py_indonesian_covid19

November 16, 2021

DATA PROCESSING: INDONESIAN COVID-19 CASES by Faisal Adam Yudithia

1 A. DATA COLLECTION & UNDERSTANDING

Import all packages needed.

[1]:
```
import requests as rq
import json
import pandas as pd
import datetime as dt
import matplotlib.pyplot as plt
```

1.1 A.1. Get the Indonesian COVID-19 Public Data in JSON Format

[2]:
```
# Get the puplic data by request from the server
resp = rq.get('https://data.covid19.go.id/public/api/update.json')

# View the server's response headers
print('Date of Access : ' + resp.headers['Date'])
print('Content Type : ' + resp.headers['Content-Type'])

# Get the content of the data
data_json = resp.content
```

```
Date of Access : Tue, 16 Nov 2021 08:30:26 GMT
Content Type : application/json
```

1.2 A.2. Convert the Data Content in JSON Format to Python

[3]:
```
# Convert the data format from JSON to Python
data_py = json.loads(data_json)
```

1.3 A.3. Exploring the Data Content

1.3.1 A.3.1. Get the Dictionary Keys

[4]:
```
# View the key list of the data in dictionary data type
print('List of Keys:')
for k in dict.keys(data_py):
    print('- ' + k)
```

```
List of Keys:
- data
- update
```

[5]:
```
# View the key list of the 'data' key inside the data
print('List of Keys:')
for k in dict.keys(data_py['data']):
    print('- ' + k)
```

```
List of Keys:
- id
- jumlah_odp
- jumlah_pdp
- total_spesimen
- total_spesimen_negatif
```

[6]:
```
# View the key list of the 'update' key inside the data
print('List of Keys:')
for k in dict.keys(data_py['update']):
    print('- ' + k)
```

```
List of Keys:
- penambahan
- harian
- total
```

[7]:
```
# View the key list of the 'harian' key inside the 'update' key
print('List of Keys:')
for k in dict.keys(data_py['update']['harian'][0]):
    print('- ' + k)
```

```
List of Keys:
- key_as_string
- key
- doc_count
- jumlah_meninggal
- jumlah_sembuh
- jumlah_positif
- jumlah_dirawat
- jumlah_positif_kum
- jumlah_sembuh_kum
```

- jumlah_meninggal_kum
- jumlah_dirawat_kum

1.3.2 A.3.2 Get the Keys and Their Values

[8]:
```
# Get the information of total specimen
print('Total Specimen:')
for k, v in data_py['data'].items():
    print('- ' + k, v)
```

```
Total Specimen:
- id 1
- jumlah_odp 3845
- jumlah_pdp 0
- total_spesimen 50382458
- total_spesimen_negatif 40800748
```

[9]:
```
# Get the information of total cases
print('Total Cases:')
for k, v in data_py['update']['total'].items():
    print('- ' + k, v)
```

```
Total Cases:
- jumlah_positif 4251076
- jumlah_dirawat 8522
- jumlah_sembuh 4098884
- jumlah_meninggal 143670
```

[10]:
```
# Get the information of last case addition
print('Last Case Addition:')
for k, v in data_py['update']['penambahan'].items():
    print('- ' + k, v)
```

```
Last Case Addition:
- jumlah_positif 221
- jumlah_meninggal 11
- jumlah_sembuh 706
- jumlah_dirawat -496
- tanggal 2021-11-15
- created 2021-11-15 17:12:28
```

1.3.3 A.3.3. Hindsight

[11]:
```
print('Cases increase percentage:')

# Positive cases increase percentage
print('Positive cases: ' +␣
 ↪str(round(data_py['update']['penambahan']['jumlah_positif'] /␣
 ↪data_py['update']['total']['jumlah_positif'] * 100, 3)) + '%')
```

```
# Recovered cases increase percentage
print('Recovered cases: ' +␣
 ↪str(round(data_py['update']['penambahan']['jumlah_sembuh'] /␣
 ↪data_py['update']['total']['jumlah_sembuh'] * 100, 3)) + '%')

# Positive cases increase percentage
print('Recovered cases: ' +␣
 ↪str(round(data_py['update']['penambahan']['jumlah_meninggal'] /␣
 ↪data_py['update']['total']['jumlah_meninggal'] * 100, 3)) + '%')
```

```
Cases increase percentage:
Positive cases: 0.005%
Recovered cases: 0.017%
Recovered cases: 0.008%
```

2 B. DATA PREPARATION

2.1 B.1. Import the Daily Cases Data to Pandas DataFrame

[12]:
```
# Import the data to dataframe
daily_cases = pd.DataFrame(data_py['update']['harian'])

# Applying values to the columns
daily_cases['jumlah_meninggal'] = daily_cases['jumlah_meninggal'].apply(lambda␣
 ↪x: x['value'])
daily_cases['jumlah_sembuh'] = daily_cases['jumlah_sembuh'].apply(lambda x:␣
 ↪x['value'])
daily_cases['jumlah_positif'] = daily_cases['jumlah_positif'].apply(lambda x:␣
 ↪x['value'])
daily_cases['jumlah_dirawat'] = daily_cases['jumlah_dirawat'].apply(lambda x:␣
 ↪x['value'])
daily_cases['jumlah_positif_kum'] = daily_cases['jumlah_positif_kum'].
 ↪apply(lambda x: x['value'])
daily_cases['jumlah_sembuh_kum'] = daily_cases['jumlah_sembuh_kum'].
 ↪apply(lambda x: x['value'])
daily_cases['jumlah_meninggal_kum'] = daily_cases['jumlah_meninggal_kum'].
 ↪apply(lambda x: x['value'])
daily_cases['jumlah_dirawat_kum'] = daily_cases['jumlah_dirawat_kum'].
 ↪apply(lambda x: x['value'])

# Change the data type
daily_cases['key_as_string'] = pd.to_datetime(daily_cases['key_as_string'])

# Change the column name
daily_cases = daily_cases.rename(columns = {'key_as_string' : 'tanggal'})
```

```
# View sample rows of the dataframe
daily_cases.sample(5)
```

[12]:

	tanggal	key	doc_count	jumlah_meninggal	jumlah_sembuh	jumlah_positif	jumlah_dirawat	jumlah_positif_kum	jumlah_sembuh_kum	jumlah_meninggal_kum	jumlah_dirawat_kum
133	2020-07-13 00:00:00+00:00	1594598400000	1	50	1051	1282	181	76981	36689	3656	36636
178	2020-08-27 00:00:00+00:00	1598486400000	1	120	3166	2719	-567	162884	118575	7064	37245
197	2020-09-15 00:00:00+00:00	1600128000000	1	124	2660	3507	723	225030	161065	8965	55000
0	2020-03-02 00:00:00+00:00	1583107200000	1	0	0	2	2	2	0	0	2
477	2021-06-22 00:00:00+00:00	1624320000000	1	335	8375	13668	4958	2018113	1810136	55291	152686

[13]:
```
# View information of the dataframe
daily_cases.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 624 entries, 0 to 623
Data columns (total 11 columns):
 #   Column                Non-Null Count  Dtype
---  ------                --------------  -----
 0   tanggal               624 non-null    datetime64[ns, UTC]
 1   key                   624 non-null    int64
 2   doc_count             624 non-null    int64
 3   jumlah_meninggal      624 non-null    int64
 4   jumlah_sembuh         624 non-null    int64
 5   jumlah_positif        624 non-null    int64
 6   jumlah_dirawat        624 non-null    int64
 7   jumlah_positif_kum    624 non-null    int64
 8   jumlah_sembuh_kum     624 non-null    int64
 9   jumlah_meninggal_kum  624 non-null    int64
 10  jumlah_dirawat_kum    624 non-null    int64
dtypes: datetime64[ns, UTC](1), int64(10)
memory usage: 53.8 KB
```

2.2 B.2. Data Cleaning

[14]:
```
# Check if there are duplicate values
daily_cases.duplicated().any()
```

[14]:
```
False
```

2.3 B.3. Create Monthly Cases DataFrame

[15]:
```
# Group by month from the date column
monthly_cases = daily_cases.groupby(daily_cases['tanggal'].dt.
 ↪strftime('%Y-%m'))[['jumlah_positif', 'jumlah_sembuh', 'jumlah_meninggal']].
 ↪sum().sort_values(by = 'tanggal').reset_index(drop = False)

# Change the column name
monthly_cases = monthly_cases.rename(columns = {'tanggal' : 'bulan'})

# View the dataframe
monthly_cases
```

[15]:

	bulan	jumlah_positif	jumlah_sembuh	jumlah_meninggal
0	2020-03	1528	81	136
1	2020-04	8590	1441	656
2	2020-05	16355	5786	821
3	2020-06	29912	17498	1263
4	2020-07	51991	41101	2255
5	2020-08	66420	60052	2286
6	2020-09	112212	88988	3323
7	2020-10	123080	122854	3129
8	2020-11	128795	112717	3076
9	2020-12	204315	160579	5193
10	2021-01	335116	262124	7860
11	2021-02	256320	269482	6168
12	2021-03	177078	205627	4692
13	2021-04	156656	174304	4663
14	2021-05	153335	146485	5057
15	2021-06	356569	211294	7913
16	2021-07	1231386	889679	35628
17	2021-08	680143	990405	38904
18	2021-09	125303	276527	8916
19	2021-10	29254	51611	1466
20	2021-11	6718	10249	265

[16]:
```
# View information of the dataframe
monthly_cases.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 21 entries, 0 to 20
```

```
Data columns (total 4 columns):
 #   Column            Non-Null Count  Dtype
---  ------            --------------  -----
 0   bulan             21 non-null     object
 1   jumlah_positif    21 non-null     int64
 2   jumlah_sembuh     21 non-null     int64
 3   jumlah_meninggal  21 non-null     int64
dtypes: int64(3), object(1)
memory usage: 800.0+ bytes
```

2.4 A.6. Descriptive Statistics

[17]:
```
# Descriptive statistics of the daily cases
daily_cases.describe()
```

[17]:

	key	doc_count	jumlah_meninggal	jumlah_sembuh	\
count	6.240000e+02	624.000000	624.000000	624.000000	
mean	1.610021e+12	1.003205	230.240385	6568.724359	
std	1.557598e+10	0.056568	363.156436	9123.226056	
min	1.583107e+12	1.000000	0.000000	0.000000	
25%	1.596564e+12	1.000000	52.000000	1082.500000	
50%	1.610021e+12	1.000000	116.000000	3921.500000	
75%	1.623478e+12	1.000000	196.250000	7166.250000	
max	1.636934e+12	2.000000	2069.000000	48832.000000	

	jumlah_positif	jumlah_dirawat	jumlah_positif_kum	jumlah_sembuh_kum	\
count	624.000000	624.000000	6.240000e+02	6.240000e+02	
mean	6812.621795	13.657051	1.366245e+06	1.221004e+06	
std	9632.242303	4931.980888	1.458799e+06	1.362515e+06	
min	0.000000	-25725.000000	2.000000e+00	0.000000e+00	
25%	1238.250000	-659.250000	1.164172e+05	7.342925e+04	
50%	4170.500000	150.500000	8.030315e+05	6.631600e+05	
75%	6830.750000	674.750000	1.903957e+06	1.741600e+06	
max	56757.000000	36726.000000	4.251076e+06	4.098884e+06	

	jumlah_meninggal_kum	jumlah_dirawat_kum
count	624.000000	624.000000
mean	41907.866987	103332.971154
std	46877.669885	120261.286411
min	0.000000	2.000000
25%	5436.000000	27663.000000
50%	23636.500000	63659.000000
75%	52767.250000	125285.000000
max	143670.000000	574135.000000

[18]:
```
# Descriptive statistics of the monthly cases
monthly_cases.describe()
```

[18]:

	jumlah_positif	jumlah_sembuh	jumlah_meninggal
count	2.100000e+01	21.000000	21.000000
mean	2.024322e+05	195184.952381	6841.428571
std	2.840715e+05	264467.683017	10449.267743
min	1.528000e+03	81.000000	136.000000
25%	2.991200e+04	41101.000000	1466.000000
50%	1.253030e+05	122854.000000	3323.000000
75%	2.043150e+05	211294.000000	6168.000000
max	1.231386e+06	990405.000000	38904.000000

3 C. DESCRIPTIVE ANALYSIS

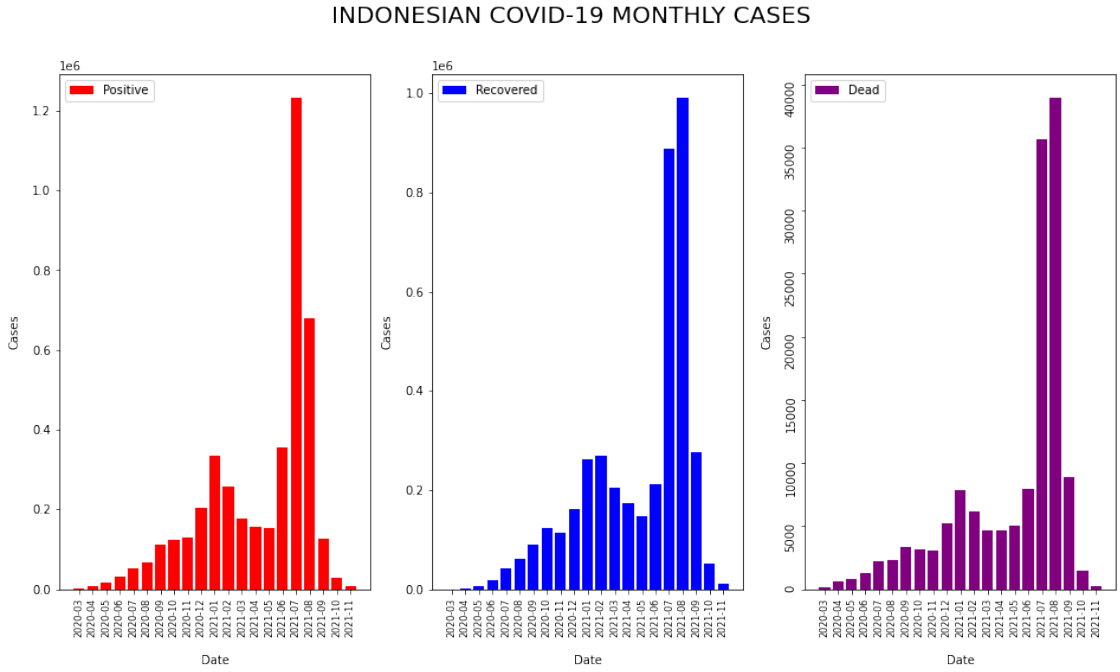
3.1 C.1 Set the Default Parameter

[19]:
```
plt.rcParams['figure.figsize'] = 16, 6
plt.rcParams['lines.linewidth'] = 1
plt.rcParams['xtick.labelsize'] = 'medium'
plt.rcParams['ytick.labelsize'] = 'medium'
plt.rcParams['axes.titlepad'] = 20
```

3.2 C.2 Monthly Cases Bar Chart

[20]:
```
plt.figure(figsize = (16,8))
plt.suptitle('INDONESIAN COVID-19 MONTHLY CASES',
             fontsize = 20)

# Subplot 1: positive cases
plt.subplot(1, 3, 1)
plt.bar(monthly_cases['bulan'],
        monthly_cases['jumlah_positif'],
        color = 'red',
        label = 'Positive')
plt.xlabel('Date',
           labelpad = 15)
plt.ylabel('Cases',
           labelpad = 10)
plt.xticks(rotation = 90,
           fontsize = 8)
plt.yticks(rotation = 0)
plt.legend(loc = 'upper left',
           bbox_to_anchor =(0, 1),
           ncol = 1)

# Subplot 2: recovered cases
plt.subplot(1, 3, 2)
plt.bar(monthly_cases['bulan'],
        monthly_cases['jumlah_sembuh'],
```

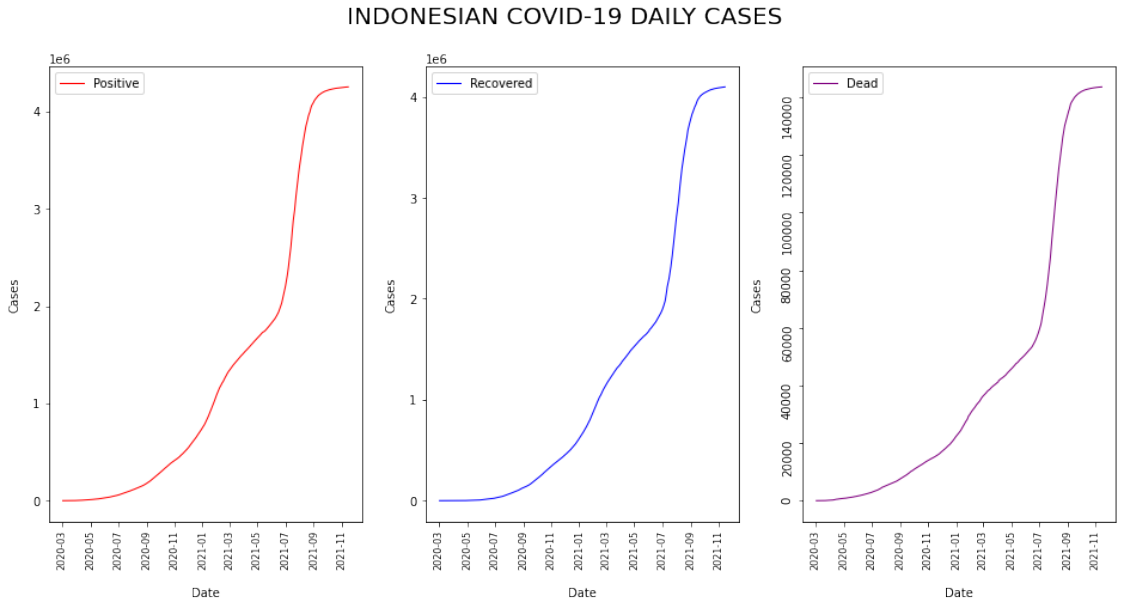
```
        color = 'blue',
        label = 'Recovered')
plt.xlabel('Date',
           labelpad = 15)
plt.ylabel('Cases',
           labelpad = 10)
plt.xticks(rotation = 90,
           fontsize = 8)
plt.yticks(rotation = 0)
plt.legend(loc = 'upper left',
           bbox_to_anchor =(0, 1),
           ncol = 1)

# Subplot 3: dead cases
plt.subplot(1, 3, 3)
plt.bar(monthly_cases['bulan'],
        monthly_cases['jumlah_meninggal'],
        color = 'purple',
        label = 'Dead')
plt.xlabel('Date',
           labelpad = 15)
plt.ylabel('Cases',
           labelpad = 10)
plt.xticks(rotation = 90,
           fontsize = 8)
plt.yticks(rotation = 90)
plt.legend(loc = 'upper left',
           bbox_to_anchor =(0, 1),
           ncol = 1)

# Show the bar chart
plt.show()
```



3.3 C.3. Daily Cases Line Chart

[21]:
```
plt.figure(figsize = (16,7))
plt.suptitle('INDONESIAN COVID-19 DAILY CASES',
             fontsize = 20)

# Subplot 1: positive cases
plt.subplot(1, 3, 1)
plt.plot(daily_cases['tanggal'],
         daily_cases['jumlah_positif_kum'],
         color = 'red',
         label = 'Positive')
plt.xlabel('Date',
           labelpad = 15)
plt.ylabel('Cases',
           labelpad = 10)
plt.xticks(rotation = 90,
           fontsize = 8)
plt.yticks(rotation = 0)
plt.legend(loc = 'upper left',
           bbox_to_anchor =(0, 1),
           ncol = 1)

# Subplot 2: recovered cases
plt.subplot(1, 3, 2)
```

```
plt.plot(daily_cases['tanggal'],
         daily_cases['jumlah_sembuh_kum'],
         color = 'blue',
         label = 'Recovered')
plt.xlabel('Date',
           labelpad = 15)
plt.ylabel('Cases',
           labelpad = 10)
plt.xticks(rotation = 90,
           fontsize = 8)
plt.yticks(rotation = 0)
plt.legend(loc = 'upper left',
           bbox_to_anchor =(0, 1),
           ncol = 1)

# Subplot 3: dead cases
plt.subplot(1, 3, 3)
plt.plot(daily_cases['tanggal'],
         daily_cases['jumlah_meninggal_kum'],
         color = 'purple',
         label = 'Dead')
plt.xlabel('Date',
           labelpad = 15)
plt.ylabel('Cases',
           labelpad = 15)
plt.xticks(rotation = 90,
           fontsize = 8)
plt.yticks(rotation = 90)
plt.legend(loc = 'upper left',
           bbox_to_anchor =(0, 1),
           ncol = 1)

# Show the line chart
plt.show()
```



4 D. DATA EXPORT

Export the Daily Cases Data to CSV Format

[22]:
```
# Current date and time
now = dt.datetime.now().strftime('%Y%m%d_%H%M%S')

# Export to CSV Format
daily_cases.to_csv('indonesian_covid19_daily_' + now +'.csv', index=False)
```