SparkSQL with U.S. Counties Covid Dataset

1. Write code to define or infer the schema and then read in the dataset

```
# Read the file into a Spark DataFrame
usCountiesFilePath = "./uscounties.csv"
from pyspark.sql.types import DateType, StringType, StructField, StructType,
IntegerType

# the fips column needs to be a string in order to preserve leading zeros
schema = StructType([StructField('date', DateType(), True),
StructField('county', StringType(), True), StructField('state',
StringType(), True), StructField('fips', StringType(), True),
StructField('cases', IntegerType(), True), StructField('deaths',
IntegerType(), True)])

df = spark.read.csv(usCountiesFilePath, schema=schema, header=True)
```

2. Write code to find the county with the most deaths

```
  df.createOrReplaceTempView("covid")  # create table that you can do sql on

  print("Max deaths:")
  spark.sql(
      """
      select county, state, deaths
      from covid
      order by deaths desc
      limit 1
    """
  ).show()
```

county	state	deaths
New York City	New York	40267

3. Write code to find the county with the most cases

```
print("Max cases:")
spark.sql(
    """
    select county, state, cases
    from covid
    order by cases desc
    limit 1
    """
).show()
```

county	state	cases
Los Angeles	California	2908425

4. Write code to find the total number of deaths in Utah county

```
print("Total deaths in Utah County:")
spark.sql(
    """
    select county, state, deaths
    from covid
    where county='Utah' and date='2022-05-13'
  """
).show()
```

county	state	deaths
Utah	Utah	791

5. Write code to find the death rate for each state and sort the states by death rate descending

```
print("Death rate for each state:")
spark.sql(
    """
    select state, sum(deaths) / sum(cases) as rate
    from covid
    where date='2022-05-13'
    group by state
    order by rate desc
  """
).show()
```

state	rate
Pennsylvania	0.015722318331513083
Mississippi	0.015541584999631953
Alabama	0.015043956128181742
Nevada	0.014900913477587933
Arizona	0.014884843113359676
Georgia	0.014874971808464166

state	rate
Michigan	0.014616217125644464
New Jersey	0.014498962846650889
New Mexico	0.014462012745729724
Missouri	0.014159391860103612
Ohio	0.01415176937498371
Connecticut	0.014002001385574628
Louisiana	0.013898007349590935
Maryland	0.013799618514678251
Indiana	0.013787799751901293
Oklahoma	0.013771585140095712
West Virginia	0.013635248690478075
Arkansas	0.01361763958527935
Tennessee	0.013055661731134637
Texas	0.013021050347158319

only showing top 20 rows

6. Write code to something else interesting with this data – your choice

```
print("Top days with the highest case increases in Utah County:")
spark.sql(
    """
    select curr.date, curr.cases - prev.cases as case_increase
    from covid curr
    left join covid prev on prev.date = curr.date - 1
    where curr.county='Utah' and prev.county='Utah'
    order by case_increase desc
    limit 10
  """
).show()
```

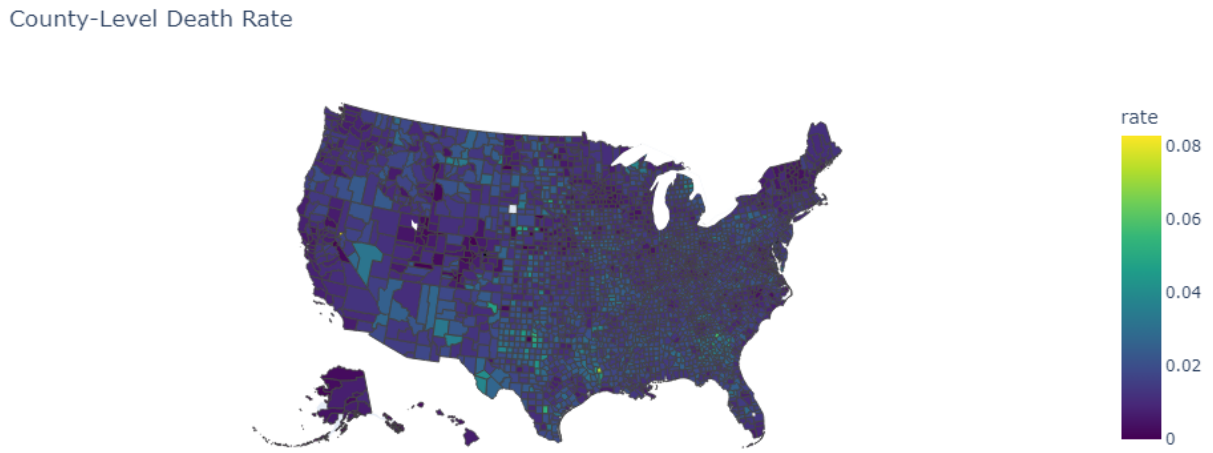
date	case_increase
2022-01-18	8221
2022-01-24	4756
2022-01-10	4463
2022-01-19	2990

date	case_increase
2022-01-21	2716
2022-01-20	2625
2022-01-03	2569
2022-01-13	2563
2022-01-14	1984
2022-01-31	1911
2021-01-13	1878
2022-01-07	1848
2022-01-11	1766
2022-01-12	1628
2022-01-06	1620
2022-01-25	1598
2022-01-27	1542
2020-11-27	1482
2022-01-26	1425
2020-11-14	1335

only showing top 20 rows

7. Extra Credit 1 - Plot your death rate data!

```
import plotly.express as px

county_death_rate = spark.sql(
  """
    select fips, deaths / cases as rate
    from covid
    where fips is not Null and date='2022-05-13'
  """
)

deathrate_pd = county_death_rate.toPandas()

fig = px.choropleth(
    deathrate_pd,

geojson="https://raw.githubusercontent.com/plotly/datasets/master/geojson-counties-fips.json",  # GeoJSON for counties
    locations='fips',  # Use county FIPS codes
    color='rate',  # Column to determine color intensity
    color_continuous_scale='Viridis',
    scope='usa',
    title='County-Level Death Rate'
)

fig.show()
```


County-Level Death Rate
rate
0.08
0.06
0.04
0.02
0