Task 2

- The Quarterly Census of Employment and Wages (QECW) dataset is provided by the US Bureau of Labor Statistics
- The files provided for year 2020 is split by county FIPS codes. I have pruned the FIPS codes outside the scope of COVID super dataset (nationwide, Puerto Rico etc.). Below is the code for merging these ~4,000 files into one dataset for easier processing.

```
import pandas as pd
import os
directory = '2020.annual.by_area/'
df_employment = pd.DataFrame() # Init an empty dataframe
for filename in sorted(os.listdir(directory)):
    f = os.path.join(directory, filename)
    # checking if it is a file
    if os.path.isfile(f):
        df_next = pd.read_csv(f)
        df_employment = pd.concat([df_employment, df_next]) # merging
each new file to the super
df_employment.to_csv('2020.annual.employment.by_area.super.csv',
index=False)

print(pd.read_csv('2020.annual.employment.by_area.super.csv'))
```

```
C:\Users\sheng\AppData\Local\Temp\ipykernel_45920\556342259.py:1:
DtypeWarning: Columns (0) have mixed types. Specify dtype option on
import or set low_memory=False.
  print(pd.read_csv('2020.annual.employment.by_area.super.csv'))

        area_fips  own_code industry_code  agglvl_code  size_code
year qtr  \
0            1000         0            10           50          0
2020   A
1            1000         1            10           51          0
2020   A
2            1000         1           102           52          0
2020   A
3            1000         1          1021           53          0
2020   A
4            1000         1          1022           53          0
2020   A
...           ...       ...           ...          ...        ...   ..
.  ..
3602755     US000         8            10           95          0
2020   A
3602756     US000         9            10           94          0
2020   A
```

```
3602757     USCMS         0             10            92           0
2020   A
3602758     USMSA         0             10            91           0
2020   A
3602759     USNMS         0             10            93           0
2020   A

        disclosure_code
area_title  \
0                   NaN                                Alabama --
Statewide
1                   NaN                                Alabama --
Statewide
2                   NaN                                Alabama --
Statewide
3                   NaN                                Alabama --
Statewide
4                   NaN                                Alabama --
Statewide
...                 ...                                      ..
.
3602755             NaN                                   U.S.
TOTAL
3602756             NaN                                   U.S.
TOTAL
3602757             NaN      U.S. Combined Statistical Areas
(combined)
3602758             NaN  U.S. Metropolitan Statistical Areas
(combined)
3602759             NaN   U.S. Nonmetropolitan Area Counties
(combined)

                                           own_title  ...  \
0                                    Total Covered  ...
1                                Federal Government  ...
2                                Federal Government  ...
3                                Federal Government  ...
4                                Federal Government  ...
...                                             ...  ...
3602755                        Total Government  ...
3602756  Total U.I. Covered (Excludes Federal Government)  ...
3602757                                Total Covered  ...
3602758                                Total Covered  ...
3602759                                Total Covered  ...

        oty_total_annual_wages_chg oty_total_annual_wages_pct_chg  \
0                       2507023243                             2.6
1                        239488772                             5.2
2                        239488772                             5.2
3                         42231595                             5.8
```

```
4                              24145                                7.7
...                              ...                                ...
3602755                  39901028476                                3.1
3602756                 124351500307                                1.5
3602757                  87827423556                                1.3
3602758                 110506897751                                1.4
3602759                  25990995082                                2.7

         oty_taxable_annual_wages_chg  oty_taxable_annual_wages_pct_chg
\
0                          -275546557                               -1.7

1                                   0                                0.0

2                                   0                                0.0

3                                   0                                0.0

4                                   0                                0.0

...                               ...                                ...

3602755                     -95245695                               -0.3

3602756                   -51272621069                               -2.9

3602757                   -42225283621                               -3.1

3602758                   -47498008565                               -3.2

3602759                    -3774612504                               -1.5


          oty_annual_contributions_chg
oty_annual_contributions_pct_chg  \
0                           -17501048                                -
9.0
1                                   0
0.0
2                                   0
0.0
3                                   0
0.0
4                                   0
0.0
...                               ...                                ..
.
3602755                      -8793026                                -
4.4
3602756                    -3452466563                               -
```

```
10.6
3602757                     -2751281643                                  -
10.6
3602758                     -3020745780                                  -
10.6
3602759                      -431720783                                  -
10.1

         oty_annual_avg_wkly_wage_chg
oty_annual_avg_wkly_wage_pct_chg  \
0                                   65
6.9
1                                   29
1.8
2                                   29
1.8
3                                   64
5.0
4                                   68
12.7
...                                ...                                  ..
.
3602755                             68
6.0
3602756                             93
8.2
3602757                             99
8.4
3602758                             97
8.3
3602759                             70
7.4

         oty_avg_annual_pay_chg  oty_avg_annual_pay_pct_chg
0                          3371                         6.9
1                          1508                         1.8
2                          1508                         1.8
3                          3336                         5.1
4                          3539                        12.7
...                         ...                         ...
3602755                    3516                         5.9
3602756                    4839                         8.2
3602757                    5118                         8.3
3602758                    5028                         8.3
3602759                    3645                         7.4

[3602760 rows x 43 columns]
```

Reduced Variable Dictionary for QCEW Dataset

Referenced to full field descriptions found at:
https://www.bls.gov/cew/about-data/downloadable-file-layouts/annual/naics-based-annual-layout.htm

Name	Description	Data Type	Possible Values
area_fips	5-character FIPS code	Integer	01000 - 56999
industry_code	6-character industry code (NAICS, SuperSector)	Text	
year	4-character year	Text	2020
qtr	1-character quarter	Text	A, B, C, D
total_annual_wages	Sum of the four quarterly total taxable wage totals for a given year	Numeric	
oty_annual_avg_estabs_chg	Over-the-year change in annual average establishments for a given year	Numeric	

Initial Hypothesis Questions

```
Was the spread of COVID 19 accelerated by certain type, density, locality of employment?

Were industries, income, locality of employment negatively affected by the spread of COVID 19 when comparing data between 2020, 2021, 2022?
```

Task 3

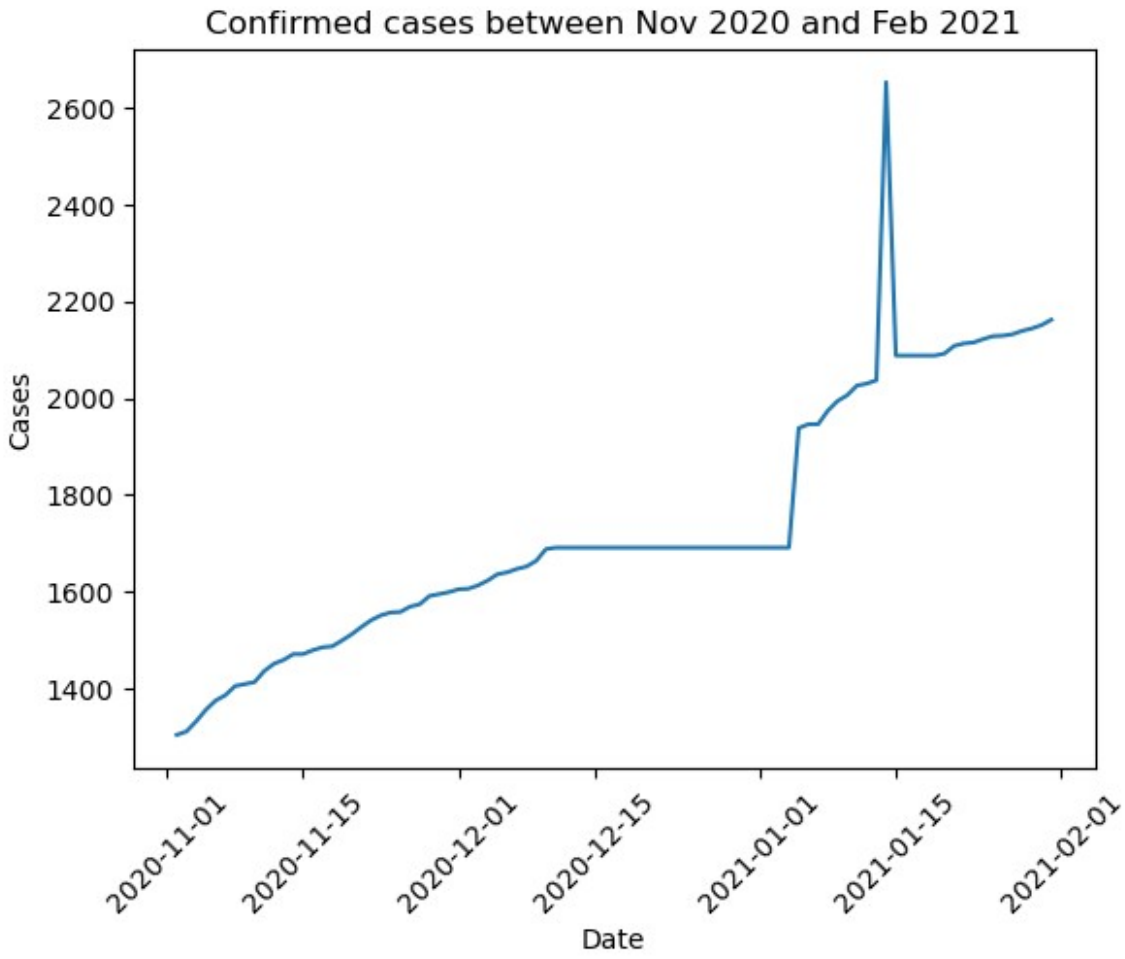
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt

specific_rows = [0, 558] # Selecting lables and row 558 for Hawaii statewide data
df = pd.read_csv('covid_super.csv', skiprows = lambda x: x not in specific_rows)
df.drop(df.loc[:,'2021-02-01_x':'2023-07-23_y'], axis=1, inplace=True)
# dropping data from end of confirmed case Feb 2021 to end of dataset
df.drop(df.loc[:,'countyFIPS':'2020-11-01_x'], axis=1, inplace=True) # dropping data from first column to Nov 2020
print(df)
```

```
   2020-11-02_x  2020-11-03_x  2020-11-04_x  2020-11-05_x  2020-11-06_x  \
0          1304          1311          1332          1356          1375

   2020-11-07_x  2020-11-08_x  2020-11-09_x  2020-11-10_x  2020-11-
```

```
11_x  ...  \
0          1386          1405          1409          1413
1436  ...

   2021-01-22_x  2021-01-23_x  2021-01-24_x  2021-01-25_x  2021-01-
26_x  \
0          2113          2115          2122          2128
2129

   2021-01-27_x  2021-01-28_x  2021-01-29_x  2021-01-30_x  2021-01-
31_x
0          2132          2139          2144          2151
2162

[1 rows x 91 columns]
```

```
x = df.columns.values
x = [s[:-2] for s in x]
x = np.asarray(x, dtype='datetime64[s]')
y = df.loc[0].values

plt.title("Confirmed cases between Nov 2020 and Feb 2021")
plt.xlabel("Date")
plt.xticks(rotation=45)
plt.ylabel("Cases")
plt.plot(x, y)
plt.show
```

```
<function matplotlib.pyplot.show(close=None, block=None)>
```



From the graph we can deduce that during this timeframe the number of confirmed cases is at a trend of increasing.

Now we are going to attempt to merge the 2020 QCEW quarterly data of Hawaii with confirmed COVID cases of 2020 in Hawaii

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt

specific_rows = [0, 558]
df = pd.read_csv('covid_super.csv', skiprows = lambda x: x not in
specific_rows)
df_columns = df.shape[1]
df.drop(df.loc[:,'2021-01-01_x':'2023-07-23_y'], axis=1, inplace=True)
df.drop(df.loc[:,'countyFIPS':'StateFIPS'], axis=1, inplace=True)

x = df.columns.values
x = [s[:-2] for s in x]
x = np.asarray(x, dtype='datetime64[s]')
y = df.loc[0].values
```

```
plt.title("2020 Hawaii total quarterly wages and confirmed cases")
plt.xlabel("Date")
plt.xticks(rotation=45)
plt.ylabel("Cases")
plt.plot(x, y, label="cases")

wage_df = pd.read_csv('2020.q1-q4 15000 Hawaii -- Statewide.csv')
x = ['2020-02-01','2020-05-01','2020-08-01','2020-11-01']
x = np.asarray(x, dtype='datetime64[s]')
y = wage_df.loc[1:4,'total_qtrly_wages'].values
plt.plot(x, y, label="wages")
plt.plot()
plt.show
```

```
<function matplotlib.pyplot.show(close=None, block=None)>
```