Analisis-Mongodb

April 24, 2018

1 Análisis de datos con Python y MongoDB

La información del dataset proporcionada por el departamento Policial de San Francisco, se encuentra abierta al público y contiene datos de todas las incidencias generadas por actividades criminales producidas desde el año 2003 hasta la actualidad. Usaremos la base de datos datascience que hemos creado en MongoDB con la coleccion incidents.

```
In [95]: %config IPCompleter.greedy=True
```

```
In [96]: %matplotlib inline
         %config InlineBackend.figure_format='svg'
         from IPython.display import display,HTML
         import pandas as pd
         import seaborn as sns
         from scipy.stats import kendalltau
         import numpy as np
         import math
         import matplotlib.pyplot as plt

         from prettypandas import PrettyPandas
         sns.set(style="ticks")
         sns.set_context(context="notebook",font_scale=1)

         import string
         import tqdm # a cool progress bar
         import re
         import json

         import pymongo
         from pymongo import MongoClient
```

1.1 Conexión con la base de datos

```
In [97]: print('Mongo version', pymongo.__version__)
         client = MongoClient('localhost', 27017)
         db = client.datascience
         collection = db.incidents
```

```
Mongo version 3.4.0
```

1.2 Estructura de los datos (documentos y colecciones)

Calculamos cuantos documentos tenemos en la coleccion

```
In [98]: d = db.incidents.count()
         d
```

```
Out[98]: 2186988
```

```
In [99]: #Check if you can access the data from the MongoDB.
         cursor = collection.find().sort('sex',pymongo.ASCENDING).limit(1)
         for doc in cursor:
             print(doc)
```

```
{'_id': ObjectId('5ac48f27a2eb3a9495192d44'), 'IncidntNum': 150060275, 'Category': 'NON-CRIMINAL
```

```
In [100]: pipeline = [
                  {"$match": {"Category":"ROBBERY"}},
          ]

          aggResult = collection.aggregate(pipeline)
          robbery = pd.DataFrame(list(aggResult))
          robbery.head()
```

Out[100]:

	Address	Category	Date	DayOfWeek	\
0	300 Block of LEAVENWORTH ST	ROBBERY	02/01/2015	Sunday	
1	2200 Block of MARKET ST	ROBBERY	02/01/2015	Sunday	
2	PACIFIC AV / GRANT AV	ROBBERY	02/01/2015	Sunday	
3	PACIFIC AV / GRANT AV	ROBBERY	02/01/2015	Sunday	
4	400 Block of ELLIS ST	ROBBERY	02/01/2015	Sunday	

	Descript	IncidntNum	\
0	ROBBERY, BODILY FORCE	150098210	
1	ROBBERY, ARMED WITH A KNIFE	150098367	
2	ROBBERY ON THE STREET, STRONGARM	150098414	
3	ROBBERY, BODILY FORCE	150098414	
4	ATTEMPTED ROBBERY WITH A DEADLY WEAPON	150098420	

	Location	PdDistrict	PdId	\
0	(37.7841907151119, -122.414406029855)	TENDERLOIN	15009821003074	
1	(37.7651107322703, -122.432198022433)	MISSION	15009836703072	
2	(37.7969028838908, -122.406831986427)	CENTRAL	15009841403014	
3	(37.7969028838908, -122.406831986427)	CENTRAL	15009841403074	
4	(37.784696907904, -122.413609328985)	TENDERLOIN	15009842003473	

```
       Resolution   Time           X          Y                        _id
0            NONE  15:45 -122.414406  37.784191  5ac48f27a2eb3a9495192d45
1            NONE  16:20 -122.432198  37.765111  5ac48f27a2eb3a9495192d52
2  ARREST, BOOKED  17:05 -122.406832  37.796903  5ac48f27a2eb3a9495192d58
3  ARREST, BOOKED  17:05 -122.406832  37.796903  5ac48f27a2eb3a9495192d59
4  ARREST, BOOKED  17:10 -122.413609  37.784697  5ac48f27a2eb3a9495192d5d
```

In [102]:
```
pipeline = [
        {"$match": {"Category":"ASSAULT"}},
]

aggResult = collection.aggregate(pipeline)
assault = pd.DataFrame(list(aggResult))
assault.head()
```

Out[102]:
```
                        Address Category        Date DayOfWeek  \
0  300 Block of LEAVENWORTH ST  ASSAULT  02/01/2015    Sunday
1        PACIFIC AV / GRANT AV  ASSAULT  02/01/2015    Sunday
2        PACIFIC AV / GRANT AV  ASSAULT  02/01/2015    Sunday
3        400 Block of ELLIS ST  ASSAULT  02/01/2015    Sunday
4     2000 Block of MISSION ST  ASSAULT  02/01/2015    Sunday

                                Descript  IncidntNum  \
0  AGGRAVATED ASSAULT WITH BODILY FORCE   150098210
1  AGGRAVATED ASSAULT WITH BODILY FORCE   150098414
2         BATTERY WITH SERIOUS INJURIES   150098414
3  AGGRAVATED ASSAULT WITH BODILY FORCE   150098420
4           BATTERY OF A POLICE OFFICER   150098458

                                Location  PdDistrict            PdId  \
0  (37.7841907151119, -122.414406029855)  TENDERLOIN  15009821004014
1  (37.7969028838908, -122.406831986427)     CENTRAL  15009841404014
2  (37.7969028838908, -122.406831986427)     CENTRAL  15009841404136
3   (37.784696907904, -122.413609328985)  TENDERLOIN  15009842004014
4   (37.764228935718, -122.419520367886)     MISSION  15009845804154

       Resolution   Time           X          Y                        _id
0            NONE  15:45 -122.414406  37.784191  5ac48f27a2eb3a9495192d46
1  ARREST, BOOKED  17:05 -122.406832  37.796903  5ac48f27a2eb3a9495192d5b
2  ARREST, BOOKED  17:05 -122.406832  37.796903  5ac48f27a2eb3a9495192d5c
3  ARREST, BOOKED  17:10 -122.413609  37.784697  5ac48f27a2eb3a9495192d5e
4  ARREST, BOOKED  16:56 -122.419520  37.764229  5ac48f27a2eb3a9495192d62
```

In [103]:
```
pipeline = [
        {"$match": {"Category":"DRUG/NARCOTIC"}},
]

aggResult = collection.aggregate(pipeline)
```

```
drug = pd.DataFrame(list(aggResult))
drug.head()
```

Out[103]:

	Address	Category	Date	DayOfWeek	Descript	IncidntNum	Location	PdDistrict	PdId	Resolution	Time	X	Y	_id
0	1700 Block of HARRISON ST	DRUG/NARCOTIC	02/01/2015	Sunday	POSSESSION OF METH-AMPHETAMINE	150098345	(37.7690748003847, -122.413354187018)	MISSION	15009834516650	ARREST, BOOKED	14:00	-122.413354	37.769075	5ac48f27a2eb3a9495192d4f
1	1700 Block of HARRISON ST	DRUG/NARCOTIC	02/01/2015	Sunday	POSSESSION OF NARCOTICS PARAPHERNALIA	150098345	(37.7690748003847, -122.413354187018)	MISSION	15009834516710	ARREST, BOOKED	14:00	-122.413354	37.769075	5ac48f27a2eb3a9495192d50
2	2000 Block of MISSION ST	DRUG/NARCOTIC	02/01/2015	Sunday	POSSESSION OF BASE/ROCK COCAINE FOR SALE	150098458	(37.764228935718, -122.419520367886)	MISSION	15009845816623	ARREST, BOOKED	16:56	-122.419520	37.764229	5ac48f27a2eb3a9495192d64
3	MISSION ST / 15TH ST	DRUG/NARCOTIC	02/01/2015	Sunday	POSSESSION OF METH-AMPHETAMINE	150098527	(37.7666737551835, -122.419827929961)	MISSION	15009852716650	ARREST, BOOKED	17:02	-122.419828	37.766674	5ac48f27a2eb3a9495192d6e
4	700 Block of MARKET ST	DRUG/NARCOTIC	02/01/2015	Sunday	POSSESSION OF MARIJUANA	150098997	(37.7871160984672, -122.403919148357)	SOUTHERN	15009899716010	NONE	20:35	-122.403919	37.787116	5ac48f27a2eb3a9495192da7

1.2.1 Calculamos tipos de resoluciones existen en nuestros datos

In [104]:
```
db.incidents.distinct( "Resolution" )
```

Out[104]:
```
['NONE',
 'ARREST, BOOKED',
 'EXCEPTIONAL CLEARANCE',
 'ARREST, CITED',
 'UNFOUNDED',
 'JUVENILE BOOKED',
 'CLEARED-CONTACT JUVENILE FOR MORE INFO',
 'PSYCHOPATHIC CASE',
 'LOCATED',
 'JUVENILE ADMONISHED',
 'COMPLAINANT REFUSES TO PROSECUTE',
 'PROSECUTED BY OUTSIDE AGENCY',
 'NOT PROSECUTED',
```

```
            'JUVENILE CITED',
            'JUVENILE DIVERTED',
            'DISTRICT ATTORNEY REFUSES TO PROSECUTE',
            'PROSECUTED FOR LESSER OFFENSE']
```

1.2.2 Distribución por tipos de delitos

```
In [105]: print("{} robberies ({:.1%}), {} assaults ({:.1%}), {} drugs ({:.1%})".format(
              len(robbery),len(robbery)/d,
              len(assault),len(assault)/d,
              len(drug),len(drug)/d))
```

```
55242 robberies (2.5%), 191952 assaults (8.8%), 118739 drugs (5.4%)
```

```
In [106]: from pprint import pprint
          cursor = collection.find().sort('Category',pymongo.ASCENDING).limit(10)
          for doc in cursor:
              pprint(doc)
```

```
{'Address': 'SACRAMENTO ST / POLK ST',
 'Category': 'ARSON',
 'Date': '01/04/2014',
 'DayOfWeek': 'Saturday',
 'Descript': 'ARSON',
 'IncidntNum': 140009459,
 'Location': '(37.7914943051906, -122.420874632415)',
 'PdDistrict': 'NORTHERN',
 'PdId': 14000945926030,
 'Resolution': 'ARREST, BOOKED',
 'Time': '03:52',
 'X': -122.420874632415,
 'Y': 37.7914943051906,
 '_id': ObjectId('5ac48f27a2eb3a9495192d63')}
{'Address': '500 Block of VALENCIA ST',
 'Category': 'ARSON',
 'Date': '02/02/2015',
 'DayOfWeek': 'Monday',
 'Descript': 'ARSON OF AN INHABITED DWELLING',
 'IncidntNum': 150100081,
 'Location': '(37.7640888944532, -122.421876488492)',
 'PdDistrict': 'MISSION',
 'PdId': 15010008126036,
 'Resolution': 'ARREST, BOOKED',
 'Time': '10:05',
 'X': -122.421876488492,
 'Y': 37.7640888944532,
 '_id': ObjectId('5ac48f27a2eb3a9495192e25')}
{'Address': '200 Block of SHOTWELL ST',
```

```
 'Category': 'ARSON',
 'Date': '02/02/2015',
 'DayOfWeek': 'Monday',
 'Descript': 'ARSON OF A VEHICLE',
 'IncidntNum': 150100677,
 'Location': '(37.7644225165568, -122.416374835778)',
 'PdDistrict': 'MISSION',
 'PdId': 15010067726031,
 'Resolution': 'NONE',
 'Time': '12:56',
 'X': -122.416374835778,
 'Y': 37.7644225165568,
 '_id': ObjectId('5ac48f27a2eb3a9495192e63')}
{'Address': '0 Block of REARDON RD',
 'Category': 'ARSON',
 'Date': '02/02/2015',
 'DayOfWeek': 'Monday',
 'Descript': 'ARSON OF A VEHICLE',
 'IncidntNum': 150102162,
 'Location': '(37.7294874636559, -122.376900658814)',
 'PdDistrict': 'BAYVIEW',
 'PdId': 15010216226031,
 'Resolution': 'NONE',
 'Time': '20:30',
 'X': -122.376900658814,
 'Y': 37.7294874636559,
 '_id': ObjectId('5ac48f27a2eb3a9495192f10')}
{'Address': '0 Block of MIDDLEPOINT RD',
 'Category': 'ARSON',
 'Date': '02/03/2015',
 'DayOfWeek': 'Tuesday',
 'Descript': 'ARSON OF A VEHICLE',
 'IncidntNum': 150102877,
 'Location': '(37.7357419068572, -122.37934537972)',
 'PdDistrict': 'BAYVIEW',
 'PdId': 15010287726031,
 'Resolution': 'NONE',
 'Time': '05:08',
 'X': -122.37934537972,
 'Y': 37.7357419068572,
 '_id': ObjectId('5ac48f27a2eb3a9495192f6f')}
{'Address': '300 Block of SAWYER ST',
 'Category': 'ARSON',
 'Date': '02/03/2015',
 'DayOfWeek': 'Tuesday',
 'Descript': 'ARSON OF AN INHABITED DWELLING',
 'IncidntNum': 150104209,
 'Location': '(37.7137889657104, -122.414200995694)',
```

```
 'PdDistrict': 'INGLESIDE',
 'PdId': 15010420926036,
 'Resolution': 'NONE',
 'Time': '13:15',
 'X': -122.414200995694,
 'Y': 37.7137889657104,
 '_id': ObjectId('5ac48f27a2eb3a9495193007')}
{'Address': 'INGERSON AV / GRIFFITH ST',
 'Category': 'ARSON',
 'Date': '02/02/2015',
 'DayOfWeek': 'Monday',
 'Descript': 'ARSON OF A VEHICLE',
 'IncidntNum': 150106249,
 'Location': '(37.716962016099, -122.389279211854)',
 'PdDistrict': 'BAYVIEW',
 'PdId': 15010624926031,
 'Resolution': 'NONE',
 'Time': '02:06',
 'X': -122.389279211854,
 'Y': 37.716962016099,
 '_id': ObjectId('5ac48f27a2eb3a94951930fb')}
{'Address': '700 Block of ROLPH ST',
 'Category': 'ARSON',
 'Date': '02/03/2015',
 'DayOfWeek': 'Tuesday',
 'Descript': 'ARSON OF A VEHICLE',
 'IncidntNum': 150106534,
 'Location': '(37.7117445002313, -122.431015257276)',
 'PdDistrict': 'INGLESIDE',
 'PdId': 15010653426031,
 'Resolution': 'NONE',
 'Time': '18:00',
 'X': -122.431015257276,
 'Y': 37.7117445002313,
 '_id': ObjectId('5ac48f27a2eb3a949519311a')}
{'Address': 'TEHAMA ST / 1ST ST',
 'Category': 'ARSON',
 'Date': '06/17/2014',
 'DayOfWeek': 'Tuesday',
 'Descript': 'ARSON',
 'IncidntNum': 140504120,
 'Location': '(37.7880925564265, -122.395481217023)',
 'PdDistrict': 'SOUTHERN',
 'PdId': 14050412026030,
 'Resolution': 'NONE',
 'Time': '22:11',
 'X': -122.395481217023,
 'Y': 37.7880925564265,
```

```
 '_id': ObjectId('5ac48f27a2eb3a94951933c6')}
{'Address': '700 Block of BAY ST',
 'Category': 'ARSON',
 'Date': '02/06/2015',
 'DayOfWeek': 'Friday',
 'Descript': 'ARSON',
 'IncidntNum': 150115585,
 'Location': '(37.8048384367685, -122.419359266314)',
 'PdDistrict': 'CENTRAL',
 'PdId': 15011558526030,
 'Resolution': 'NONE',
 'Time': '21:00',
 'X': -122.419359266314,
 'Y': 37.8048384367685,
 '_id': ObjectId('5ac48f27a2eb3a9495193508')}
```

```
In [107]: # aislar los dias Sunday
          aggResult = collection.aggregate([{"$match": {"DayOfWeek":"Sunday"}}])
          sunday = pd.DataFrame(list(aggResult))

In [108]: # aislar los dias Saturday
          aggResult = collection.aggregate([{"$match": {"DayOfWeek":"Saturday"}}])
          saturday = pd.DataFrame(list(aggResult))

In [109]: print("{} Domingos ({:.1%}), {} Sabados ({:.1%})".format(
              len(sunday),len(sunday)/d,
              len(saturday),len(saturday)/d))
```

```
290936 Domingos (13.3%), 316451 Sabados (14.5%)
```

1.3 Consultas y vistas

- Obtener actividad criminal
- Obtener actividad criminal en un rango/periodo de tiempo
- Actividad criminal por zonas o distrito
- Actividad criminal por tipo de delito

1.3.1 Obtener actividad criminal de forma específica

-

```
In [110]: db.incidents.count({"DayOfWeek":"Sunday"})
```

Out[110]: 290936

-

In [111]:
```
pipeline = [
        {"$match": {"Date":"02/01/2015"}},
]

aggResult = collection.aggregate(pipeline)
dia = pd.DataFrame(list(aggResult))
dia.head()
```

Out[111]:

	Address	Category	Date	DayOfWeek	Descript	IncidntNum	Location	PdDistrict	PdId	Resolution	Time	X	Y	_id
0	300 Block of LEAVENWORTH ST	ROBBERY	02/01/2015	Sunday	ROBBERY, BODILY FORCE	150098210	(37.7841907151119, -122.414406029855)	TENDERLOIN	15009821003074	NONE	15:45	-122.414406	37.784191	5ac48f27a2eb3a9495192d45
1	300 Block of LEAVENWORTH ST	ASSAULT	02/01/2015	Sunday	AGGRAVATED ASSAULT WITH BODILY FORCE	150098210	(37.7841907151119, -122.414406029855)	TENDERLOIN	15009821004014	NONE	15:45	-122.414406	37.784191	5ac48f27a2eb3a9495192d46
2	300 Block of LEAVENWORTH ST	SECONDARY CODES	02/01/2015	Sunday	DOMESTIC VIOLENCE	150098210	(37.7841907151119, -122.414406029855)	TENDERLOIN	15009821015200	NONE	15:45	-122.414406	37.784191	5ac48f27a2eb3a9495192d47
3	400 Block of LOCUST ST	NON-CRIMINAL	02/01/2015	Sunday	AIDED CASE -PROPERTY FOR DESTRUCTION	150098232	(37.7870853907529, -122.451781767894)	RICHMOND	15009823251041	NONE	16:21	-122.451782	37.787085	5ac48f27a2eb3a9495192d49
4	1700 Block of HARRISON ST	LARCENY/THEFT	02/01/2015	Sunday	PETTY THEFT SHOPLIFTING	150098345	(37.7690748003847, -122.413354187018)	MISSION	15009834506362	ARREST, BOOKED	14:00	-122.413354	37.769075	5ac48f27a2eb3a9495192d4e

-

```
In [112]: db.incidents.count({"Date":"02/01/2015"})
```

```
Out[112]: 466
```

1.3.2 Actividad criminal por zona/distrito

-

```
In [113]: pipeline = [
                {'$match': {'Address':{'$regex': 'LEAVENWORTH'}}},
          ]

          aggResult = collection.aggregate(pipeline)
          zona = pd.DataFrame(list(aggResult))
          zona.head()
```

```
Out[113]:                          Address           Category        Date DayOfWeek  \
          0     300 Block of LEAVENWORTH ST            ROBBERY  02/01/2015    Sunday
          1     300 Block of LEAVENWORTH ST            ASSAULT  02/01/2015    Sunday
          2     300 Block of LEAVENWORTH ST    SECONDARY CODES  02/01/2015    Sunday
          3  MCALLISTER ST / LEAVENWORTH ST  RECOVERED VEHICLE  02/01/2015    Sunday
          4  MCALLISTER ST / LEAVENWORTH ST     OTHER OFFENSES  02/01/2015    Sunday

                                          Descript  IncidntNum  \
          0                    ROBBERY, BODILY FORCE   150098210
          1      AGGRAVATED ASSAULT WITH BODILY FORCE   150098210
          2                         DOMESTIC VIOLENCE   150098210
          3                 VEHICLE, RECOVERED, AUTO   150098919
          4  CONTRIBUTING TO THE DELINQUENCY OF MINOR   150098919

                                        Location  PdDistrict            PdId  \
          0  (37.7841907151119, -122.414406029855)  TENDERLOIN  15009821003074
          1  (37.7841907151119, -122.414406029855)  TENDERLOIN  15009821004014
          2  (37.7841907151119, -122.414406029855)  TENDERLOIN  15009821015200
          3  (37.7809258336852, -122.413679376888)  TENDERLOIN  15009891907041
          4  (37.7809258336852, -122.413679376888)  TENDERLOIN  15009891915030

                 Resolution   Time           X          Y                       _id
          0            NONE  15:45 -122.414406  37.784191  5ac48f27a2eb3a9495192d45
```

```
1             NONE  15:45 -122.414406  37.784191  5ac48f27a2eb3a9495192d46
2             NONE  15:45 -122.414406  37.784191  5ac48f27a2eb3a9495192d47
3  JUVENILE BOOKED  19:53 -122.413679  37.780926  5ac48f27a2eb3a9495192d99
4  JUVENILE BOOKED  19:53 -122.413679  37.780926  5ac48f27a2eb3a9495192d9a
```

-

In [114]:
```
pipeline = [
        {'$match': {'Date':{'$regex': '2013'},'Category':'ROBBERY'}},
]

aggResult = collection.aggregate(pipeline)
act = pd.DataFrame(list(aggResult))
act.head()
```

Out[114]:
```
                     Address Category        Date  DayOfWeek  \
0  1600 Block of KIRKWOOD AV  ROBBERY  02/10/2013     Sunday
1     2200 Block of GEARY BL  ROBBERY  09/18/2013  Wednesday
2       FULTON ST / BAKER ST  ROBBERY  02/27/2013  Wednesday
3      MARKET ST / CASTRO ST  ROBBERY  03/15/2013     Friday
4   HAYES ST / DIVISADERO ST  ROBBERY  09/26/2013   Thursday

                          Descript  IncidntNum  \
0       ROBBERY, ARMED WITH A KNIFE   130117084
1             ROBBERY, BODILY FORCE   130790232
2  ROBBERY ON THE STREET WITH A GUN   130168366
3             ROBBERY, BODILY FORCE   130215296
4      ATTEMPTED ROBBERY WITH A GUN   130810830

                                Location PdDistrict            PdId  \
0  (37.7386625599684, -122.390952930587)    BAYVIEW  13011708403072
1  (37.7833242481047, -122.440341074545)       PARK  13079023203074
2  (37.7764331716134, -122.441488426414)       PARK  13016836603011
3  (37.7626702770872, -122.435187699349)    MISSION  13021529603074
4  (37.7749912944366, -122.437799703468)       PARK  13081083003471

  Resolution   Time           X          Y                       _id
0       NONE  01:46 -122.390953  37.738663  5ac48f2fa2eb3a94951ce496
1       NONE  23:00 -122.440341  37.783324  5ac48f2fa2eb3a94951ce73c
2       NONE  02:32 -122.441488  37.776433  5ac48f2fa2eb3a94951ce804
3       NONE  03:15 -122.435188  37.762670  5ac48f2fa2eb3a94951cea67
4       NONE  07:15 -122.437800  37.774991  5ac48f2fa2eb3a94951ceac5
```

1.4 Funciones auxiliares

Una pequeña función para contar el número de documentos según una colección dada.

```
In [115]: def mongo_stats(mg_coll, filter={}):
              try:
                  # connect to database
                  client = MongoClient('localhost', 27017)
                  db = client.datascience

                  coll = db[mg_coll]
                  return coll.find(filter).count()
              except:
                  return False
```

```
In [116]: mongo_stats("incidents")
```

```
Out[116]: 2186988
```

1.4.1 O una función para obtener el último documento por fecha:

```
In [117]: def get_last_doc(mg_coll, filter = {}, query_limit = 1):
              try:
                  # connect to database
                  client = MongoClient('localhost', 27017)
                  db = client.datascience

                  coll = db[mg_coll]
                  cursor = coll.find(filter, limit=query_limit).sort('date',pymongo.ASCENDING)
                  return cursor

              except Exception as e:
                  print ("No se pudo conectar a la base de datos: ", e)
```

```
In [118]: from pprint import pprint
          for doc in get_last_doc("incidents"):
              pprint(doc)
```

```
{'Address': '18TH ST / VALENCIA ST',
 'Category': 'NON-CRIMINAL',
 'Date': '01/19/2015',
```

```
'DayOfWeek': 'Monday',
'Descript': 'LOST PROPERTY',
'IncidntNum': 150060275,
'Location': '(37.7617007179518, -122.42158168137)',
'PdDistrict': 'MISSION',
'PdId': 15006027571000,
'Resolution': 'NONE',
'Time': '14:00',
'X': -122.42158168137,
'Y': 37.7617007179518,
'_id': ObjectId('5ac48f27a2eb3a9495192d44')}
```