Predict Future Sales

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Project Introduction
Data Set Preprocessing
Data Cleaning
Structured Data And Analysis
Profit Analysis
Predict Future Trend
Model Adopted
Summary

Introduction

Project Introduction

Defn

- Project Introduction
  Analyze the company's operating status, find out the relevant factors affecting the sales volume of goods, Taking the historical sales data set of convenience stores as the object of study, the data were preprocessed and feature extracted, and the model was used to train the data set to predict the sales volume of different goods in each store of the company in the next month.

Data Set Preprocessing

Preprocessing Of Project Data Sets

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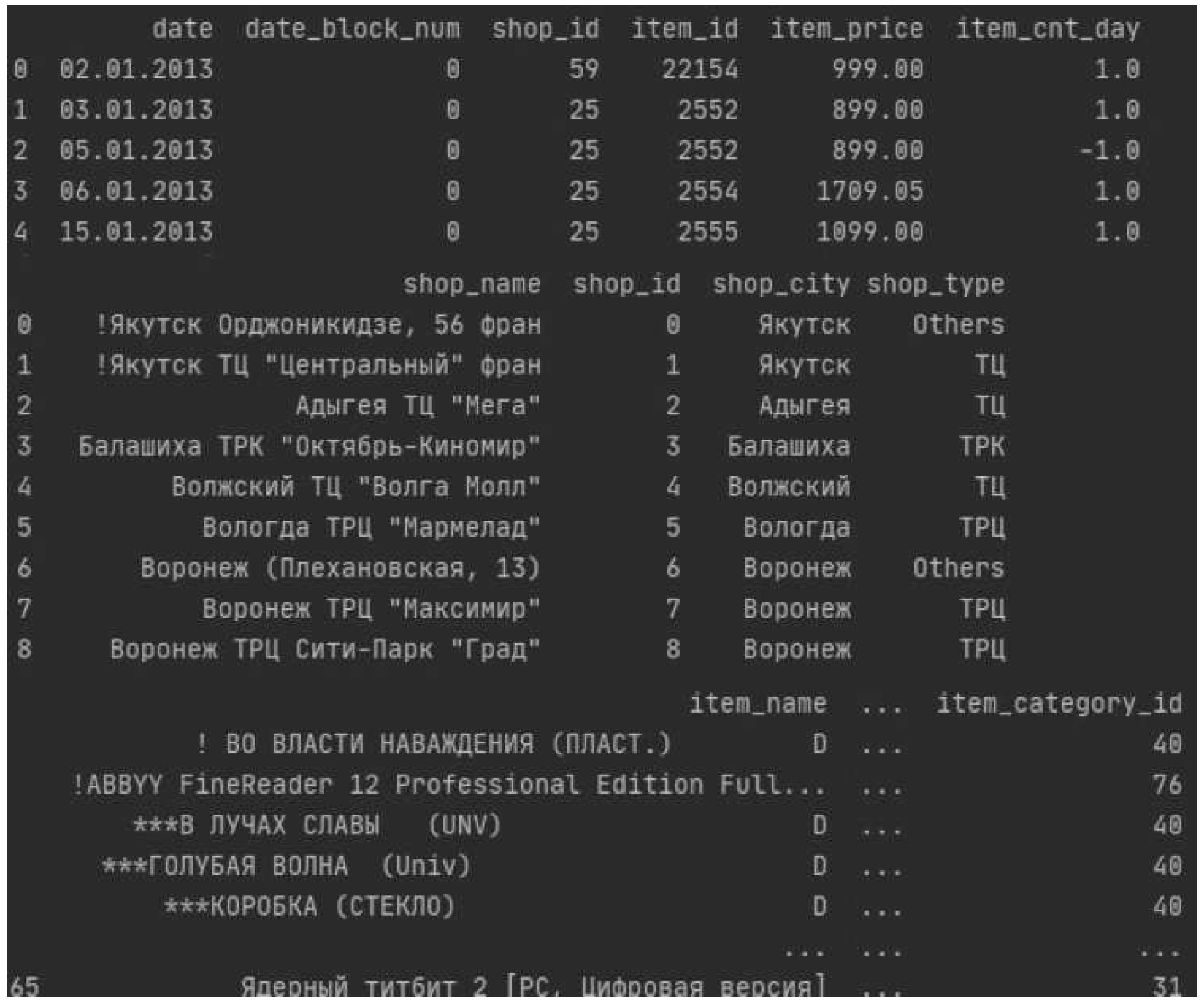
- Data Collection

  Download dataset from the kaggle project.



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0  02.01.2013               0       59    22154      999.00           1.0
1  03.01.2013               0       25     2552      899.00           1.0
2  05.01.2013               0       25     2552      899.00          -1.0
3  06.01.2013               0       25     2554     1709.05           1.0
4  15.01.2013               0       25     2555     1099.00           1.0
                        shop_name  shop_id  shop_city shop_type
0   !Якутск Орджоникидзе, 56 фран        0     Якутск    Others
1   !Якутск ТЦ "Центральный" фран        1     Якутск        ТЦ
2                Адыгея ТЦ "Мега"        2     Адыгея        ТЦ
3  Балашиха ТРК "Октябрь-Киномир"        3   Балашиха       ТРК
4        Волжский ТЦ "Волга Молл"        4   Волжский        ТЦ
5          Вологда ТРЦ "Мармелад"        5    Вологда       ТРЦ
6      Воронеж (Плехановская, 13)        6    Воронеж    Others
7          Воронеж ТРЦ "Максимир"        7    Воронеж       ТРЦ
8    Воронеж ТРЦ Сити-Парк "Град"        8    Воронеж       ТРЦ
                                            item_name  ...  item_category_id
               ! ВО ВЛАСТИ НАВАЖДЕНИЯ (ПЛАСТ.)         D  ...                40
    !ABBYY FineReader 12 Professional Edition Full...  ...                76
        ***В ЛУЧАХ СЛАВЫ   (UNV)                       D  ...                40
      ***ГОЛУБАЯ ВОЛНА  (Univ)                         D  ...                40
          ***КОРОБКА (СТЕКЛО)                          D  ...                40
                                                  ...  ...               ...
65              Ядерный титбит 2 [PC, Цифровая версия]  ...                31
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Data Cleaning

Training Set Data Cleaning

- Use a scatter plot to observe the distribution of commodity prices and daily sales.
- Filter for anomalies and apparent outliers

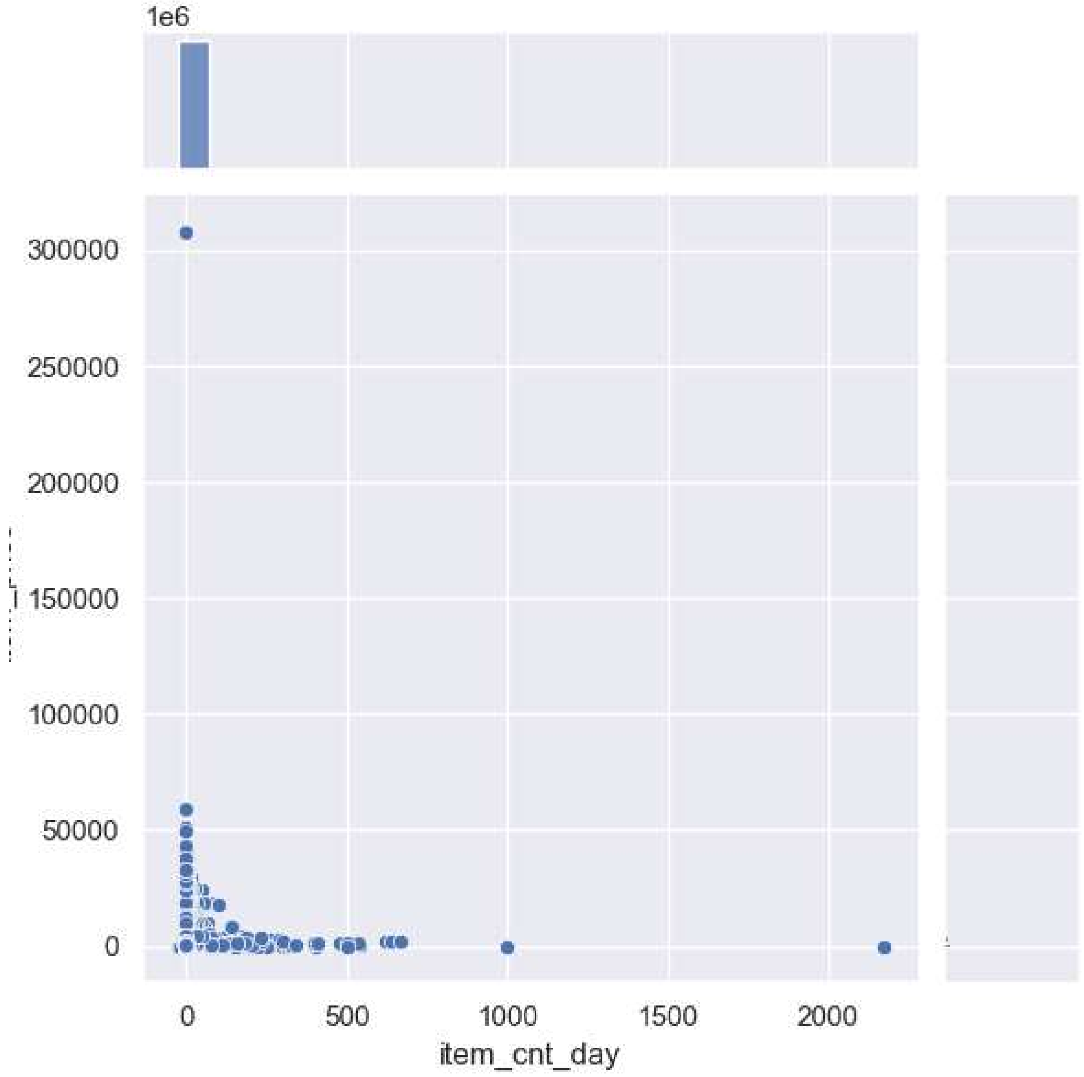


Figure 1: Distribution

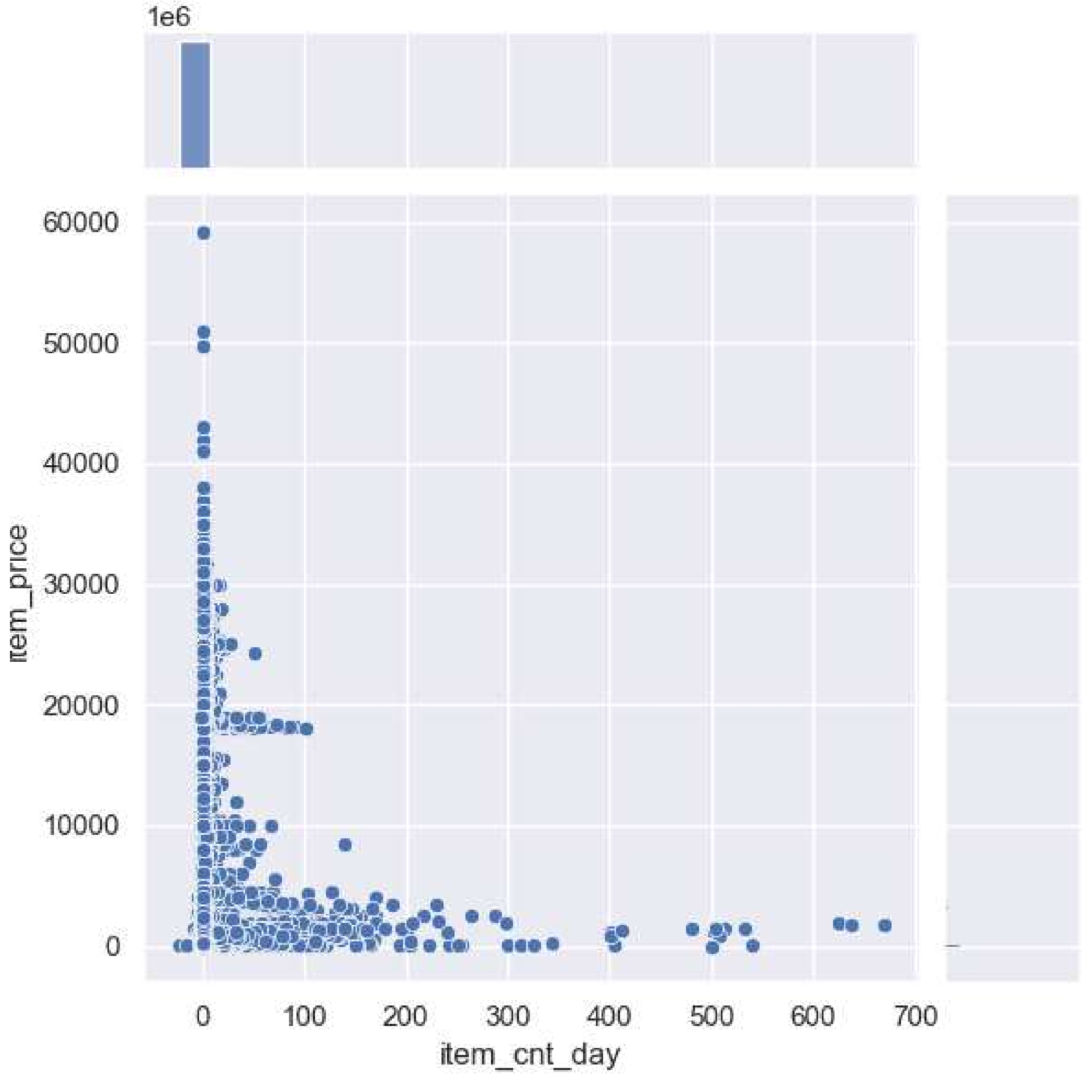


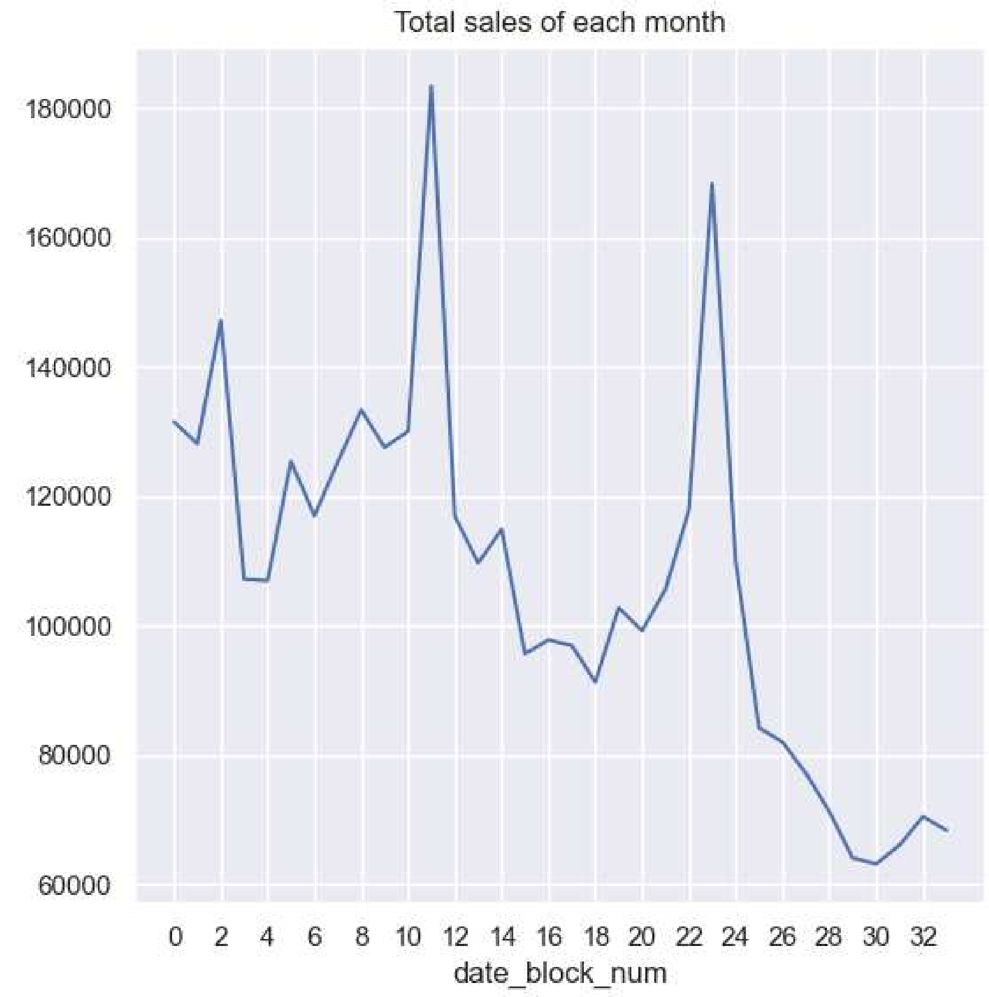
Figure 2: Filter Abnormal

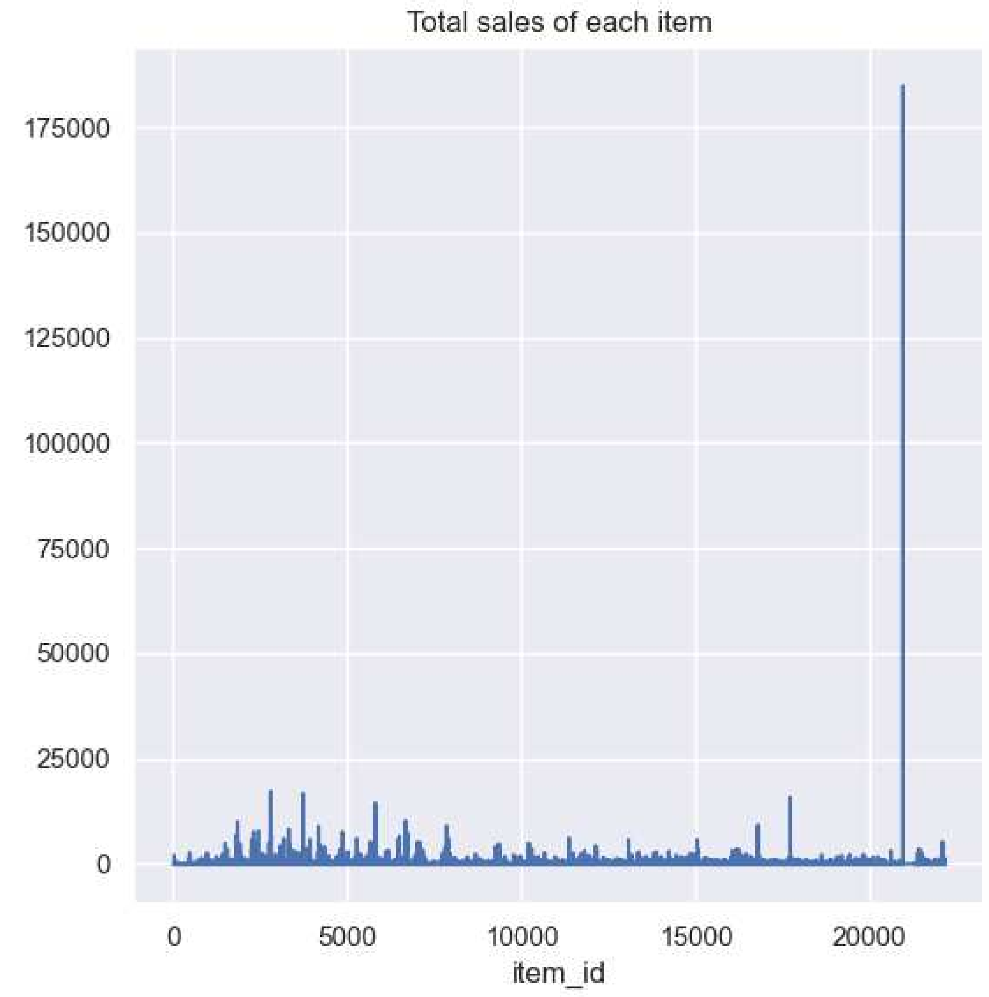
Structured Data And Analysis

Sales Analysis

Then, we created additional features. More specifically:

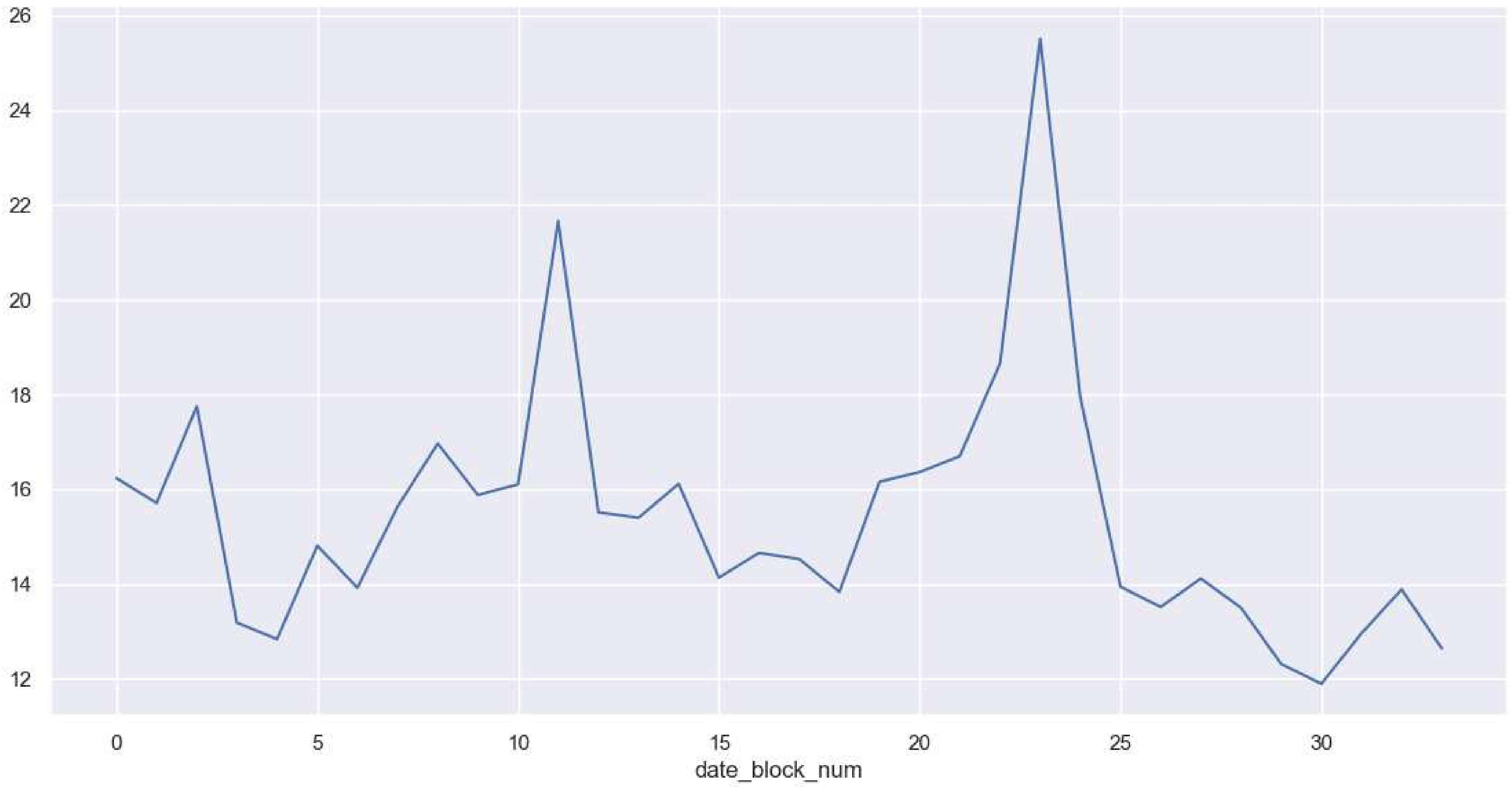
- Sales analysis
  Overall sales were down, and monthly sales were mostly down year on year. One item sold exceptionally well.





Sales Analysis

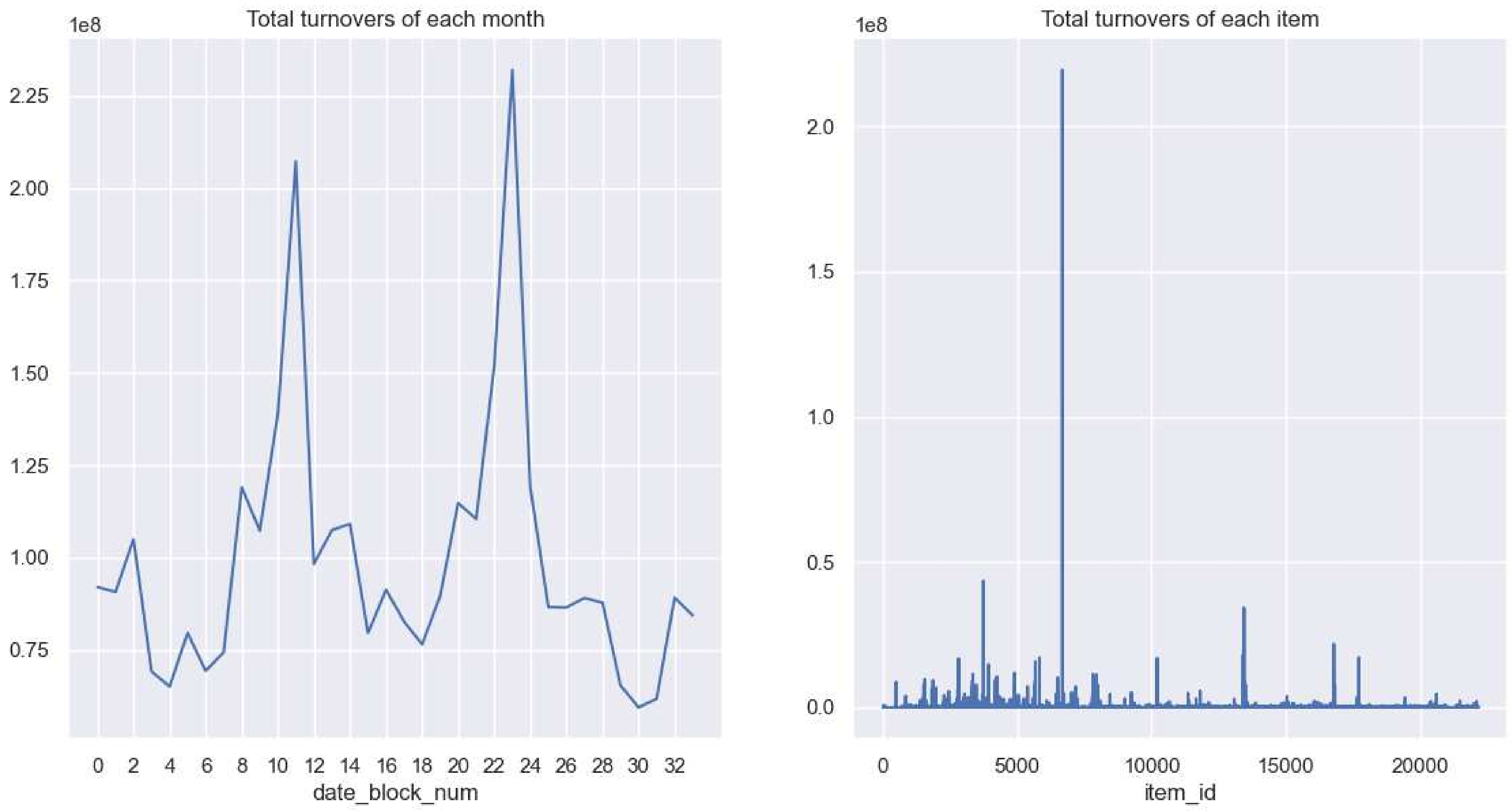
- Average number of items sold in the month
  In 2013 and 2014, the average monthly sales volume of goods under sale was basically 13-16, while in 2015, the average monthly sales volume of goods under sale decreased to 12-14.



Profit Analysis

Profit Analysis

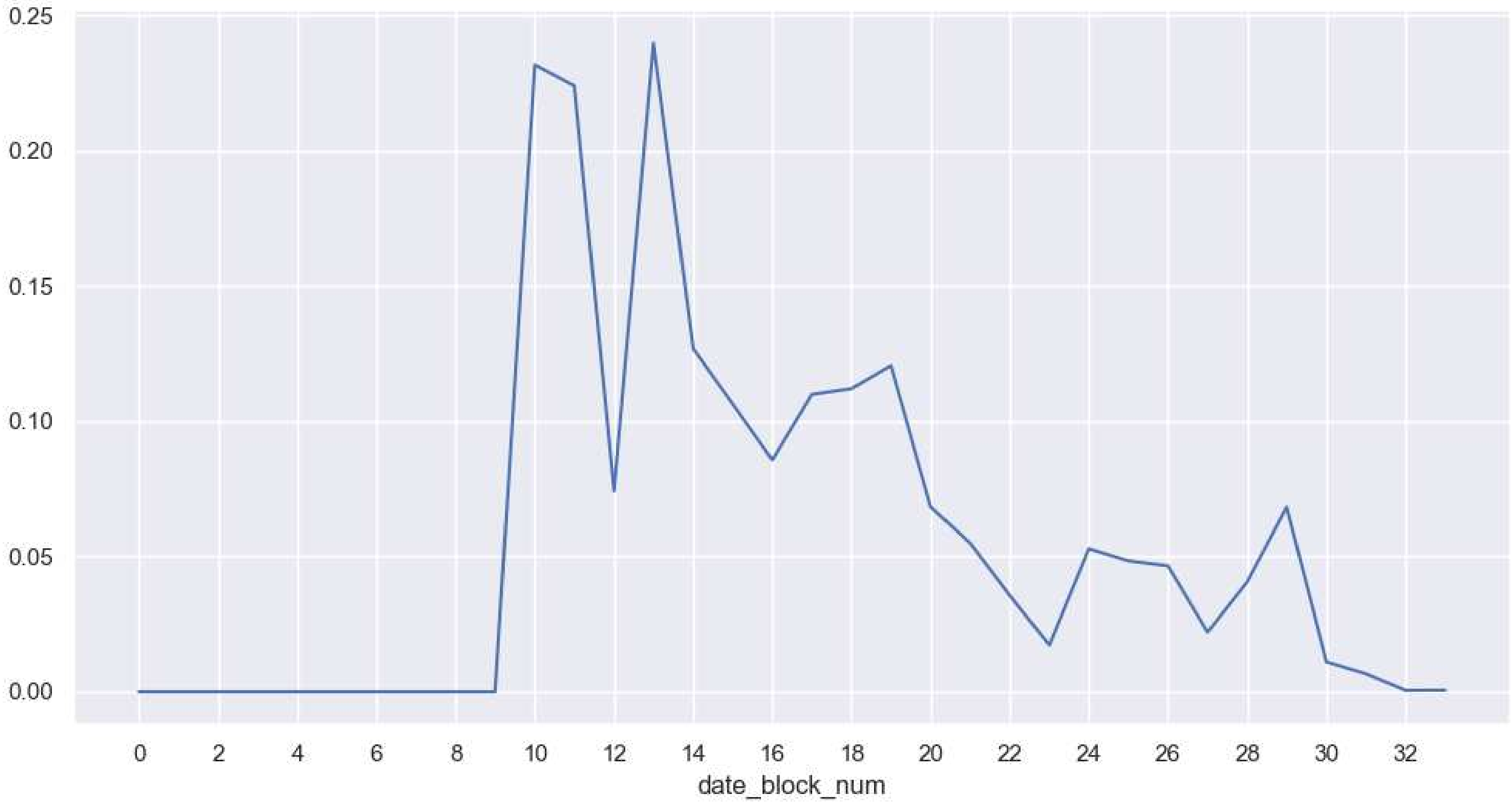
- turnover analysis



Profit Analysis

- The highest-grossing commodity

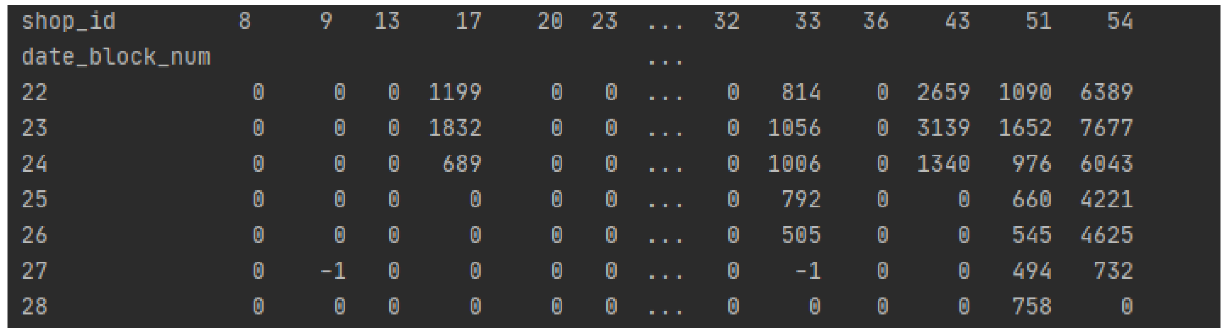
  The number one item in total revenue accounts for a percentage of monthly revenue



Predict Future Trend

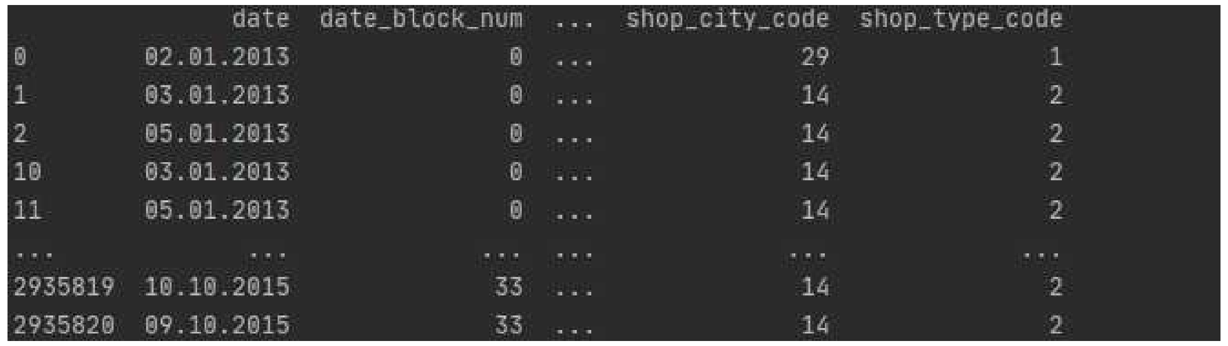
Working With Training Set

- Handle closed stores and discontinued goods.
- Only keep the goods that are normally operated in the last 6 months and the goods with sale volume.



```
shop_id          8     9   13    17    20  23  ...  32    33   36    43    51    54
date_block_num                                 ...
22               0     0    0  1199     0   0  ...   0   814    0  2659  1090  6389
23               0     0    0  1832     0   0  ...   0  1056    0  3139  1652  7677
24               0     0    0   689     0   0  ...   0  1006    0  1340   976  6043
25               0     0    0     0     0   0  ...   0   792    0     0   660  4221
26               0     0    0     0     0   0  ...   0   505    0     0   545  4625
27               0    -1    0     0     0   0  ...   0    -1    0     0   494   732
28               0     0    0     0     0   0  ...   0     0    0     0   758     0
```

Figure 3: Closed Stores



```
               date  date_block_num  ...  shop_city_code  shop_type_code
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1        03.01.2013               0  ...              14               2
2        05.01.2013               0  ...              14               2
10       03.01.2013               0  ...              14               2
11       05.01.2013               0  ...              14               2
...             ...             ...  ...             ...             ...
2935819  10.10.2015              33  ...              14               2
2935820  09.10.2015              33  ...              14               2
```
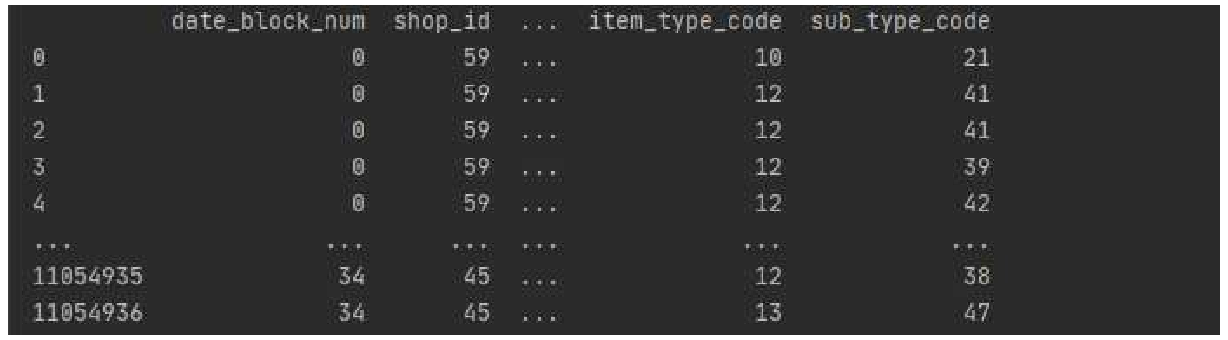

Figure 4: Normal Opreation

Characteristics Of The Processing

- use historical sales data to predict future sales.
  Using the historical sales data as the characteristics of the model,
  this month's sales results as labels to build a model for regression analysis.



```
          date_block_num  shop_id  ...  item_type_code  sub_type_code
0                      0       59  ...              10             21
1                      0       59  ...              12             41
2                      0       59  ...              12             41
3                      0       59  ...              12             39
4                      0       59  ...              12             42
...                  ...      ...  ...             ...            ...
11054935              34       45  ...              12             38
11054936              34       45  ...              13             47
```

Figure 5: Fusion Feature

Model Adopted

LightGBM Model

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LightGBM Model
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This project uses lightGBM model for training.
LightGBM is a fast, distributed, high-performance gradient enhancement framework based on decision tree algorithms.It supports category characteristics.
LightGBM supports category characteristics directly and natively by changing the decision rules of the decision tree algorithm, without transformation.

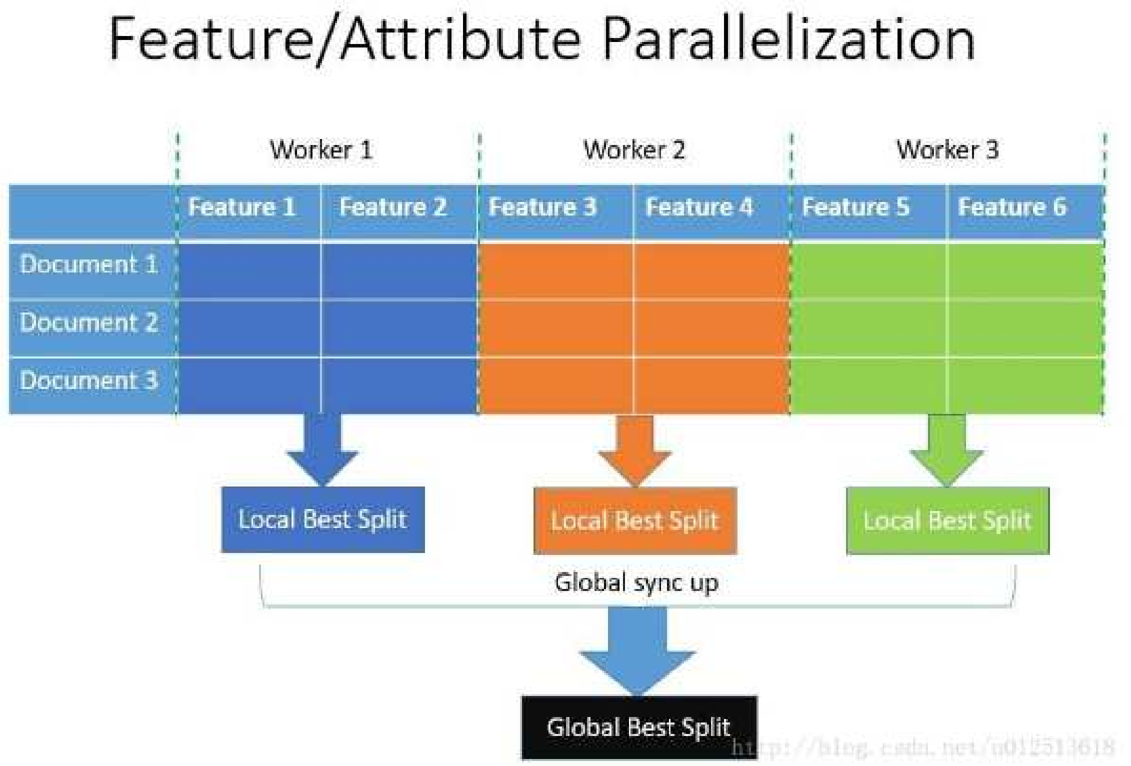

Figure 6: Feature Parallelization

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From data analysis methods to feature engineering and prediction model construction, a lot of time has been spent to study and comb.

Through this project, I have learned a lot, including the effective aspects of problem cutting, code implementation of analysis algorithm, design of analysis process, etc. which enables me to better grasp the thinking of data analysis on the whole.

In the process of predictive analysis, the theoretical and data support for feature analysis and model construction is not concise and powerful enough,which needs to be strengthened.