

SPRINT 2

| | |
|---------------|---|
| Date | 07-11-2022 |
| Team ID | PNT2022TMID35656 |
| Project Title | Analytics for Hospitals' Health-Care Data |

Data Cleaning and Preparation

In this data set, variables “City_code_patient” and “Bed Grade” have missing values. These missing values must be treated before feeding to the algorithm as they distort the model performance.

So, the missing values are replaced using the “mode” of the column. Since most of the variables in the dataset have ordinal data, we transformed them into levels by using a label encoder to perform further analysis on the data.

Distinct Observations of Ordinal Data

| Variables | Number of distinct observations |
|----------------------|--|
| Hospital_type_code | 7 |
| Hospital_region_code | 3 |
| Department | 5 |
| Ward_Type | 6 |
| Ward_Facility_Code | 6 |
| Type of Admission | 3 |
| Severity of Illness | 3 |
| Age | 10 |
| Stay | 11 |

Data Exploration in python

The screenshot shows a Jupyter Notebook interface with the title "Healthcare analytics.ipynb". The notebook contains three code cells. The first cell imports necessary libraries: numpy, pandas, matplotlib, and warnings. The second cell imports the 'train' and 'test' datasets using pandas' read_csv function. The third cell displays the first five rows of the 'train' dataset using the head() method. The output of the head() command is a table with 10 columns: case_id, Hospital_code, Hospital_type_code, City_Code_Hospital, Hospital_region_code, Available Extra Rooms in Hospital, Department, Ward_Type, and Ward_Facility. The first five rows of data are shown.

```
[1] import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
np.set_printoptions(suppress=True)
import warnings
warnings.filterwarnings('ignore')

[9] # Importing datasets
train = pd.read_csv('train.csv')
test = pd.read_csv('test.csv')

DATA EXPLORATION BEFORE DATASET CLEANING AND PREPARING

[10] train.head()
```

| | case_id | Hospital_code | Hospital_type_code | City_Code_Hospital | Hospital_region_code | Available Extra Rooms in Hospital | Department | Ward_Type | Ward_Facility |
|---|---------|---------------|--------------------|--------------------|----------------------|-----------------------------------|--------------|-----------|---------------|
| 0 | 1 | 8 | c | 3 | Z | 3 | radiotherapy | R | |
| 1 | 2 | 2 | c | 5 | Z | 2 | radiotherapy | S | |
| 2 | 3 | 10 | e | 1 | X | 2 | anesthesia | S | |
| 3 | 4 | 26 | b | 2 | Y | 2 | radiotherapy | R | |
| 4 | 5 | 26 | b | 2 | Y | 2 | radiotherapy | S | |



+ Code + Text



```
[11] train.info()
      train.Stay.unique()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 318438 entries, 0 to 318437
Data columns (total 18 columns):
 #   Column                                Non-Null Count  Dtype  
---  -
 0   case_id                             318438 non-null  int64  
 1   Hospital_code                       318438 non-null  int64  
 2   Hospital_type_code                  318438 non-null  object  
 3   City_Code_Hospital                 318438 non-null  int64  
 4   Hospital_region_code               318438 non-null  object  
 5   Available Extra Rooms in Hospital  318438 non-null  int64  
 6   Department                         318438 non-null  object  
 7   Ward_Type                          318438 non-null  object  
 8   Ward_Facility_Code                 318438 non-null  object  
 9   Bed Grade                          318325 non-null  float64 
10  patientid                          318438 non-null  int64  
11  City_Code_Patient                  313906 non-null  float64 
12  Type of Admission                  318438 non-null  object  
13  Severity of Illness                318438 non-null  object  
14  Visitors with Patient              318438 non-null  int64  
15  Age                               318438 non-null  object  
16  Admission_Deposit                  318438 non-null  float64 
17  Stay                              318438 non-null  object  
dtypes: float64(3), int64(6), object(9)
memory usage: 43.7+ MB
array(['0-10', '41-50', '31-40', '11-20', '51-60', '21-30', '71-80',
       'More than 100 Days', '81-90', '61-70', '91-100'], dtype=object)
```



+ Code + Text



```
✓ [12] # NA values in train dataset  
0s train.isnull().sum().sort_values(ascending = False)
```

| | |
|-----------------------------------|-------|
| City_Code_Patient | 4532 |
| Bed Grade | 113 |
| Hospital_code | 0 |
| Admission_Deposit | 0 |
| Age | 0 |
| Visitors with Patient | 0 |
| Severity of Illness | 0 |
| Type of Admission | 0 |
| patientid | 0 |
| case_id | 0 |
| Ward_Facility_Code | 0 |
| Ward_Type | 0 |
| Department | 0 |
| Available Extra Rooms in Hospital | 0 |
| Hospital_region_code | 0 |
| City_Code_Hospital | 0 |
| Hospital_type_code | 0 |
| Stay | 0 |
| dtype: | int64 |

```
✓ [13] # NA values in test dataset  
0s test.isnull().sum().sort_values(ascending = False)
```

| | |
|-------------------|------|
| City_Code_Patient | 2157 |
| Bed Grade | 35 |
| case_id | 0 |



+ Code + Text

✓
0s

```
[13] # NA values in test dataset
test.isnull().sum().sort_values(ascending = False)
```

```
City_Code_Patient      2157
Bed_Grade              35
case_id                0
Age                   0
Visitors with Patient  0
Severity of Illness    0
Type of Admission      0
patientid             0
Ward_Facility_Code     0
Hospital_code          0
Ward_Type              0
Department             0
Available Extra Rooms in Hospital  0
Hospital_region_code   0
City_Code_Hospital     0
Hospital_type_code     0
Admission_Deposit      0
dtype: int64
```

✓
0s

```
[14] # Dimension of train dataset
train.shape
```

```
(318438, 18)
```

✓

```
[15] # Dimension of test dataset
```



+ Code + Text



0s

```
[15] # Dimension of test dataset  
test.shape
```



```
(137057, 17)
```



0s

```
[16] # Number of distinct observations in train dataset  
for i in train.columns:  
    print(i, ': ', train[i].nunique())
```

```
case_id : 318438  
Hospital_code : 32  
Hospital_type_code : 7  
City_Code_Hospital : 11  
Hospital_region_code : 3  
Available Extra Rooms in Hospital : 18  
Department : 5  
Ward_Type : 6  
Ward_Facility_Code : 6  
Bed Grade : 4  
patientid : 92017  
City_Code_Patient : 37  
Type of Admission : 3  
Severity of Illness : 3  
Visitors with Patient : 28  
Age : 10  
Admission_Deposit : 7300  
Stay : 11
```





+ Code + Text



```
[17] # Number of distinct observations in test dataset
      for i in test.columns:
          print(i, ': ', test[i].nunique())
```

```
case_id : 137057
Hospital_code : 32
Hospital_type_code : 7
City_Code_Hospital : 11
Hospital_region_code : 3
Available Extra Rooms in Hospital : 15
Department : 5
Ward_Type : 6
Ward_Facility_Code : 6
Bed Grade : 4
patientid : 39607
City_Code_Patient : 37
Type of Admission : 3
Severity of Illness : 3
Visitors with Patient : 27
Age : 10
Admission_Deposit : 6609
```

DATA PREPARATION

```
Healthcare analytics .ipynb
File Edit View Insert Runtime Tools Help All changes saved

+ Code + Text

DATA PREPARATION

[18] #Replacing NA values in Bed Grade Column for both Train and Test datasets
train['Bed Grade'].fillna(train['Bed Grade'].mode()[0], inplace = True)
test['Bed Grade'].fillna(test['Bed Grade'].mode()[0], inplace = True)

[19] #Replacing NA values in City_Code_Patient Column for both Train and Test datasets
train['City_Code_Patient'].fillna(train['City_Code_Patient'].mode()[0], inplace = True)
test['City_Code_Patient'].fillna(test['City_Code_Patient'].mode()[0], inplace = True)

[20] # Label Encoding Stay column in train dataset
from sklearn.preprocessing import LabelEncoder
le = LabelEncoder()
train['Stay'] = le.fit_transform(train['Stay'].astype('str'))

[21] #Imputing dummy Stay column in test dataset to concatenate with train dataset
test['Stay'] = -1
df = pd.concat([train, test])
df.shape

(455495, 18)

[22] #Label Encoding all the columns in Train and test datasets
for i in ['Hospital_type_code', 'Hospital_region_code', 'Department',
          'Ward_Type', 'Ward_Facility_Code', 'Type of Admission', 'Severity of Illness', 'Age']:
    le = LabelEncoder()
    df[i] = le.fit_transform(df[i].astype(str))

[23] #Separating Train and Test Datasets
train = df[df['Stay']!= -1]
test = df[df['Stay']== -1]
```

Data exploration after preparing:

```
Healthcare analytics .ipynb
File Edit View Insert Runtime Tools Help All changes saved

+ Code + Text

DATA EXPLORATION AFTER DATASET PREPARATION

[24] train.head()

case_id  Hospital_code  Hospital_type_code  City_Code_Hospital  Hospital_region_code  Available
Extra Rooms in Hospital  Department  Ward_Type  Ward_Facility_Code  Bed Grade  patientid  City_Code_Patient  Type of Admission  Severity of Illness  Visitors with Age  Admission_Deposit  s
0      1      8      2      3      2      3      3      3      5  2.0  31997      7.0      0      0      2      5      4911.0
1      2      2      2      5      2      2      3      3      5  2.0  31997      7.0      1      0      2      5      5954.0
2      3      10      4      1      0      2      1      3      4  2.0  31997      7.0      1      0      2      5      4745.0
3      4      26      1      2      1      2      3      2      3  2.0  31997      7.0      1      0      2      5      7272.0
4      5      26      1      2      1      2      3      3      3  2.0  31997      7.0      1      0      2      5      5558.0

[26] test.head()

case_id  Hospital_code  Hospital_type_code  City_Code_Hospital  Hospital_region_code  Available
Extra Rooms in Hospital  Department  Ward_Type  Ward_Facility_Code  Bed Grade  patientid  City_Code_Patient  Type of Admission  Severity of Illness  Visitors with Age  Admission_Deposit  s
0  318439      21      2      3      2      3      2      3      0  2.0  17006      2.0      0      2      2      7      3095.0
1  318440      29      0      4      0      2      2      3      5  2.0  17006      2.0      1      2      4      7      4018.0
2  318441      26      1      2      1      3      2      1      3  4.0  17006      2.0      0      2      3      7      4492.0
3  318442      6      0      6      0      3      2      1      5  2.0  17006      2.0      1      2      3      7      4173.0
4  318443      28      1      11      0      2      2      2      5  2.0  17006      2.0      1      2      4      7      4161.0
```




Healthcare analytics .ipynb



File Edit View Insert Runtime Tools Help All changes saved



+ Code + Text



✓ [27] train.shape

0s

(318438, 18)

✓ [28] test.shape

0s

(137057, 18)

✓ [30] train.info()

0s

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 318438 entries, 0 to 318437
Data columns (total 18 columns):
#   Column                                Non-Null Count  Dtype
---  ---                                -
0   case_id                             318438 non-null  int64
1   Hospital_code                       318438 non-null  int64
2   Hospital_type_code                 318438 non-null  int64
3   City_Code_Hospital                 318438 non-null  int64
4   Hospital_region_code               318438 non-null  int64
5   Available Extra Rooms in Hospital  318438 non-null  int64
6   Department                         318438 non-null  int64
7   Ward_Type                          318438 non-null  int64
8   Ward_Facility_Code                 318438 non-null  int64
9   Bed Grade                          318438 non-null  float64
10  patientid                          318438 non-null  int64
11  City_Code_Patient                  318438 non-null  float64
12  Type of Admission                  318438 non-null  int64
13  Severity of Illness                318438 non-null  int64
14  Visitors with Patient              318438 non-null  int64
15  Age                               318438 non-null  int64
```



Healthcare analytics .ipynb ☆

File Edit View Insert Runtime Tools Help [All changes saved](#)



+ Code + Text



{x}



```
✓ [30] 16 Admission_Deposit      318438 non-null float64
      17 Stay                    318438 non-null int64
      dtypes: float64(3), int64(15)
      memory usage: 46.2 MB
```

```
✓ [31] test.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 137057 entries, 0 to 137056
Data columns (total 18 columns):
#   Column                                     Non-Null Count  Dtype
---  -
0   case_id                                   137057 non-null int64
1   Hospital_code                           137057 non-null int64
2   Hospital_type_code                       137057 non-null int64
3   City_Code_Hospital                      137057 non-null int64
4   Hospital_region_code                    137057 non-null int64
5   Available Extra Rooms in Hospital       137057 non-null int64
6   Department                              137057 non-null int64
7   Ward_Type                               137057 non-null int64
8   Ward_Facility_Code                      137057 non-null int64
9   Bed Grade                               137057 non-null float64
10  patientid                               137057 non-null int64
11  City_Code_Patient                       137057 non-null float64
12  Type of Admission                       137057 non-null int64
13  Severity of Illness                     137057 non-null int64
14  Visitors with Patient                   137057 non-null int64
15  Age                                      137057 non-null int64
16  Admission_Deposit                       137057 non-null float64
17  Stay                                    137057 non-null int64
dtypes: float64(3), int64(15)
memory usage: 19.9 MB
```

Jira Sprint 2 Tracking:

Jira Software

Your work

Projects

Filters





Dashboards

People

Apps

Create


Q Search





Healthcare-Analytics

Software project


PLANNING


 Roadmap


 Backlog


 Board

DEVELOPMENT

 Code




 Project pages

 Add shortcut


 Project settings

Projects / Healthcare-Analytics



Sprint 2

 12 days remaining

Complete sprint



Q



Sprint 1

Clear filters

GROUP BY None

Insights


TO DO 3 OF 3 ISSUES

IN PROGRESS


DONE

COMPLETED


Data cleaning in python




Data preparation in python



Data exploration in Python



Data cleaning in python



Jira Software

Your work

Projects

Filters





Dashboards

People

Apps

Create


Q Search





Healthcare-Analytics

Software project


PLANNING


 Roadmap


 Backlog


 Board

DEVELOPMENT

 Code

 Project pages

 Add shortcut

 Project settings

Projects / Healthcare-Analytics

Sprint 2

 12 days remaining

Complete sprint



Q



Sprint 1

Clear filters

GROUP BY None

Insights

TO DO 1 OF 1 ISSUE

IN PROGRESS 1 OF 1 ISSUE

DONE 1 OF 1 ISSUE

COMPLETED

Data exploration in Python



Data preparation in python

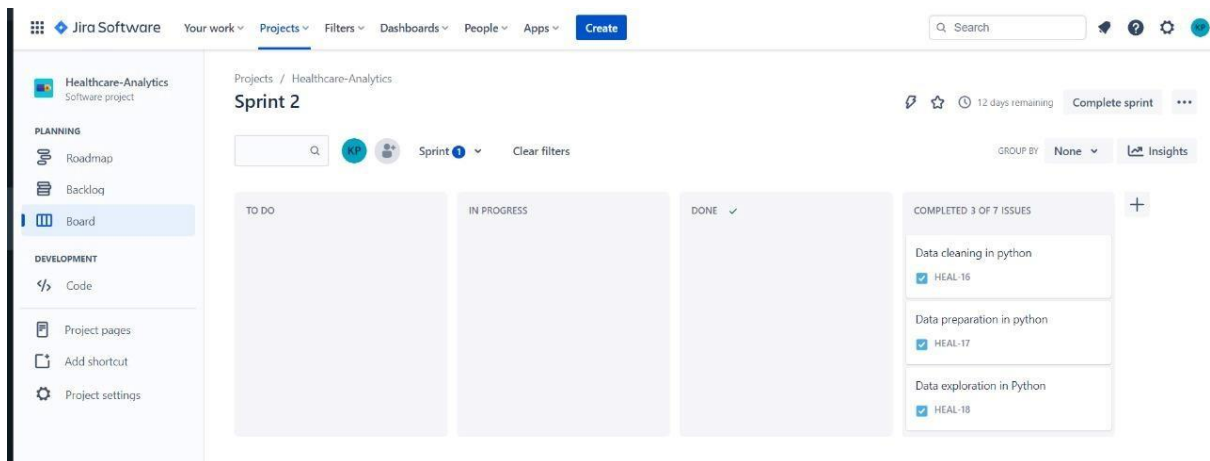


Data cleaning in python



Data cleaning in python





“Uploaded ipynb file in the sprint 2 folder in github.”