databricksproject

```
"""
Preprocess data and save it to tables:
1. Read data into a pyspark dataframe.
2. column selection.
3. convert data type.
4. transform data to what will be used on tables if needed.
5. sort by date.
"""
%python

# process covid data
from pyspark.sql import functions as F
from pyspark.sql import types as T
from pyspark.sql.functions import col,to_date


rdd1 =
spark.read.csv('/FileStore/tables/COVID_19_Daily_Counts_of_Cases__Hospitalizati
ons__and_Deaths.csv', header= True, inferSchema= True)
rdd1.printSchema()
```

```
root
 |-- DATE_OF_INTEREST: string (nullable = true)
 |-- CASE_COUNT: integer (nullable = true)
 |-- HOSPITALIZED_COUNT: integer (nullable = true)
 |-- DEATH_COUNT: integer (nullable = true)
 |-- DEATH_COUNT_PROBABLE       : integer (nullable = true)
 |-- CASE_COUNT_7DAY_AVG        : integer (nullable = true)
 |-- HOSP_COUNT_7DAY_AVG: integer (nullable = true)
 |-- DEATH_COUNT_7DAY_AVG: integer (nullable = true)
 |-- BX_CASE_COUNT: integer (nullable = true)
 |-- BX_HOSPITALIZED_COUNT: integer (nullable = true)
 |-- BX_DEATH_COUNT: integer (nullable = true)
 |-- BX_CASE_COUNT_7DAY_AVG: integer (nullable = true)
 |-- BX_HOSPITALIZED_COUNT_7DAY_AVG: integer (nullable = true)
 |-- BX_DEATH_COUNT_7DAY_AVG: integer (nullable = true)
 |-- BK_CASE_COUNT: integer (nullable = true)
 |-- BK_HOSPITALIZED_COUNT: integer (nullable = true)
 |-- BK_DEATH_COUNT: integer (nullable = true)
 |-- BK_CASE_COUNT_7DAY_AVG: integer (nullable = true)
 |-- BK_HOSPITALIZED_COUNT_7DAY_AVG: integer (nullable = true)
 |-- BK_DEATH_COUNT_7DAY_AVG: integer (nullable = true)
```

```
# only keep date, cases, hospitalized and death and sort by date
col_covid = ['DATE', 'CASE_COUNT', 'HOSPITALIZED_COUNT', 'DEATH_COUNT']
covid = rdd1.withColumn('DATE',  to_date('DATE_OF_INTEREST', 'MM/dd/yyyy')
).select(col_covid).sort('DATE', ascending=False)
print(covid.count())
covid.show()
covid.write.saveAsTable('COVID19')
```

```
266
+----------+----------+------------------+-----------+
|      DATE|CASE_COUNT|HOSPITALIZED_COUNT|DEATH_COUNT|
+----------+----------+------------------+-----------+
|2020-11-20|       831|                47|          4|
|2020-11-19|      1169|                88|          3|
|2020-11-18|      1282|                95|          7|
|2020-11-17|      1337|                78|          9|
|2020-11-16|      1589|               110|          9|
|2020-11-15|       816|                82|         12|
|2020-11-14|       947|                81|         10|
|2020-11-13|      1418|                75|          6|
|2020-11-12|      1408|                65|         14|
|2020-11-11|      1436|                78|          9|
|2020-11-10|      1508|                66|          7|
|2020-11-09|      1511|                73|          4|
|2020-11-08|       761|                51|          9|
|2020-11-07|       798|                55|         14|
|2020-11-06|      1002|                53|         10|
|2020-11-05|      1104|                71|         10|
|2020-11-04|      1077|                54|          9|
```

```
# preprocess shooting data
rdd2 =
spark.read.csv('/FileStore/tables/NYPD_Shooting_Incident_Data__Year_To_Date_.cs
v', header = True, inferSchema=True)
rdd2.printSchema()
```

```
root
 |-- INCIDENT_KEY: integer (nullable = true)
 |-- OCCUR_DATE: string (nullable = true)
 |-- OCCUR_TIME: string (nullable = true)
 |-- BORO: string (nullable = true)
 |-- PRECINCT: integer (nullable = true)
 |-- JURISDICTION_CODE: integer (nullable = true)
 |-- LOCATION_DESC: string (nullable = true)
 |-- STATISTICAL_MURDER_FLAG: boolean (nullable = true)
 |-- PERP_AGE_GROUP: string (nullable = true)
```

```
 |-- PERP_SEX: string (nullable = true)
 |-- PERP_RACE: string (nullable = true)
 |-- VIC_AGE_GROUP: string (nullable = true)
 |-- VIC_SEX: string (nullable = true)
 |-- VIC_RACE: string (nullable = true)
 |-- X_COORD_CD: integer (nullable = true)
 |-- Y_COORD_CD: integer (nullable = true)
 |-- Latitude: double (nullable = true)
 |-- Longitude: double (nullable = true)
 |-- New Georeferenced Column: string (nullable = true)
```

```
shooting = rdd2.withColumn('DATE',  to_date('OCCUR_DATE', 'MM/dd/yyyy')
).select(['DATE', 'BORO', 'LOCATION_DESC',  'PERP_AGE_GROUP', 'PERP_SEX',
'PERP_RACE', 'VIC_AGE_GROUP', 'VIC_SEX', 'VIC_RACE',
'STATISTICAL_MURDER_FLAG']).sort('DATE', ascending = False)
shooting.printSchema()
shooting.show()
shooting.write.saveAsTable('SHOOTING')
```

```
root
 |-- DATE: date (nullable = true)
 |-- BORO: string (nullable = true)
 |-- LOCATION_DESC: string (nullable = true)
 |-- PERP_AGE_GROUP: string (nullable = true)
 |-- PERP_SEX: string (nullable = true)
 |-- PERP_RACE: string (nullable = true)
 |-- VIC_AGE_GROUP: string (nullable = true)
 |-- VIC_SEX: string (nullable = true)
 |-- VIC_RACE: string (nullable = true)
 |-- STATISTICAL_MURDER_FLAG: boolean (nullable = true)

+----------+-------------+--------------------+--------------+--------+-------
-------+-------------+-------+--------------+-----------------------+
|      DATE|         BORO|       LOCATION_DESC|PERP_AGE_GROUP|PERP_SEX|     PE
RP_RACE|VIC_AGE_GROUP|VIC_SEX|      VIC_RACE|STATISTICAL_MURDER_FLAG|
+----------+-------------+--------------------+--------------+--------+-------
-------+-------------+-------+--------------+-----------------------+
|2020-09-30|     BROOKLYN|MULTI DWELL - APT...|         18-24|       M|
BLACK|        18-24|      M|WHITE HISPANIC|                  false|
|2020-09-30|       QUEENS|MULTI DWELL - APT...|         25-44|       M|WHITE H
```

```
%python
# proprecess prisoner data

rdd3 = spark.read.csv('/FileStore/tables/Daily_Inmates_In_Custody.csv', header
= True, inferSchema=True)
rdd3.printSchema()
rdd3.show()
```

```
root
 |-- INMATEID: integer (nullable = true)
 |-- ADMITTED_DT: string (nullable = true)
 |-- DISCHARGED_DT: string (nullable = true)
 |-- CUSTODY_LEVEL: string (nullable = true)
 |-- BRADH: string (nullable = true)
 |-- RACE: string (nullable = true)
 |-- GENDER: string (nullable = true)
 |-- AGE: integer (nullable = true)
 |-- INMATE_STATUS_CODE: string (nullable = true)
 |-- SEALED: string (nullable = true)
 |-- SRG_FLG: string (nullable = true)
 |-- TOP_CHARGE: string (nullable = true)
 |-- INFRACTION: string (nullable = true)

+--------+-------------------+-------------+-------------+-----+----+------+-
--+------------------+------+-------+----------+----------+
|INMATEID|         ADMITTED_DT|DISCHARGED_DT|CUSTODY_LEVEL|BRADH|RACE|GENDER|A
GE|INMATE_STATUS_CODE|SEALED|SRG_FLG|TOP_CHARGE|INFRACTION|
+--------+-------------------+-------------+-------------+-----+----+------+-
--+------------------+------+-------+----------+----------+
```

```
%python
# extract date only without time of the day
string_udf = F.udf(lambda x: x[:10])
prisoner = rdd3.withColumn('DATE',  F.to_date(string_udf('ADMITTED_DT'),
'MM/dd/yyyy') ).select(['DATE', 'CUSTODY_LEVEL', 'BRADH', 'GENDER', 'AGE',
'RACE', 'INFRACTION']).sort('DATE', ascending = False)
prisoner.show()
prisoner.write.saveAsTable('PRISONER')
```

```
+----------+-------------+-----+------+---+----+----------+
|      DATE|CUSTODY_LEVEL|BRADH|GENDER|AGE|RACE|INFRACTION|
+----------+-------------+-----+------+---+----+----------+
|2020-11-23|         null|    N|     M| 58|   O|         N|
|2020-11-23|         null|    N|     M| 33|   B|         N|
|2020-11-23|         null|    N|     M| 30|   B|         N|
|2020-11-23|         null|    N|     M| 32|   B|         N|
```

```
|2020-11-23|         null|    N|     M| 37|   B|         N|
|2020-11-23|         null|    N|     M| 43|   B|         N|
|2020-11-23|         null|    N|     M| 36|   B|         N|
|2020-11-23|         null|    N|     M| 43|   B|         N|
|2020-11-22|         null|    N|     M| 31|   W|         N|
|2020-11-22|         null|    N|     M| 37|   B|         N|
|2020-11-22|         null|    N|     M| 26|   B|         N|
|2020-11-22|         null|    N|     M| 39|   B|         N|
|2020-11-22|         null|    N|     M| 26|   O|         N|
|2020-11-22|         null|    N|     M| 26|   B|         N|
|2020-11-22|         null|    N|     M| 21|   B|         N|
|2020-11-22|          MAX|    N|     M| 28|   B|         N|
|2020-11-22|         null|    N|     M| 27|   B|         N|
```

```
# process utility data
rdd4 =
spark.read.csv('/FileStore/tables/Energy_and_Water_Data_Disclosure_for_Local_La
w_84_2020__Data_for_Calendar_Year_2019_.csv', header=True, inferSchema=True )
# check column names
cols = rdd4.columns
# pick up needed columns from more than 60 columns
index = [60, 14, 17, 27, 48, 51, 54, 57]
columns = [cols[i] for i in index]
# select those columns and check if they are correct
rdd4 = rdd4.select(columns)
rdd4.columns
```

```
Out[1]: ['Generation Date',
 'Borough',
 'Primary Property Type - Self Selected',
 'Occupancy',
 'Weather Normalized Site Natural Gas Use (therms)',
 'Weather Normalized Site Electricity (kWh)',
 'Total GHG Emissions (Metric Tons CO2e)',
 'Water Use (All Water Sources) (kgal)']
```

```
# change column names to be short and convert date
df = rdd4.select(col('Generation Date').alias('Date'), col('Primary Property
Type - Self Selected').alias('Usage'), 'Occupancy', col('Weather Normalized
Site Natural Gas Use (therms)').alias('Gas'), col('Weather Normalized Site
Electricity (kWh)').alias('Electricity'), col('Total GHG Emissions (Metric Tons
CO2e)').alias('Emission'), col('Water Use (All Water Sources)
(kgal)').alias('Water'))
df = df.withColumn('DATE',  to_date('Date', 'MM/dd/yyyy') ).sort('DATE',
ascending = False)
df.printSchema()
df.show()
```

```
root
 |-- DATE: date (nullable = true)
 |-- Usage: string (nullable = true)
 |-- Occupancy: integer (nullable = true)
 |-- Gas: string (nullable = true)
 |-- Electricity: string (nullable = true)
 |-- Emission: string (nullable = true)
 |-- Water: string (nullable = true)

+----------+--------------------+---------+-------------+-------------+-------
------+-------------+
|      DATE|               Usage|Occupancy|          Gas|  Electricity|     Em
ission|        Water|
+----------+--------------------+---------+-------------+-------------+-------
------+-------------+
|2020-11-09| Distribution Center|      100|       3070.5|     208908.2|
73.1|        478.8|
|2020-11-09| Multifamily Housing|       50|       2403.5|Not Available|Not Ava
ilable|        503.4|
|2020-11-09|      Medical Office|      100|       5719.4|       505838|
169.9|       1259.6|
```

```
# clean data and format it as one person usage
# an issue is that multiple null value representations, it causes dataframe
could do computation and hard to convert types, so I use RDD instead.
def isfloat(x):
  """return float values"""
  try:
    float(x)
    return True
  except:
    return False


def filter_value(x):
  """Filter float values"""
  if isfloat(x[2]) and x[2] != 0 and isfloat(x[3]) and isfloat(x[4]) and
isfloat(x[5]) and isfloat(x[6]):
    return x

def get_ave(x):
  """divide gas, electricity, emission and water by the number of occupants"""
  return (x[0], x[1], x[2], round(float(x[3]) / float(x[2]), 2),
round(float(x[4]) / float(x[2]), 2), round(float(x[5]) / x[2], 2),
round(float(x[6]) / x[2], 2)  )


rdd_df = df.rdd
print('Before filtering:', rdd_df.count())
header = rdd_df.first()
rdd_df = rdd_df.subtract(sc.parallelize([header])).map(tuple)
rdd_df = rdd_df.filter(filter_value)
print('After filtering:', rdd_df.count())
rdd_df = rdd_df.map(lambda x: get_ave(x) )
rdd_df.take(10)
utility_df = spark.createDataFrame(rdd_df, ['DATE', 'Usage', 'Occupancy',
'Gas', 'Electricity', 'Emission', 'Water'])
#utility_df.show()
utility_df.printSchema()
utility_df.show()
utility_df.coalesce(1).write.saveAsTable('UTILITY')
```

```
28807
18256
root
 |-- DATE: date (nullable = true)
 |-- Usage: string (nullable = true)
 |-- Occupancy: long (nullable = true)
```

```
 |-- Gas: double (nullable = true)
 |-- Electricity: double (nullable = true)
 |-- Emission: double (nullable = true)
 |-- Water: double (nullable = true)

+----------+--------------------+---------+-------+-----------+--------+------
-+
|      DATE|               Usage|Occupancy|    Gas|Electricity|Emission|  Wate
r|
+----------+--------------------+---------+-------+-----------+--------+------
-+
|2020-11-03| Multifamily Housing|       95| 254.76|    3906.83|    2.45|  39.1
5|
|2020-11-02|               Hotel|      100| 398.39|   10395.76|    4.93|  41.4
```

```
# process complaints data which includes conflicts and crimes

rdd5 =
spark.read.csv('/FileStore/tables/NYPD_Complaint_Data_Current__Year_To_Date_.cs
v', header=True, inferSchema=True )
rdd5.printSchema()
rdd5.show()
```

```
root
 |-- CMPLNT_NUM: integer (nullable = true)
 |-- ADDR_PCT_CD: integer (nullable = true)
 |-- BORO_NM: string (nullable = true)
 |-- CMPLNT_FR_DT: string (nullable = true)
 |-- CMPLNT_FR_TM: string (nullable = true)
 |-- CMPLNT_TO_DT: string (nullable = true)
 |-- CMPLNT_TO_TM: string (nullable = true)
 |-- CRM_ATPT_CPTD_CD: string (nullable = true)
 |-- HADEVELOPT: string (nullable = true)
 |-- HOUSING_PSA: integer (nullable = true)
 |-- JURISDICTION_CODE: integer (nullable = true)
 |-- JURIS_DESC: string (nullable = true)
 |-- KY_CD: integer (nullable = true)
 |-- LAW_CAT_CD: string (nullable = true)
 |-- LOC_OF_OCCUR_DESC: string (nullable = true)
 |-- OFNS_DESC: string (nullable = true)
 |-- PARKS_NM: string (nullable = true)
 |-- PATROL_BORO: string (nullable = true)
 |-- PD_CD: integer (nullable = true)
 |-- PD_DESC: string (nullable = true)
```

```
cols = ['DATE', 'OFNS_DESC', 'SUSP_AGE_GROUP', 'SUSP_RACE', 'SUSP_SEX',
'VIC_AGE_GROUP', 'VIC_RACE', 'VIC_SEX']
rdd5 = rdd5.withColumn('DATE', to_date('CMPLNT_FR_DT', 'MM/dd/yyyy')
).select(cols).sort('DATE', ascending = False)
rdd5.show()
# rdd5.write.saveAsTable('CRIME')
rdd5.printSchema()
# filter imcomplete rows
file_read = rdd5.filter((rdd5['SUSP_AGE_GROUP'] != 'UNKNOWN') &
(rdd5['SUSP_RACE'] != 'UNKNOWN') &
                        (rdd5['SUSP_SEX'] != 'UNKNOWN') &
(rdd5['VIC_AGE_GROUP'] != 'UNKNOWN') & (rdd5['VIC_RACE'] != 'UNKNOWN') &
            (rdd5['SUSP_SEX'] != 'UNKNOWN') )
# a problem is the data too big to be converted to a table, so I saved it to a
csv file and then read the file into a table
file_read.write.csv('crime.csv', header = True)
```

```
+----------+--------------------+--------------+--------------+--------+------
-------+--------------+-------+
|      DATE|           OFNS_DESC|SUSP_AGE_GROUP|     SUSP_RACE|SUSP_SEX|VIC_AG
E_GROUP|      VIC_RACE|VIC_SEX|
+----------+--------------------+--------------+--------------+--------+------
-------+--------------+-------+
|2020-09-30|CRIMINAL MISCHIEF...|       UNKNOWN|       UNKNOWN|       U|
25-44|WHITE HISPANIC|      F|
|2020-09-30|      FELONY ASSAULT|         25-44|         BLACK|       F|
UNKNOWN|       UNKNOWN|      E|
|2020-09-30|ASSAULT 3 & RELAT...|         25-44|         BLACK|       M|
25-44|         BLACK|      F|
|2020-09-30|       PETIT LARCENY|          null|          null|    null|
UNKNOWN|       UNKNOWN|      D|
|2020-09-30|            BURGLARY|       UNKNOWN|BLACK HISPANIC|       M|
UNKNOWN|BLACK HISPANIC|      D|
|2020-09-30|ASSAULT 3 & RELAT...|       UNKNOWN|         BLACK|       F|
45-64|WHITE HISPANIC|      F|
|2020-09-30|       GRAND LARCENY|       UNKNOWN|       UNKNOWN|       M|
25-44|         WHITE|      F|
|2020-09-30|ASSAULT 3 & RELAT...|       UNKNOWN|         BLACK|       M|
```

```
%fs rm -r '/crime.csv'
```

```
res19: Boolean = true
```

```
%sql

create table if not exists CRIME
using csv
options(
path "/crime.csv",
inferSchema 'true',
header 'true'
)
```

OK

```
%sql
--- Crime table finished
select * from crime limit 10
```

	DATE	OFNS_DESC	SUSP_AGE_GROUP	SUSP_RA
1	2020-09-30	ASSAULT 3 & RELATED OFFENSES	25-44	WHITE HI
2	2020-09-30	ROBBERY	18-24	BLACK
3	2020-09-30	ASSAULT 3 & RELATED OFFENSES	25-44	BLACK
4	2020-09-30	HARRASSMENT 2	25-44	BLACK H
5	2020-09-30	FELONY ASSAULT	25-44	BLACK
6	2020-09-30	HARRASSMENT 2	18-24	BLACK
7	2020-09-30	ROBBERY	18-24	BLACK
8	2020-09-30	OFFENSES AGAINST PUBLIC ADMINI	25-44	WHITE

Showing all 10 rows.

```
rdd6 =
spark.read.csv('/FileStore/tables/Motor_Vehicle_Collisions___Crashes.csv',
inferSchema=True, header= True)
rdd6.printSchema()
rdd6.show()
```

```
root
 |-- CRASH DATE: string (nullable = true)
 |-- CRASH TIME: string (nullable = true)
 |-- BOROUGH: string (nullable = true)
 |-- ZIP CODE: string (nullable = true)
 |-- LATITUDE: double (nullable = true)
```

```
 |-- LONGITUDE: double (nullable = true)
 |-- LOCATION: string (nullable = true)
 |-- ON STREET NAME: string (nullable = true)
 |-- CROSS STREET NAME: string (nullable = true)
 |-- OFF STREET NAME: string (nullable = true)
 |-- NUMBER OF PERSONS INJURED: string (nullable = true)
 |-- NUMBER OF PERSONS KILLED: integer (nullable = true)
 |-- NUMBER OF PEDESTRIANS INJURED: integer (nullable = true)
 |-- NUMBER OF PEDESTRIANS KILLED: integer (nullable = true)
 |-- NUMBER OF CYCLIST INJURED: integer (nullable = true)
 |-- NUMBER OF CYCLIST KILLED: string (nullable = true)
 |-- NUMBER OF MOTORIST INJURED: string (nullable = true)
 |-- NUMBER OF MOTORIST KILLED: integer (nullable = true)
 |-- CONTRIBUTING FACTOR VEHICLE 1: string (nullable = true)
```

```
incident = rdd6.groupBy('CRASH DATE', 'BOROUGH').agg(F.count('NUMBER OF PERSONS
INJURED').alias('injured_count'),
                                                     F.count('NUMBER OF PERSONS
KILLED').alias('death_count')).withColumn('Date',
to_date('CRASH DATE', 'MM/dd/yyyy')).select(['DATE', 'BOROUGH',
'injured_count', 'death_count'] ).sort('DATE', ascending = False)
incident.show()
incident.printSchema()
```

```
+----------+-------------+-------------+-----------+
|      DATE|      BOROUGH|injured_count|death_count|
+----------+-------------+-------------+-----------+
|2020-11-20|     BROOKLYN|           70|         70|
|2020-11-20|    MANHATTAN|           20|         20|
|2020-11-20|STATEN ISLAND|            3|          3|
|2020-11-20|       QUEENS|           53|         53|
|2020-11-20|        BRONX|           29|         29|
|2020-11-20|         null|           87|         87|
|2020-11-19|       QUEENS|           42|         42|
|2020-11-19|    MANHATTAN|           12|         12|
|2020-11-19|STATEN ISLAND|            3|          3|
|2020-11-19|     BROOKLYN|           52|         52|
|2020-11-19|        BRONX|           32|         32|
|2020-11-19|         null|           84|         84|
|2020-11-18|    MANHATTAN|           23|         23|
|2020-11-18|         null|           84|         84|
|2020-11-18|        BRONX|           36|         36|
|2020-11-18|       QUEENS|           44|         44|
|2020-11-18|     BROOKLYN|           67|         67|
|2020-11-18|STATEN ISLAND|            3|          3|
```

```
#print(incident.count())
#incident.write.saveAsTable('Vehicle_Collisions')
incident.select('injured_count')
```

```
%sql
--- check the vehicle_collision table
--- select * from vehicle_collisions limit 5;
--- Now, we have 6 tables of utility, covid19, shooting, crime,
vehicle_collision and prisoner
select PERP_RACE, count(*) from shooting group by PERP_RACE
```

	PERP_RACE	count(1)
1	WHITE	15
2	BLACK	390
3	null	906
4	BLACK HISPANIC	61
5	WHITE HISPANIC	103
6	UNKNOWN	20
7	ASIAN / PACIFIC ISLANDER	6

Showing all 7 rows.

```
%sql
--- make view of covid19
CREATE VIEW covid19_view AS
select year(date) as year,  month(date) as month, DAY(date) as day, CASE_COUNT,
HOSPITALIZED_COUNT, DEATH_COUNT from covid19 order by month desc, day desc
```

OK

```
%sql
--- create a view with daily prisoners
CREATE VIEW PRISONER_BY_DAY AS

select year, month, day, sum(prisoner_count) as prisoner_sum from
(select month(date) as month, year(date) as year, DAY(date) as day, count(*)
prisoner_count from prisoner where year(date) = 2020 group by date order by
prisoner_count desc)
group by year, month, day order by year desc, month desc , day desc
```

OK

```
%sql
--- check the view
select *  from prisoner_by_day limit 20
```

	year	month	day	prisoner_sum
1	2020	11	23	8
2	2020	11	22	29
3	2020	11	21	39
4	2020	11	20	51
5	2020	11	19	59
6	2020	11	18	33
7	2020	11	17	34
8	2020	11	16	20

Showing all 20 rows.

```
%sql

-- get daily shooting
CREATE VIEW DAILY_SHOOTING_VIEW AS
select year(date) as year, month(date) as month, day(date) as day, count(*) as
shooting_case_count from shooting group by year, month, day order by month
desc, day desc
```

	year	month	day	shooting_case_count
1	2020	9	30	8
2	2020	9	29	2

3	2020	9	28	4
4	2020	9	27	8
5	2020	9	26	3
6	2020	9	25	5
7	2020	9	24	4
8	2020	9	23	7

Showing all 254 rows.

```
%sql

--- get average daily average utility usage

---CREATE VIEW bridge_table as

with temp_table(date, gas_ave, electricity_ave, water_ave, emission_ave) as (
select date, sum(Gas)/ count(*) as gas_ave, sum(Electricity) / count(*) as
electricity_ave, sum(Water)/ count(*) as water_ave, sum(Emission) / count(*) as
emission_ave
from utility
group by date order by date desc)

select min(gas_ave) as min_gas, max(gas_ave) as max_gas, min(electricity_ave)
as min_electricity, max(electricity_ave) as max_electricity, min(water_ave) as
min_water, max(water_ave) as max_water, min(emission_ave) as min_emission,
max(emission_ave) as max_emission from temp_table
```

	min_gas	max_gas	min_electricity	max_electricity	min_water
1	16.59	14301.895384615385	388.44	185741.84000000003	3.23

Showing all 1 rows.

```
%sql

--- get normalize those data and scale up to make them comparable
--CREATE VIEW NORMALIZED_UTILITY AS

with temp_table(date, gas_ave, electricity_ave, water_ave, emission_ave) as (
select date, round(sum(Gas)/ count(*), 2) as gas_ave, round(sum(Electricity) /
count(*), 2) as electricity_ave, round(sum(Water)/ count(*), 2) as water_ave,
sum(Emission) / count(*) as emission_ave
from utility
group by date order by date desc)


select year(date) as year, month(date) as month, day(date) as day, round(
(gas_ave - min_gas) / (max_gas - min_gas) * 10000) as norm_gas, round(
(electricity_ave - min_electricity) / (max_electricity - min_electricity) *
10000) as norm_electricity, round( (water_ave - min_water) / (max_water -
min_water) * 10000) as norm_water, round( (emission_ave - min_emission) /
(max_emission - min_emission) * 10000) as norm_emission from temp_table,
bridge_table order by year desc, month desc, day desc
```

OK

```
%sql
--- check normalized utility view
select month, sum(norm_gas) as gas, sum(norm_electricity) as electricity,
sum(norm_water) water, sum(norm_emission) emission from NORMALIZED_UTILITY
group by month order by month desc
```

	month	gas	electricity	water	emission
1	11	2070	4722	3	2644
2	10	14437	17930	43	14823
3	9	25863	22090	10	21403
4	8	17452	26465	35	20620
5	7	11332	15380	19	12728
6	6	10607	13864	14	11562
7	5	11353	19906	25	24608
8	4	11675	15314	10023	12473

Showing all 9 rows.

```
%sql
--- create a crime view
---CREATE VIEW CRIME_VIEW AS

select year(date) as year, month(date) as month, day(date) as day, count(*) as cases from crime where date > '2019-12-31' group by year, month, day order by year desc, month desc, day desc
```

	year	month	day	cases
1	2020	9	30	225
2	2020	9	29	288
3	2020	9	28	305
4	2020	9	27	339
5	2020	9	26	350
6	2020	9	25	313
7	2020	9	24	289
8	2020	9	23	273

Showing all 274 rows.

```
%sql
-- create a vehicle incident view
---CREATE VIEW VEHICLE_COLLISIONS_VIEW AS

select year(date) as year, month(date) as month, day(date) as day,
sum(injured_count) as daily_injured, sum(DEATH_COUNT) as daily_death from
vehicle_collisions
where date > '2019-12-31'
group by year, month, day order by year desc, month desc, day desc
--- we can see people who got involved in a vehicle collision are mostly dead
```

	year	month	day	daily_injured	daily_death
1	2020	11	20	262	262
2	2020	11	19	225	225
3	2020	11	18	257	257
4	2020	11	17	232	232
5	2020	11	16	282	282
6	2020	11	15	229	229
7	2020	11	14	272	272

2	2020	11	12	274	274

Showing all 325 rows.

```
%sql

--- a fact table with all records regarding to covid table
--create table fact_table as

select P.year, P.month, P.day, prisoner_sum, shooting_case_count, CASE_COUNT,
HOSPITALIZED_COUNT, DEATH_COUNT, cases as crime_daily,
norm_gas, norm_electricity, norm_water, norm_emission, daily_injured as
vehicle_collision_injured, daily_death as vehicle_collision_death
from prisoner_by_day P
right join covid19_view C on P.year = C.year and P.month = C.month and P.day =
C.day
left join daily_shooting_view D on P.year = D.year and P.month = D.month and
P.day = D.day
left join crime_view M on P.year = M.year and P.month = M.month and P.day =
M.day
left join normalized_utility N on P.year = N.year and P.month = N.month and
P.day = N.day
left join vehicle_collisions_view V on P.year = V.year and P.month = V.month
and P.day = V.day
order by year desc, month desc, day desc
```

	year	month	day	prisoner_sum	shooting_case_count
1	2020	11	20	51	null
2	2020	11	19	59	null
3	2020	11	18	33	null
4	2020	11	17	34	null
5	2020	11	16	20	null
6	2020	11	15	23	null
7	2020	11	14	26	null
8	2020	11	13	32	null

Showing all 266 rows.

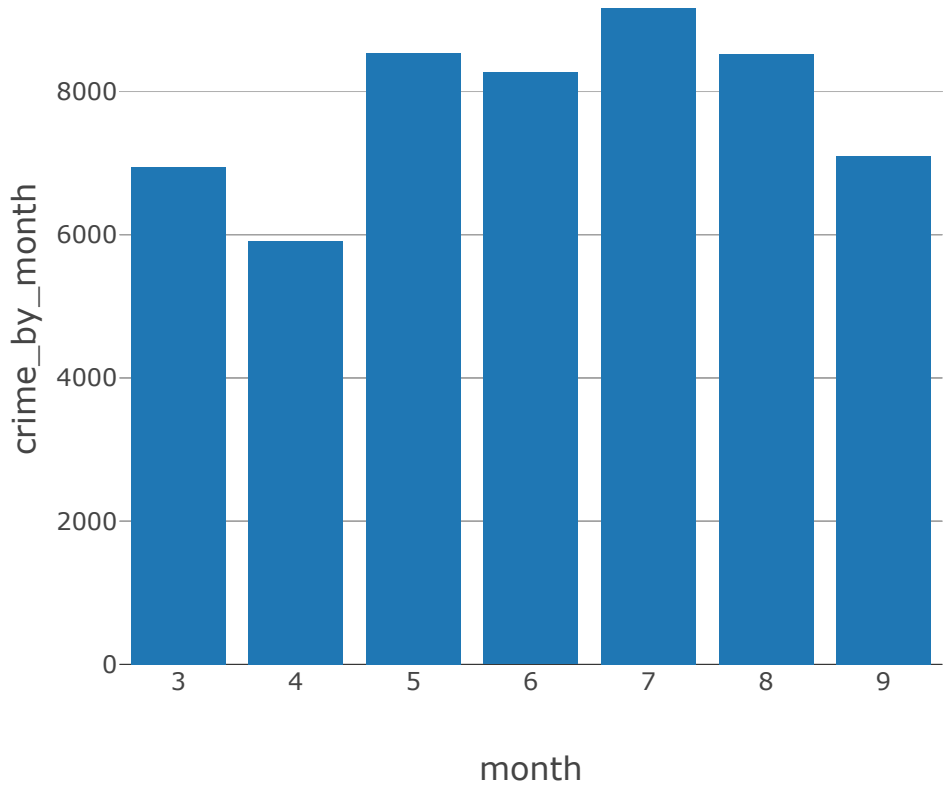
```
%sql

--- the table I will use with intersection date of all tables
--create table fact_table as

select P.year, P.month, P.day, prisoner_sum, shooting_case_count, CASE_COUNT,
HOSPITALIZED_COUNT, DEATH_COUNT, cases as crime_daily,
norm_gas, norm_electricity, norm_water, norm_emission, daily_injured as
vehicle_collision_injured, daily_death as vehicle_collision_death
from prisoner_by_day P
join covid19_view C on P.year = C.year and P.month = C.month and P.day = C.day
join daily_shooting_view D on P.year = D.year and P.month = D.month and P.day =
D.day
join crime_view M on P.year = M.year and P.month = M.month and P.day = M.day
join normalized_utility N on P.year = N.year and P.month = N.month and P.day =
N.day
join vehicle_collisions_view V on P.year = V.year and P.month = V.month and
P.day = V.day
order by year desc, month desc, day desc
```

```
%sql

select * from fact_table
```

	year	month	day	prisoner_sum	shooting_case_count
1	2020	9	30	26	8
2	2020	9	29	23	2
3	2020	9	28	15	4
4	2020	9	25	18	5
5	2020	9	24	24	4
6	2020	9	23	29	7
7	2020	9	22	12	2
8	2020	9	21	12	5

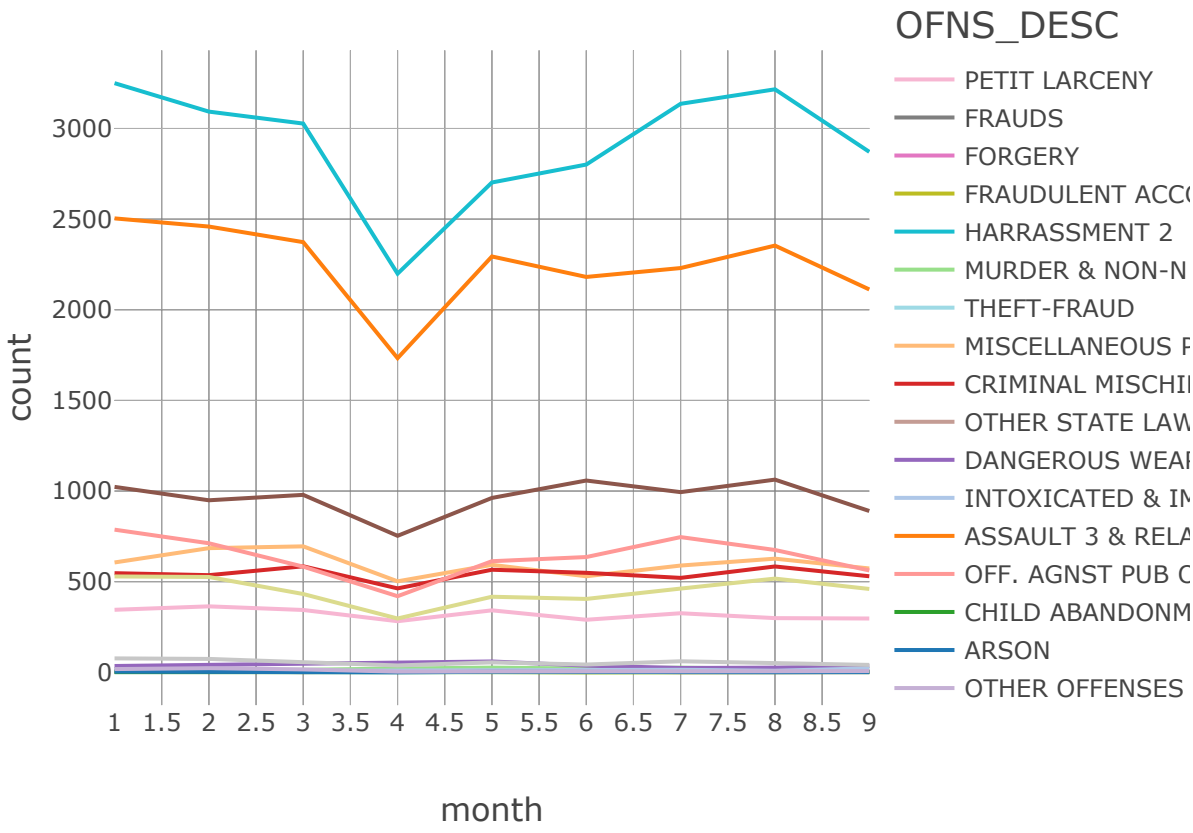
Showing all 173 rows.

```
%sql
--- Question: Have people committed more crimes after lockdown? So, the mental problem caused by lockdown made public safety worse?

select month, sum(crime_daily) as crime_by_month from fact_table group by month order by month
```

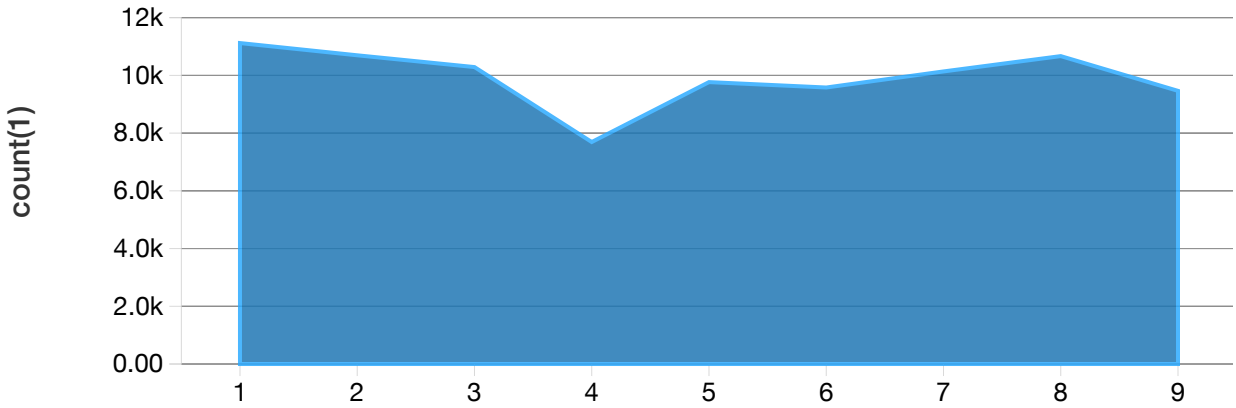



```
%sql

select OFNS_DESC, month(date) as month, count(*) as count from crime where year(date) = 2020 group by OFNS_DESC, month order by month

--- Answer: No, they are the same before and after covid lockdown
```

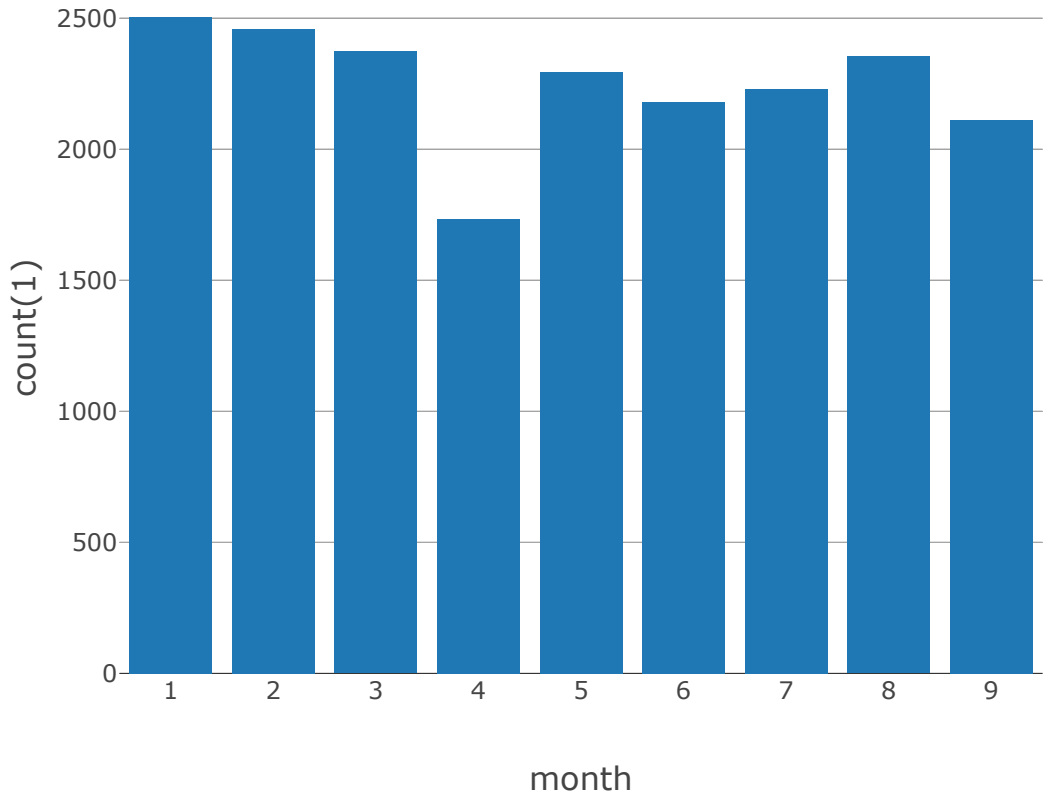
Only showing the first twenty series.



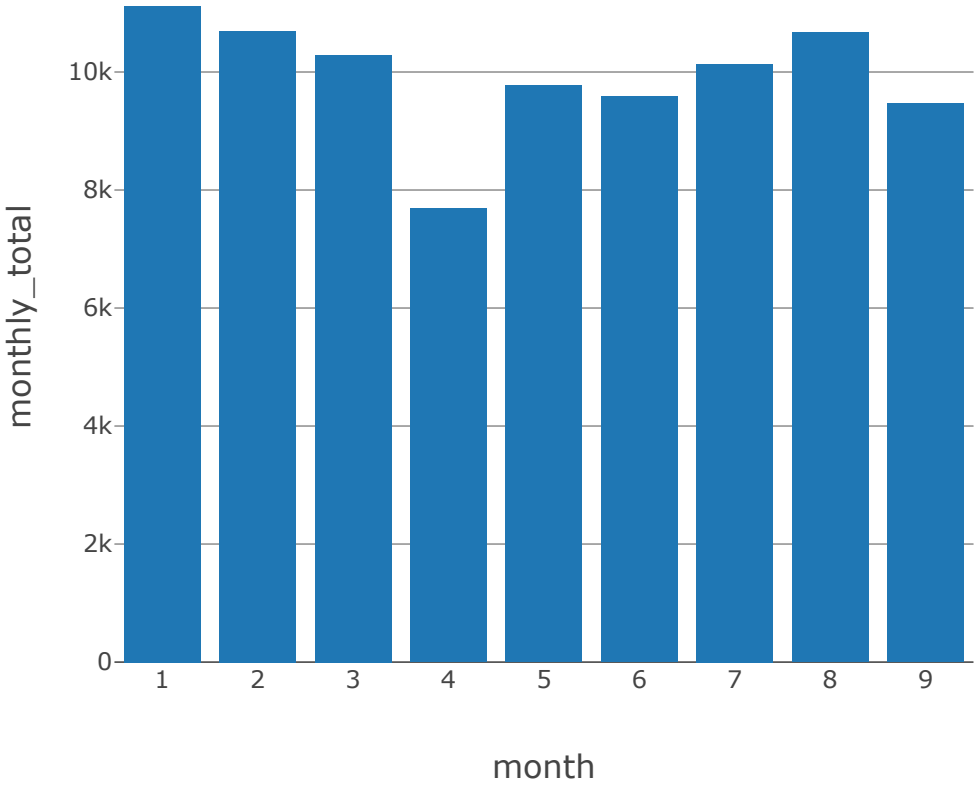

```
%sql
--- overall crime count
select month(date) as month, OFNS_DESC, count(*) from crime where year(date) =
2020 group by month, OFNS_DESC order by month
```



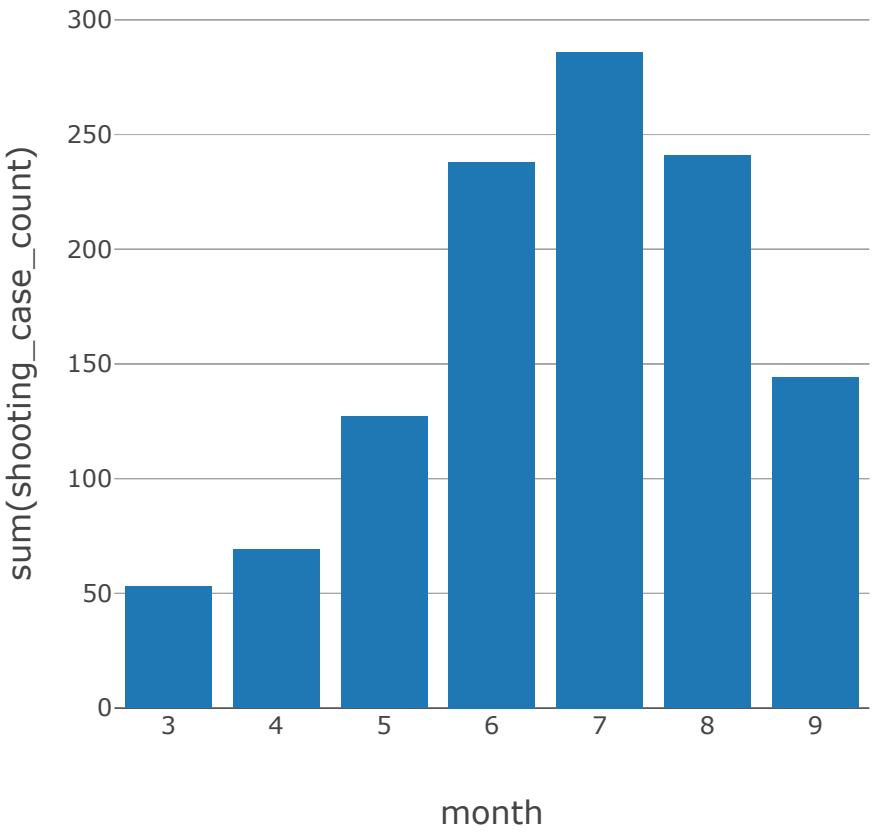
```
%sql

select month(date) month, count(*) from crime where OFNS_DESC = 'ASSAULT 3 & RELATED OFFENSES' and year(date) = 2020  group by month, OFNS_DESC order by month
```



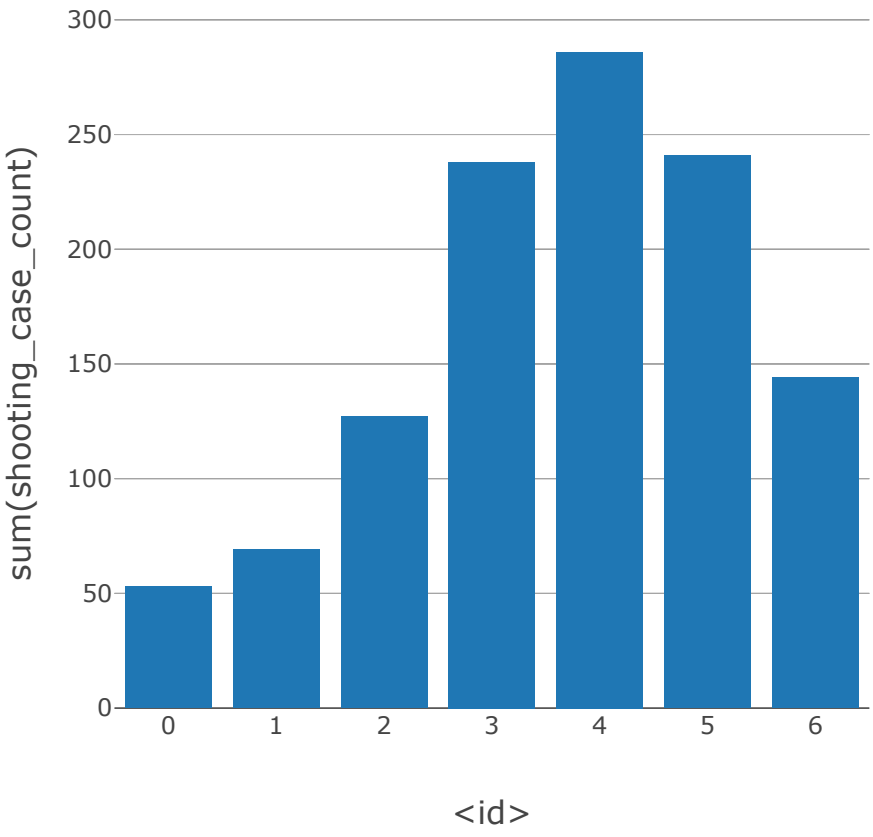

```
%sql

select month, sum(cases) as monthly_total from crime_view group by month order by month
```



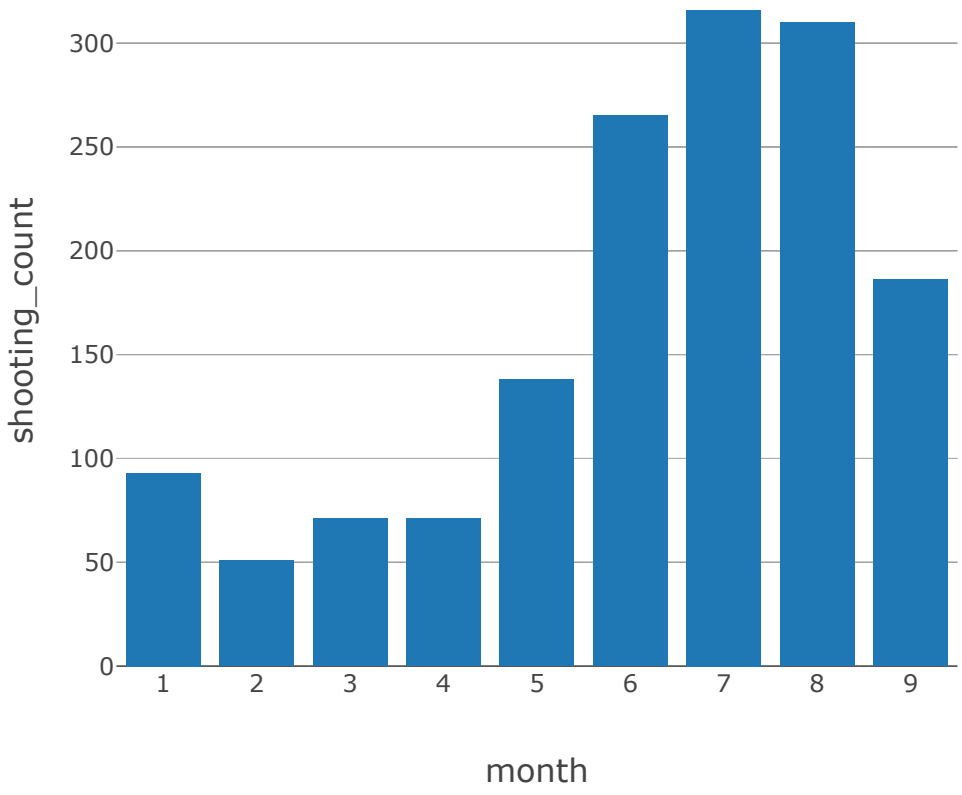

```
%sql

select month, sum(shooting_case_count) from fact_table group by month order by month
```



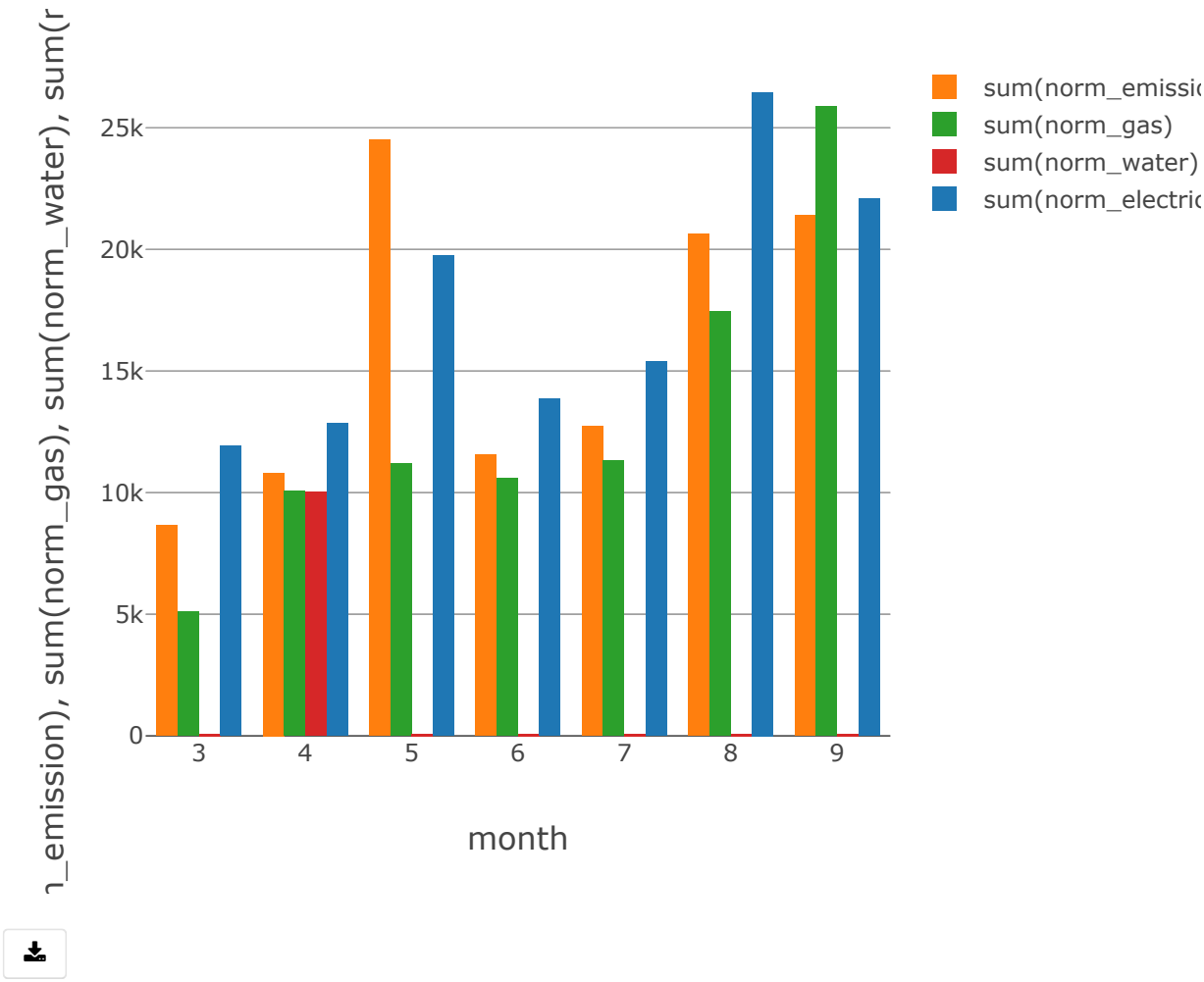

```
%sql
--- Question: If crimes didn't change, what about shooting cases?

--- check fact_table shooting cases count
select month, sum(shooting_case_count) from fact_table group by month order by
month
```




```
%sql
--- check the original table
select month(date) as month, count(*) as shooting_count from shooting group by
month order by month
--- It increased a lot after lockdown.
```




```
%sql
--- Question: Have covid19 reduced energy consumption?

select month, sum(norm_gas), sum(norm_electricity), sum(norm_water),
sum(norm_emission) from fact_table group by month order by month
```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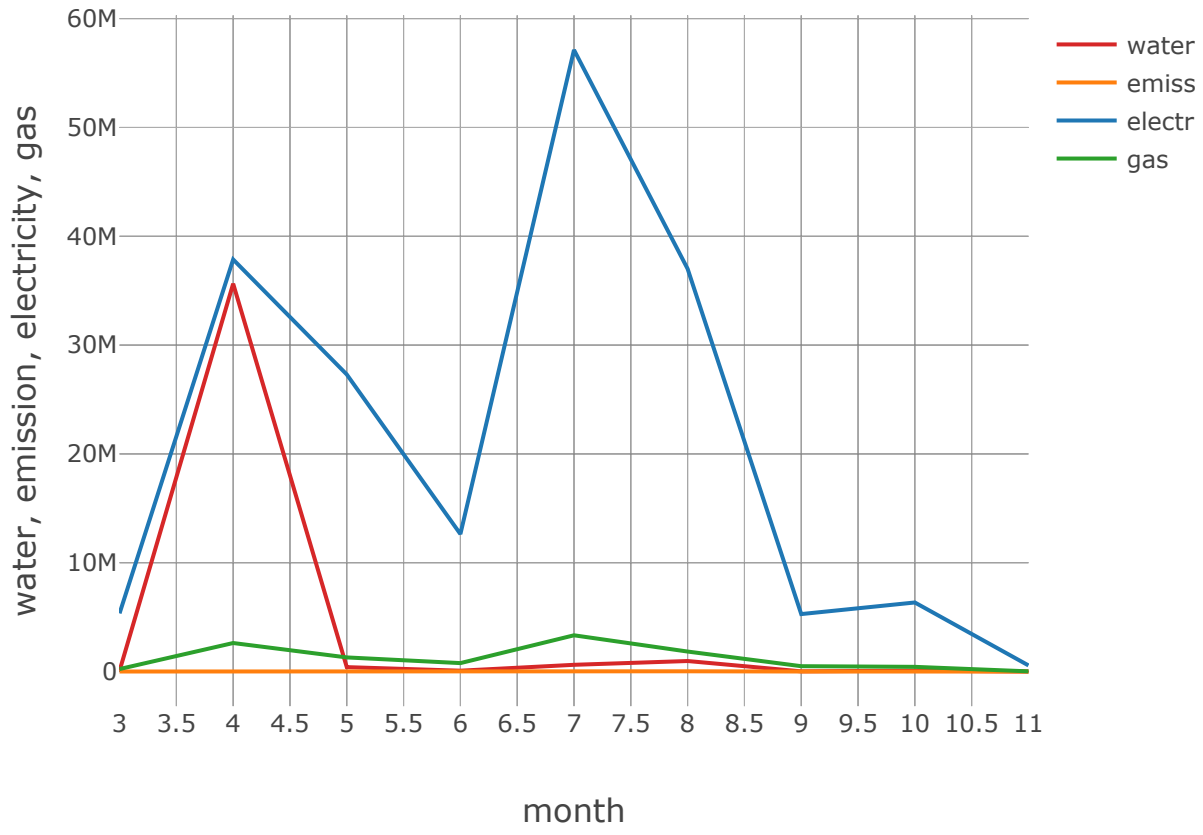
60M
50M
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month
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gas