0.0,2.0,...|[-1.800708
```

pipelineModel.transform(test).select("segment", "label", "probability", "prediction", "category").show(1) pipelineModel.transform(test).select("segment", "label", "probability", "prediction", "category").show(10)


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл
Правка
Вид
Терминал
Вкладки
Справка
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...

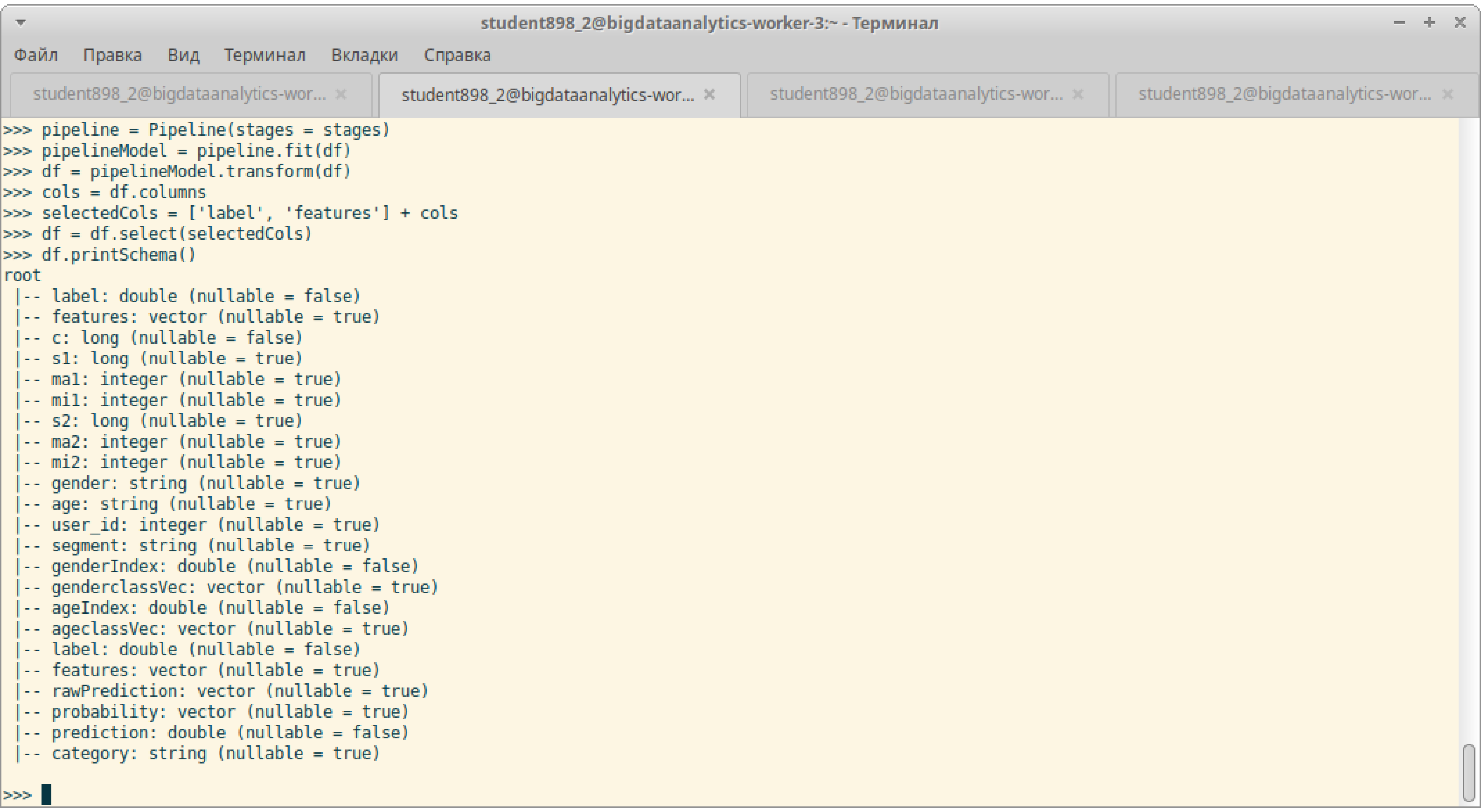
```
>>> pipelineModel.transform(test).select("segment", "label", "probability", "prediction", "category").show(1)
+-------+-----+--------------------+----------+--------+
|segment|label|         probability|prediction|category|
+-------+-----+--------------------+----------+--------+
|    shy|  1.0|[0.00127799518498...|       1.0|     shy|
+-------+-----+--------------------+----------+--------+
only showing top 1 row

>>> pipelineModel.transform(test).select("segment", "label", "probability", "prediction", "category").show(10)
+-------+-----+--------------------+----------+--------+
|segment|label|         probability|prediction|category|
+-------+-----+--------------------+----------+--------+
|    shy|  1.0|[0.00127799518498...|       1.0|     shy|
|    shy|  1.0|[7.38882364438537...|       1.0|     shy|
|    shy|  1.0|[1.36048951709207...|       1.0|     shy|
|    shy|  1.0|[4.68611483334799...|       1.0|     shy|
|    shy|  1.0|[0.02636789545321...|       1.0|     shy|
|    shy|  1.0|[0.04181979137745...|       1.0|     shy|
|    shy|  1.0|[0.03127384502272...|       1.0|     shy|
|    shy|  1.0|[0.03256454050483...|       2.0| neutral|
|    shy|  1.0|[0.00146472458139...|       1.0|     shy|
|    shy|  1.0|[9.56566232482099...|       1.0|     shy|
+-------+-----+--------------------+----------+--------+
only showing top 10 rows

>>> 
```

stages


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл
Правка
Вид
Терминал
Вкладки
Справка
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...

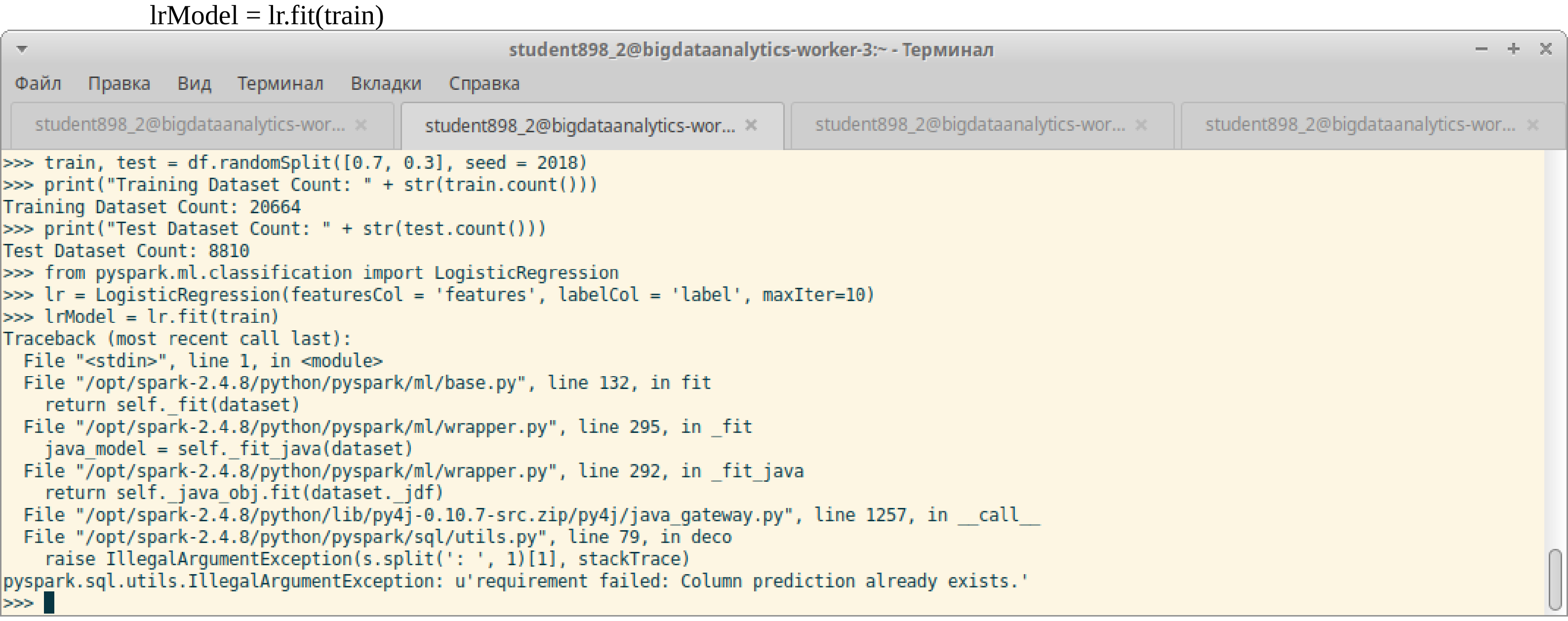
```
>>> stages
[StringIndexer_f311599de7bc, OneHotEncoderEstimator_ce0dbf596089, StringIndexer_c4cc4b820dae, OneHotEncoderEstimator_5d16b7b63811, StringIndexer_2b4dc
7f3854f, VectorAssembler_d0b3b62dae72, LogisticRegression_63f5c641f4af, IndexToString_578d3318e1da]
>>> 
```

```
for categoricalCol in categoricalColumns:
    stringIndexer = StringIndexer(inputCol = categoricalCol, outputCol = categoricalCol + 'Index')
    encoder = OneHotEncoderEstimator(inputCols=[stringIndexer.getOutputCol()], outputCols=[categoricalCol + "classVec"])
stages += [stringIndexer, encoder]
pipeline = Pipeline(stages = stages)
pipelineModel = pipeline.fit(df)
df = pipelineModel.transform(df)
cols = df.columns
selectedCols = ['label', 'features'] + cols
df = df.select(selectedCols)
df.printSchema()
```


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл
Правка
Вид
Терминал
Вкладки
Справка
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...

```
>>> pipeline = Pipeline(stages = stages)
>>> pipelineModel = pipeline.fit(df)
>>> df = pipelineModel.transform(df)
>>> cols = df.columns
>>> selectedCols = ['label', 'features'] + cols
>>> df = df.select(selectedCols)
>>> df.printSchema()
root
 |-- label: double (nullable = false)
 |-- features: vector (nullable = true)
 |-- c: long (nullable = false)
 |-- s1: long (nullable = true)
 |-- ma1: integer (nullable = true)
 |-- mi1: integer (nullable = true)
 |-- s2: long (nullable = true)
 |-- ma2: integer (nullable = true)
 |-- mi2: integer (nullable = true)
 |-- gender: string (nullable = true)
 |-- age: string (nullable = true)
 |-- user_id: integer (nullable = true)
 |-- segment: string (nullable = true)
 |-- genderIndex: double (nullable = false)
 |-- genderclassVec: vector (nullable = true)
 |-- ageIndex: double (nullable = false)
 |-- ageclassVec: vector (nullable = true)
 |-- label: double (nullable = false)
 |-- features: vector (nullable = true)
 |-- rawPrediction: vector (nullable = true)
 |-- probability: vector (nullable = true)
 |-- prediction: double (nullable = false)
 |-- category: string (nullable = true)

>>> 
```

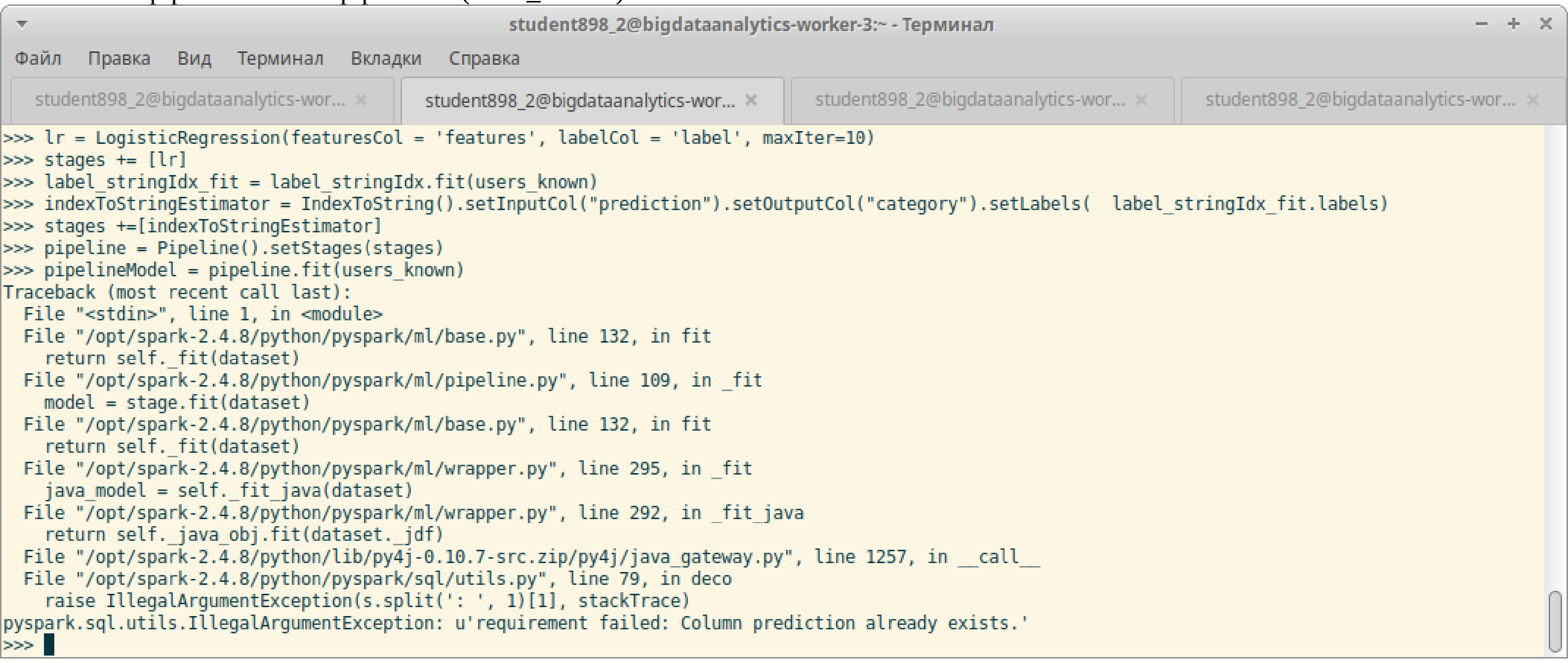
```
train, test = df.randomSplit([0.7, 0.3], seed = 2018)
print("Training Dataset Count: " + str(train.count()))
print("Test Dataset Count: " + str(test.count()))
from pyspark.ml.classification import LogisticRegression
lr = LogisticRegression(featuresCol = 'features', labelCol = 'label', maxIter=10)
lrModel = lr.fit(train)
```


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл
Правка
Вид
Терминал
Вкладки
Справка
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...

```
>>> train, test = df.randomSplit([0.7, 0.3], seed = 2018)
>>> print("Training Dataset Count: " + str(train.count()))
Training Dataset Count: 20664
>>> print("Test Dataset Count: " + str(test.count()))
Test Dataset Count: 8810
>>> from pyspark.ml.classification import LogisticRegression
>>> lr = LogisticRegression(featuresCol = 'features', labelCol = 'label', maxIter=10)
>>> lrModel = lr.fit(train)
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
  File "/opt/spark-2.4.8/python/pyspark/ml/base.py", line 132, in fit
    return self._fit(dataset)
  File "/opt/spark-2.4.8/python/pyspark/ml/wrapper.py", line 295, in _fit
    java_model = self._fit_java(dataset)
  File "/opt/spark-2.4.8/python/pyspark/ml/wrapper.py", line 292, in _fit_java
    return self._java_obj.fit(dataset._jdf)
  File "/opt/spark-2.4.8/python/lib/py4j-0.10.7-src.zip/py4j/java_gateway.py", line 1257, in __call__
  File "/opt/spark-2.4.8/python/pyspark/sql/utils.py", line 79, in deco
    raise IllegalArgumentException(s.split(': ', 1)[1], stackTrace)
pyspark.sql.utils.IllegalArgumentException: u'requirement failed: Column prediction already exists.'
>>> 
```

```
lr = LogisticRegression(featuresCol = 'features', labelCol = 'label', maxIter=10)
stages += [lr]
label_stringIdx_fit = label_stringIdx.fit(users_known)
indexToStringEstimator =
IndexToString().setInputCol("prediction").setOutputCol("category").setLabels(  label_stringIdx_fit.labels)
stages +=[indexToStringEstimator]
pipeline = Pipeline().setStages(stages)
```

pipelineModel = pipeline.fit(users_known)

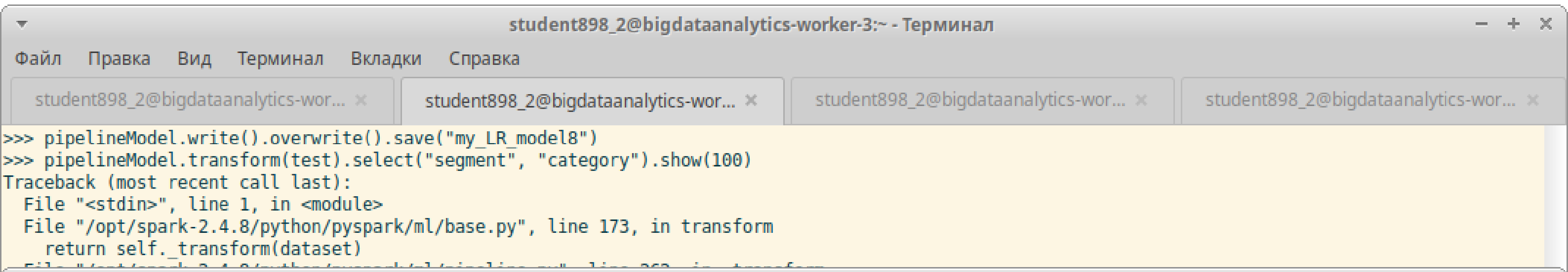


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл Правка Вид Терминал Вкладки Справка
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...

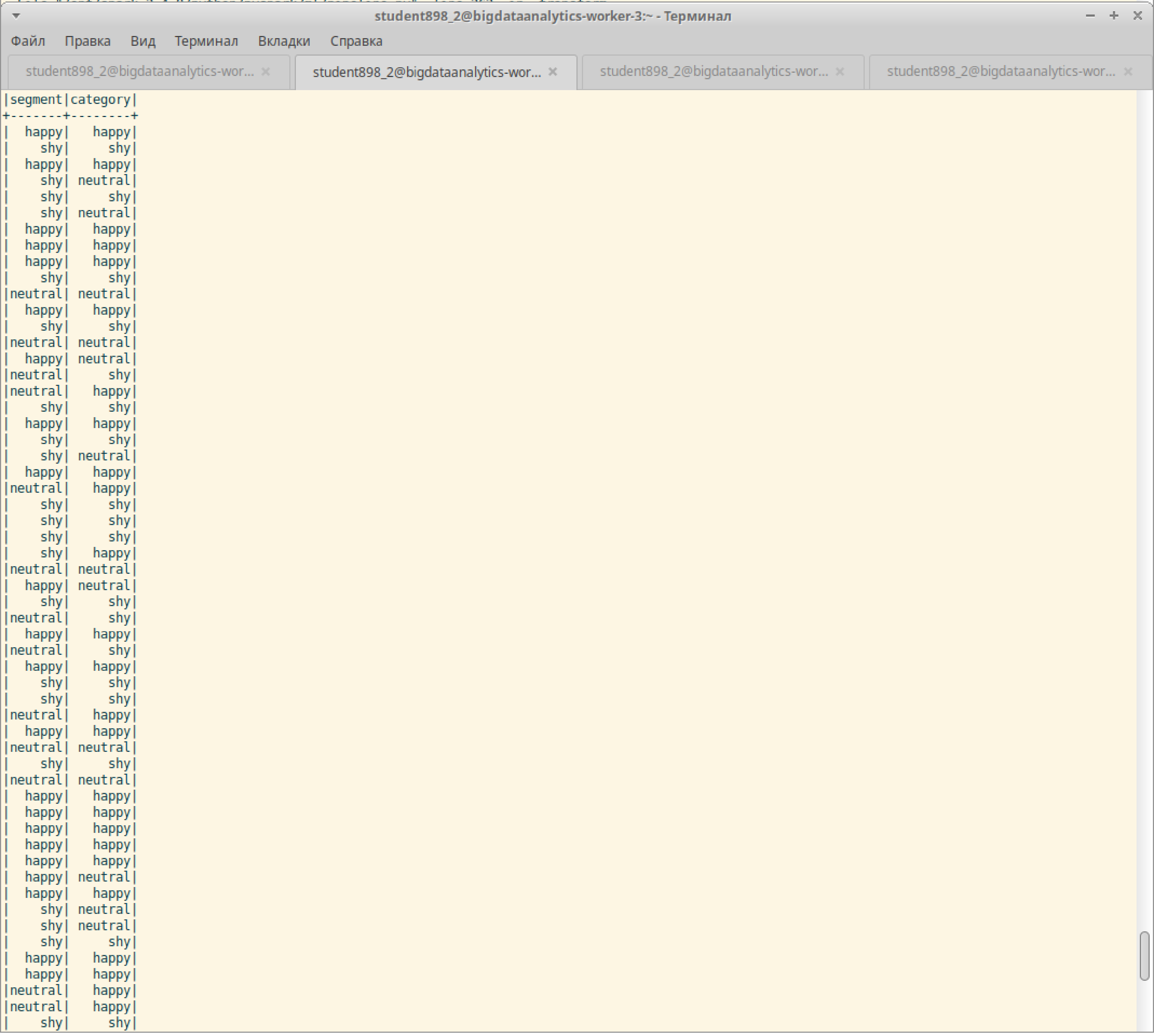
```
>>> lr = LogisticRegression(featuresCol = 'features', labelCol = 'label', maxIter=10)
>>> stages += [lr]
>>> label_stringIdx_fit = label_stringIdx.fit(users_known)
>>> indexToStringEstimator = IndexToString().setInputCol("prediction").setOutputCol("category").setLabels(  label_stringIdx_fit.labels)
>>> stages +=[indexToStringEstimator]
>>> pipeline = Pipeline().setStages(stages)
>>> pipelineModel = pipeline.fit(users_known)
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
  File "/opt/spark-2.4.8/python/pyspark/ml/base.py", line 132, in fit
    return self._fit(dataset)
  File "/opt/spark-2.4.8/python/pyspark/ml/pipeline.py", line 109, in _fit
    model = stage.fit(dataset)
  File "/opt/spark-2.4.8/python/pyspark/ml/base.py", line 132, in fit
    return self._fit(dataset)
  File "/opt/spark-2.4.8/python/pyspark/ml/wrapper.py", line 295, in _fit
    java_model = self._fit_java(dataset)
  File "/opt/spark-2.4.8/python/pyspark/ml/wrapper.py", line 292, in _fit_java
    return self._java_obj.fit(dataset._jdf)
  File "/opt/spark-2.4.8/python/lib/py4j-0.10.7-src.zip/py4j/java_gateway.py", line 1257, in __call__
  File "/opt/spark-2.4.8/python/pyspark/sql/utils.py", line 79, in deco
    raise IllegalArgumentException(s.split(': ', 1)[1], stackTrace)
pyspark.sql.utils.IllegalArgumentException: u'requirement failed: Column prediction already exists.'
>>>
```

pipelineModel.write().overwrite().save("my_LR_model8")

pipelineModel.transform(test).select("segment", "category").show(100)


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл Правка Вид Терминал Вкладки Справка
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...

```
>>> pipelineModel.write().overwrite().save("my_LR_model8")
>>> pipelineModel.transform(test).select("segment", "category").show(100)
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
  File "/opt/spark-2.4.8/python/pyspark/ml/base.py", line 173, in transform
    return self._transform(dataset)
```


student898_2@bigdataanalytics-worker-3:~ - Терминал
Файл Правка Вид Терминал Вкладки Справка
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...
student898_2@bigdataanalytics-wor...

```
|segment|category|
+-------+--------+
|  happy|   happy|
|    shy|     shy|
|  happy|   happy|
|    shy| neutral|
|    shy|     shy|
|    shy| neutral|
|  happy|   happy|
|  happy|   happy|
|  happy|   happy|
|    shy|     shy|
|neutral| neutral|
|  happy|   happy|
|    shy|     shy|
|neutral| neutral|
|  happy| neutral|
|neutral|     shy|
|neutral|   happy|
|    shy|     shy|
|  happy|   happy|
|    shy|     shy|
|    shy| neutral|
|  happy|   happy|
|neutral|   happy|
|    shy|     shy|
|    shy|     shy|
|    shy|     shy|
|    shy|   happy|
|neutral| neutral|
|  happy| neutral|
|    shy|     shy|
|neutral|     shy|
|  happy|   happy|
|neutral|     shy|
|  happy|   happy|
|    shy|     shy|
|    shy|     shy|
|neutral|   happy|
|  happy|   happy|
|neutral| neutral|
|    shy|     shy|
|neutral| neutral|
|  happy|   happy|
|  happy|   happy|
|  happy|   happy|
|  happy|   happy|
|  happy|   happy|
|  happy| neutral|
|  happy|   happy|
|    shy| neutral|
|    shy| neutral|
|    shy|     shy|
|  happy|   happy|
|  happy|   happy|
|neutral|   happy|
|neutral|   happy|
|    shy|     shy|
```

pipelineModel.transform(users_known).select("segment", "category").show(100)