DATA WRANGLING

Pune City has been chosen because, it is among the fastest growing cities in India. It is a perfect mixture of new and old with its heritage and new MNCs setting up every day. Also, most of the street Names, Places and areas are named like western cities. So, It will be reliable to identify the names and cleaning them

Reference link for Pune.osm: https://mapzen.com/data/metro-extracts/metro/pune_india/

Size: 293MB (uncompressed)

First, some street types have been identified from the imported data by matching the last name of street name (i.e. usually a street name ends with a street type) with regular expression function. It was found that many of the last names of the street name were entered incorrectly or by using abbreviations (i.e. Road as rd or Rd. etc..) and some street names ended with numerical numbers representing the serial number of respective street name(eg: Lane 1, Avenue 4 etc..) and some are ended with ‘, Pune ’.

Secondly, since Pune is a district, it was required to differentiate Pune city from Pune district ,I found that Postal code can be used to differentiate Pune city from Pune District ie..areas with postal codes ranging from 411001 and 411053 lie inside Pune city region and rest lie outside Pune city .Overall 37 postal codes lie outside Pune city ,647 lie inside Pune city circumference and 13 postal codes were wrongly specified

AUDITING:

1.A list was created for wrongly specified street types and updated the wrongly entered street names by mapping, the numerical numbers at the end of street names removed and replaced “,” or “,pune” with “”

2.In the first iteration of postal code Auditing, the postal codes which had white space characters present in postal codes were identified and updated.

3.In the second iteration, I found that some Postal codes were entered as string and In third iteration I found some pin codes wrongly entered as a string and colon “ : ” present in the string with help of regular expression(“^([a-z]|_)+:”) I’ve updated the both postal codes as NONE

4.Below there are some data mentioned before and after Auditing

STREET NAMES:

Before Auditing		After Auditing
Kalyani nagar	-	Kalyani Nagar
Gulawani Maharaj Rd	-	Gulawani Maharaj Road
Hinjewadi Phase 1	-	Hinjewadi Phase
Echinus Court road	-	Echinus Court Road
Vega Center Swargate,	-	Vega Center Swargate
finolex chaulk	-	finolex Chowk

POSTAL CODES:

Before Auditing		After Auditing
410506	-	None
Paschimanagari	-	None
411 021	-	411021

Preparing for Data Base:

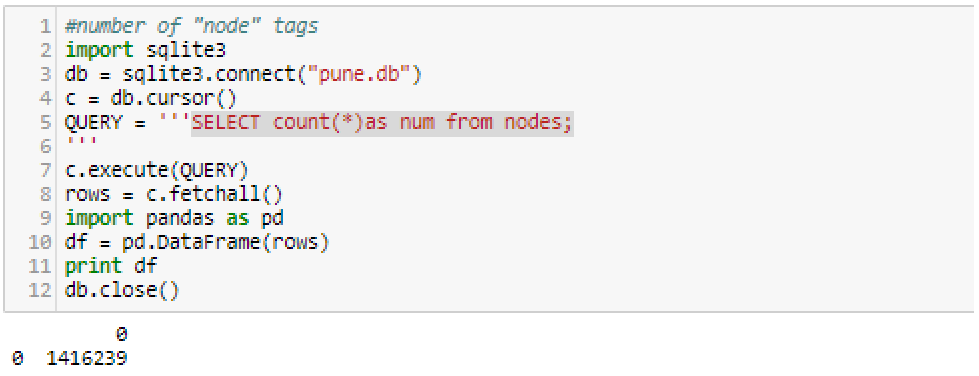
After auditing the data, the cleaned data is exported into respective dictionaries nodes ,tags, ways, ways nodes and ways _tags in CSV format the sizes of the files are mentioned below

FILE		SIZE
nodes.csv	-	113 MB
nodes_tags.csv	-	490 KB
ways.csv	-	15.7 MB
ways_nodes.csv	-	39 MB
ways_tags.csv	-	8.98 MB

QUERIES USING DATA BASE:

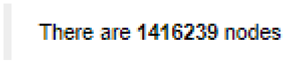
A data base named pune.db was created with schema. Furthermore, the following questions were explored.

1. Number of Nodes:



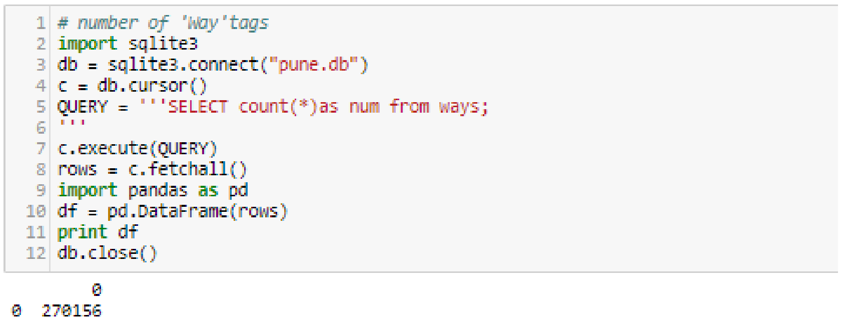
```
#number of "node" tags
import sqlite3
db = sqlite3.connect("pune.db")
c = db.cursor()
QUERY = '''SELECT count(*)as num from nodes;
'''
c.execute(QUERY)
rows = c.fetchall()
import pandas as pd
df = pd.DataFrame(rows)
print df
db.close()
```

```
         0
0  1416239
```



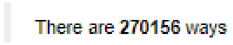
There are **1416239** nodes

2. Number of Ways:



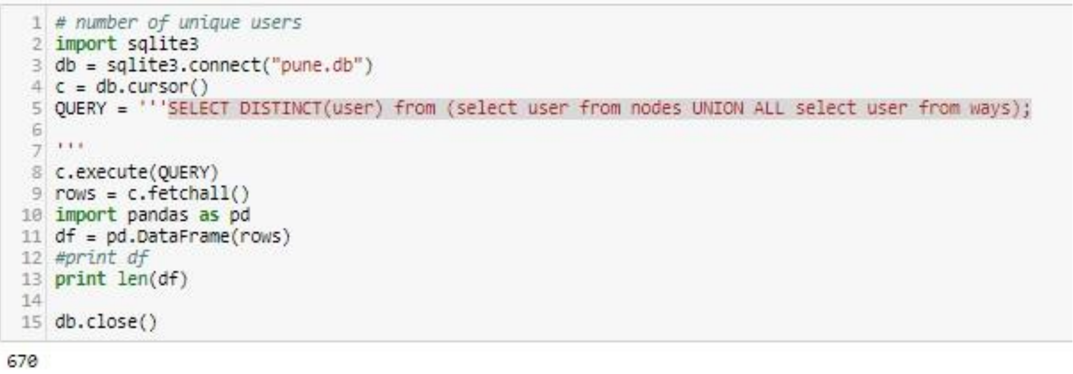
```
# number of 'Way'tags
import sqlite3
db = sqlite3.connect("pune.db")
c = db.cursor()
QUERY = '''SELECT count(*)as num from ways;
'''
c.execute(QUERY)
rows = c.fetchall()
import pandas as pd
df = pd.DataFrame(rows)
print df
db.close()
```

```
        0
0  270156
```



There are **270156** ways

3. Number of Unique users:

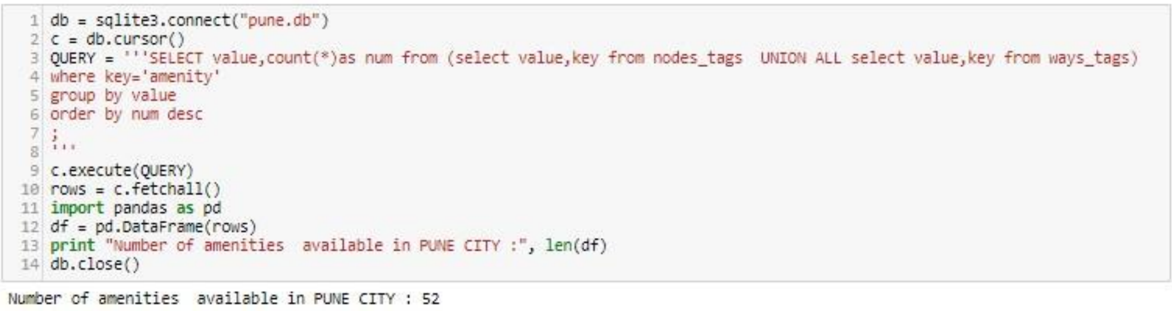


```
# number of unique users
import sqlite3
db = sqlite3.connect("pune.db")
c = db.cursor()
QUERY = '''SELECT DISTINCT(user) from (select user from nodes UNION ALL select user from ways);

'''
c.execute(QUERY)
rows = c.fetchall()
import pandas as pd
df = pd.DataFrame(rows)
#print df
print len(df)

db.close()
```

```
670
```

> There are 670 unique users

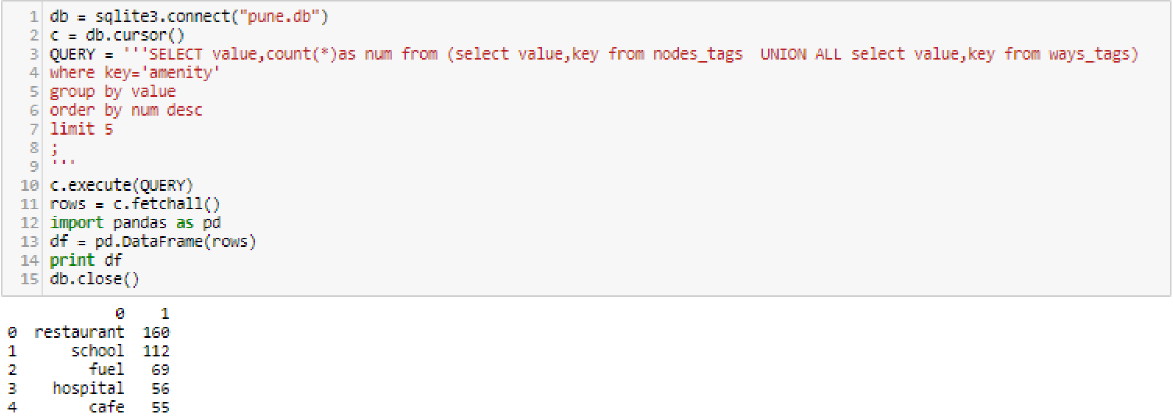
4.Number of amenities available in pune:



```
db = sqlite3.connect("pune.db")
c = db.cursor()
QUERY = '''SELECT value,count(*)as num from (select value,key from nodes_tags  UNION ALL select value,key from ways_tags)
where key='amenity'
group by value
order by num desc
;
'''
c.execute(QUERY)
rows = c.fetchall()
import pandas as pd
df = pd.DataFrame(rows)
print "Number of amenities  available in PUNE CITY :", len(df)
db.close()
```

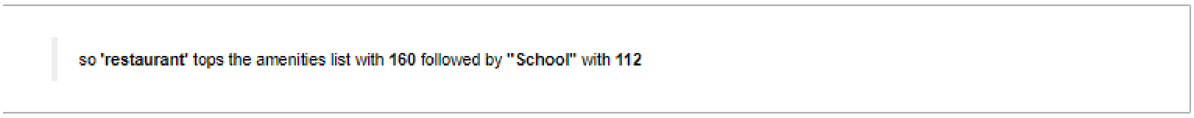
```
Number of amenities  available in PUNE CITY : 52
```

5.Top 5 Amenities:



```
db = sqlite3.connect("pune.db")
c = db.cursor()
QUERY = '''SELECT value,count(*)as num from (select value,key from nodes_tags  UNION ALL select value,key from ways_tags)
where key='amenity'
group by value
order by num desc
limit 5
;
'''
c.execute(QUERY)
rows = c.fetchall()
import pandas as pd
df = pd.DataFrame(rows)
print df
db.close()
```

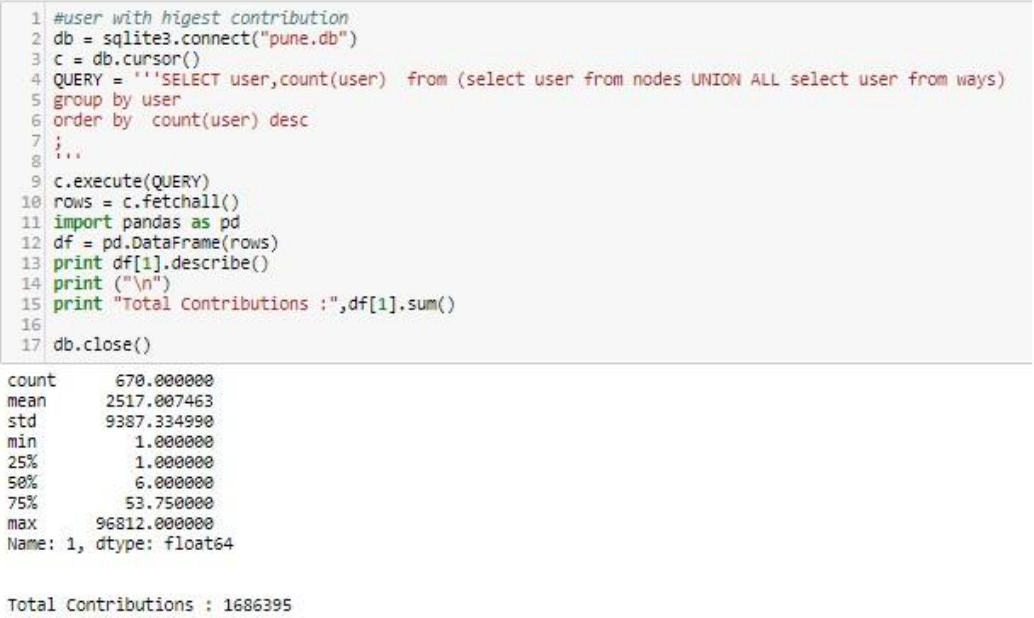
```
            0    1
0  restaurant  160
1      school  112
2        fuel   69
3    hospital   56
4        cafe   55
```



> so **'restaurant'** tops the amenities list with **160** followed by **"School"** with **112**

ADDITIONAL IDEAS:

User and Contribution facts:



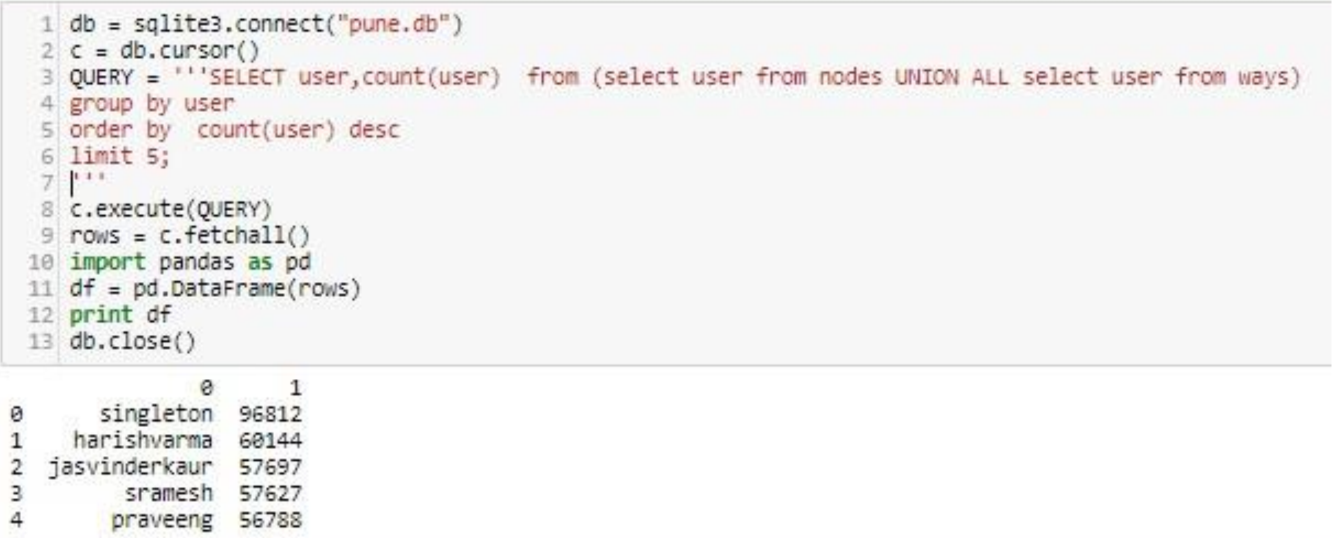
```
#user with higest contribution
db = sqlite3.connect("pune.db")
c = db.cursor()
QUERY = '''SELECT user,count(user)  from (select user from nodes UNION ALL select user from ways)
group by user
order by  count(user) desc
;
'''
c.execute(QUERY)
rows = c.fetchall()
import pandas as pd
df = pd.DataFrame(rows)
print df[1].describe()
print ("\n")
print "Total Contributions :",df[1].sum()

db.close()
```

```
count      670.000000
mean      2517.007463
std       9387.334990
min          1.000000
25%          1.000000
50%          6.000000
75%         53.750000
max      96812.000000
Name: 1, dtype: float64


Total Contributions : 1686395
```

- Total 1686395 contributions were received.
- User named Singleton has contributed more than any other contributors.
- 179 users holds the least contribution rate with only one post of contribution.

Additional Data Exploration:

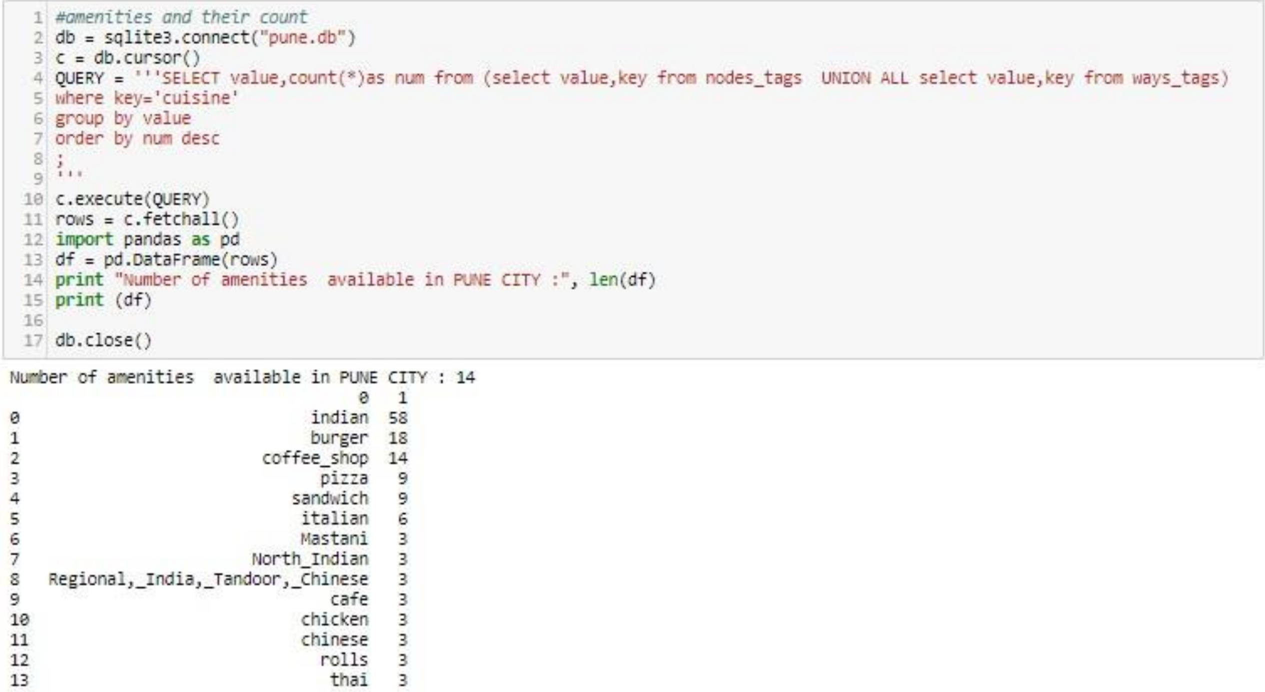
Top 5 Contributers:



```
db = sqlite3.connect("pune.db")
c = db.cursor()
QUERY = '''SELECT user,count(user)  from (select user from nodes UNION ALL select user from ways)
group by user
order by  count(user) desc
limit 5;
'''
c.execute(QUERY)
rows = c.fetchall()
import pandas as pd
df = pd.DataFrame(rows)
print df
db.close()
```

```
               0      1
0      singleton  96812
1    harishvarma  60144
2  jasvinderkaur  57697
3        sramesh  57627
4       praveeng  56788
```

Cuisines available and their count :



```
#amenities and their count
db = sqlite3.connect("pune.db")
c = db.cursor()
QUERY = '''SELECT value,count(*)as num from (select value,key from nodes_tags  UNION ALL select value,key from ways_tags)
where key='cuisine'
group by value
order by num desc
;
'''
c.execute(QUERY)
rows = c.fetchall()
import pandas as pd
df = pd.DataFrame(rows)
print "Number of amenities  available in PUNE CITY :", len(df)
print (df)

db.close()
```

```
Number of amenities  available in PUNE CITY : 14
                                    0   1
0                              indian  58
1                              burger  18
2                         coffee_shop  14
3                               pizza   9
4                            sandwich   9
5                             italian   6
6                             Mastani   3
7                        North_Indian   3
8   Regional,_India,_Tandoor,_Chinese   3
9                                cafe   3
10                            chicken   3
11                            chinese   3
12                              rolls   3
13                               thai   3
```

Future Implementation:

From the analysis of the Pune Dataset, it was established that it is still far from perfect, at least when compared to data from western cities. This can be attributed to lack of previous work on the data set. One way of generating interest is with a reward system for contributions. Rewards could be given based on number of contributions. Reward could be trials of related products and so on.

A foresee-able downside to this method could be people making meaningless contributions just to get their hands on the rewards. So, checks should be kept in place to check whether people are not just duplicating changes, etc.

Conclusion:

After series of iterations in Auditing process, I believe that the data which was concentrated on, ie. Street names and pin codes have been cleaned and analyzed well in exploration phase .

Also it was found from initial analysis that, a lot of street names were intentionally incorrect. Some Pin code entries even had words of people in them. It was almost as if people were trying to leave a mark on the maps. But as all crowd sourced data, it's hard to maintain consistent quality control. Of course, it is free to alter and access, but it’s a long way from other map services such as Google maps.

References:

The Open Street Maps WIKI, particularly the elements section.

The sample project provided in the instructor notes.

https://discussions.udacity.com/t/p3-openstreetmap-overview/172045

https://discussions.udacity.com/t/problem-creating-sample-osm-file-for-p3/296583

Load of posts from Myles.

Help from fellow nanodegree students.