# Importing Libraries

In [1]:
```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
```

# Importing Datasets

In [2]:
```
df=pd.read_csv("rainfall in india 1901-2015.csv")
df
```

Out[2]:

| | index | SUBDIVISION | YEAR | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 0 | ANDAMAN & NICOBAR ISLANDS | 1901 | 49.2 | 87.1 | 29.2 | 2.3 | 528.8 | 517.5 | 365.1 | 481.1 | 332.6 | 388.5 |
| **1** | 1 | ANDAMAN & NICOBAR ISLANDS | 1902 | 0.0 | 159.8 | 12.2 | 0.0 | 446.1 | 537.1 | 228.9 | 753.7 | 666.2 | 197.2 |
| **2** | 2 | ANDAMAN & NICOBAR ISLANDS | 1903 | 12.7 | 144.0 | 0.0 | 1.0 | 235.1 | 479.9 | 728.4 | 326.7 | 339.0 | 181.2 |
| **3** | 3 | ANDAMAN & NICOBAR ISLANDS | 1904 | 9.4 | 14.7 | 0.0 | 202.4 | 304.5 | 495.1 | 502.0 | 160.1 | 820.4 | 222.2 |
| **4** | 4 | ANDAMAN & NICOBAR ISLANDS | 1905 | 1.3 | 0.0 | 3.3 | 26.9 | 279.5 | 628.7 | 368.7 | 330.5 | 297.0 | 260.7 |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| **4111** | 4111 | LAKSHADWEEP | 2011 | 5.1 | 2.8 | 3.1 | 85.9 | 107.2 | 153.6 | 350.2 | 254.0 | 255.2 | 117.4 |
| **4112** | 4112 | LAKSHADWEEP | 2012 | 19.2 | 0.1 | 1.6 | 76.8 | 21.2 | 327.0 | 231.5 | 381.2 | 179.8 | 145.9 |
| **4113** | 4113 | LAKSHADWEEP | 2013 | 26.2 | 34.4 | 37.5 | 5.3 | 88.3 | 426.2 | 296.4 | 154.4 | 180.0 | 72.8 |
| **4114** | 4114 | LAKSHADWEEP | 2014 | 53.2 | 16.1 | 4.4 | 14.9 | 57.4 | 244.1 | 116.1 | 466.1 | 132.2 | 169.2 |
| **4115** | 4115 | LAKSHADWEEP | 2015 | 2.2 | 0.5 | 3.7 | 87.1 | 133.1 | 296.6 | 257.5 | 146.4 | 160.4 | 165.4 |

4116 rows × 20 columns

# head

In [3]:
```
df.head(5)
df
```

Out[3]:

| | index | SUBDIVISION | YEAR | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 0 | ANDAMAN & NICOBAR ISLANDS | 1901 | 49.2 | 87.1 | 29.2 | 2.3 | 528.8 | 517.5 | 365.1 | 481.1 | 332.6 | 388.5 |
| **1** | 1 | ANDAMAN & NICOBAR ISLANDS | 1902 | 0.0 | 159.8 | 12.2 | 0.0 | 446.1 | 537.1 | 228.9 | 753.7 | 666.2 | 197.2 |
| **2** | 2 | ANDAMAN & NICOBAR ISLANDS | 1903 | 12.7 | 144.0 | 0.0 | 1.0 | 235.1 | 479.9 | 728.4 | 326.7 | 339.0 | 181.2 |
| **3** | 3 | ANDAMAN & NICOBAR ISLANDS | 1904 | 9.4 | 14.7 | 0.0 | 202.4 | 304.5 | 495.1 | 502.0 | 160.1 | 820.4 | 222.2 |
| **4** | 4 | ANDAMAN & NICOBAR ISLANDS | 1905 | 1.3 | 0.0 | 3.3 | 26.9 | 279.5 | 628.7 | 368.7 | 330.5 | 297.0 | 260.7 |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| **4111** | 4111 | LAKSHADWEEP | 2011 | 5.1 | 2.8 | 3.1 | 85.9 | 107.2 | 153.6 | 350.2 | 254.0 | 255.2 | 117.4 |
| **4112** | 4112 | LAKSHADWEEP | 2012 | 19.2 | 0.1 | 1.6 | 76.8 | 21.2 | 327.0 | 231.5 | 381.2 | 179.8 | 145.9 |
| **4113** | 4113 | LAKSHADWEEP | 2013 | 26.2 | 34.4 | 37.5 | 5.3 | 88.3 | 426.2 | 296.4 | 154.4 | 180.0 | 72.8 |
| **4114** | 4114 | LAKSHADWEEP | 2014 | 53.2 | 16.1 | 4.4 | 14.9 | 57.4 | 244.1 | 116.1 | 466.1 | 132.2 | 169.2 |
| **4115** | 4115 | LAKSHADWEEP | 2015 | 2.2 | 0.5 | 3.7 | 87.1 | 133.1 | 296.6 | 257.5 | 146.4 | 160.4 | 165.4 |

4116 rows × 20 columns

# tail

In [4]:

```
df.tail(5)
df
```

Out[4]:

| | index | SUBDIVISION | YEAR | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 0 | ANDAMAN & NICOBAR ISLANDS | 1901 | 49.2 | 87.1 | 29.2 | 2.3 | 528.8 | 517.5 | 365.1 | 481.1 | 332.6 | 388.5 |
| **1** | 1 | ANDAMAN & NICOBAR ISLANDS | 1902 | 0.0 | 159.8 | 12.2 | 0.0 | 446.1 | 537.1 | 228.9 | 753.7 | 666.2 | 197.2 |
| **2** | 2 | ANDAMAN & NICOBAR ISLANDS | 1903 | 12.7 | 144.0 | 0.0 | 1.0 | 235.1 | 479.9 | 728.4 | 326.7 | 339.0 | 181.2 |
| **3** | 3 | ANDAMAN & NICOBAR ISLANDS | 1904 | 9.4 | 14.7 | 0.0 | 202.4 | 304.5 | 495.1 | 502.0 | 160.1 | 820.4 | 222.2 |
| **4** | 4 | ANDAMAN & NICOBAR | 1905 | 1.3 | 0.0 | 3.3 | 26.9 | 279.5 | 628.7 | 368.7 | 330.5 | 297.0 | 260.7 |

| | index | SUBDIVISION | YEAR | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ISLANDS | | | | | | | | | | | |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| **4111** | 4111 | LAKSHADWEEP | 2011 | 5.1 | 2.8 | 3.1 | 85.9 | 107.2 | 153.6 | 350.2 | 254.0 | 255.2 | 117.4 |
| **4112** | 4112 | LAKSHADWEEP | 2012 | 19.2 | 0.1 | 1.6 | 76.8 | 21.2 | 327.0 | 231.5 | 381.2 | 179.8 | 145.9 |
| **4113** | 4113 | LAKSHADWEEP | 2013 | 26.2 | 34.4 | 37.5 | 5.3 | 88.3 | 426.2 | 296.4 | 154.4 | 180.0 | 72.8 |
| **4114** | 4114 | LAKSHADWEEP | 2014 | 53.2 | 16.1 | 4.4 | 14.9 | 57.4 | 244.1 | 116.1 | 466.1 | 132.2 | 169.2 |
| **4115** | 4115 | LAKSHADWEEP | 2015 | 2.2 | 0.5 | 3.7 | 87.1 | 133.1 | 296.6 | 257.5 | 146.4 | 160.4 | 165.4 |

4116 rows × 20 columns

# Data Cleaning and Data Preprocessing

# describe()

In [5]:
```
df.describe()
```

Out[5]:

| | index | YEAR | JAN | FEB | MAR | APR | MAY | |
|---|---|---|---|---|---|---|---|---|
| **count** | 4116.000000 | 4116.000000 | 4112.000000 | 4113.000000 | 4110.000000 | 4112.000000 | 4113.000000 | 4 |
| **mean** | 2057.500000 | 1958.218659 | 18.957320 | 21.805325 | 27.359197 | 43.127432 | 85.745417 | |
| **std** | 1188.331183 | 33.140898 | 33.585371 | 35.909488 | 46.959424 | 67.831168 | 123.234904 | |
| **min** | 0.000000 | 1901.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | |
| **25%** | 1028.750000 | 1930.000000 | 0.600000 | 0.600000 | 1.000000 | 3.000000 | 8.600000 | |
| **50%** | 2057.500000 | 1958.000000 | 6.000000 | 6.700000 | 7.800000 | 15.700000 | 36.600000 | |
| **75%** | 3086.250000 | 1987.000000 | 22.200000 | 26.800000 | 31.300000 | 49.950000 | 97.200000 | |
| **max** | 4115.000000 | 2015.000000 | 583.700000 | 403.500000 | 605.600000 | 595.100000 | 1168.600000 | 1 |

# shape

In [6]:
```
np.shape(df)
```

Out[6]:
```
(4116, 20)
```

# size

In [7]:
```
np.size(df)
```

Out[7]:
```
82320
```

# dropna

In [8]:
```
df=df.dropna()
```

# columns

In [9]:
```
df.columns
```

Out[9]:
```
Index(['index', 'SUBDIVISION', 'YEAR', 'JAN', 'FEB', 'MAR', 'APR', 'MAY',
       'JUN', 'JUL', 'AUG', 'SEP', 'OCT', 'NOV', 'DEC', 'ANNUAL', 'Jan-Feb',
       'Mar-May', 'Jun-Sep', 'Oct-Dec'],
      dtype='object')
```

# info()

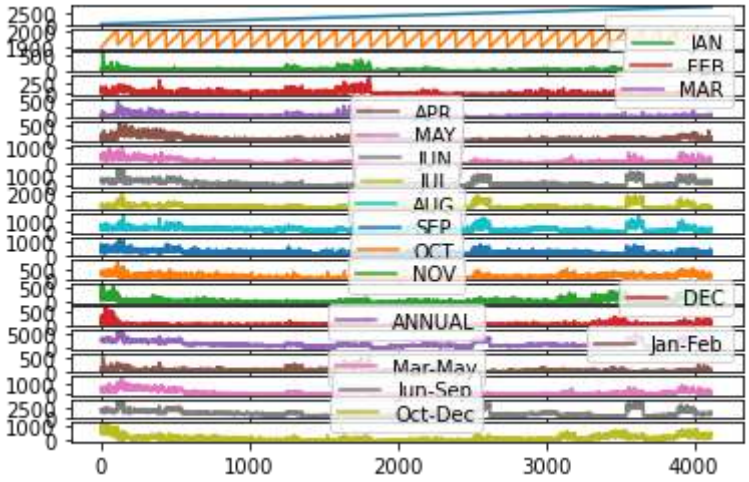
In [10]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 4090 entries, 0 to 4115
Data columns (total 20 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   index        4090 non-null   int64  
 1   SUBDIVISION  4090 non-null   object 
 2   YEAR         4090 non-null   int64  
 3   JAN          4090 non-null   float64
 4   FEB          4090 non-null   float64
 5   MAR          4090 non-null   float64
 6   APR          4090 non-null   float64
 7   MAY          4090 non-null   float64
 8   JUN          4090 non-null   float64
 9   JUL          4090 non-null   float64
 10  AUG          4090 non-null   float64
 11  SEP          4090 non-null   float64
 12  OCT          4090 non-null   float64
 13  NOV          4090 non-null   float64
 14  DEC          4090 non-null   float64
 15  ANNUAL       4090 non-null   float64
 16  Jan-Feb      4090 non-null   float64
 17  Mar-May      4090 non-null   float64
 18  Jun-Sep      4090 non-null   float64
 19  Oct-Dec      4090 non-null   float64
dtypes: float64(17), int64(2), object(1)
memory usage: 671.0+ KB
```

# Line chart

In [11]:
```
df.plot.line(subplots=True)
```

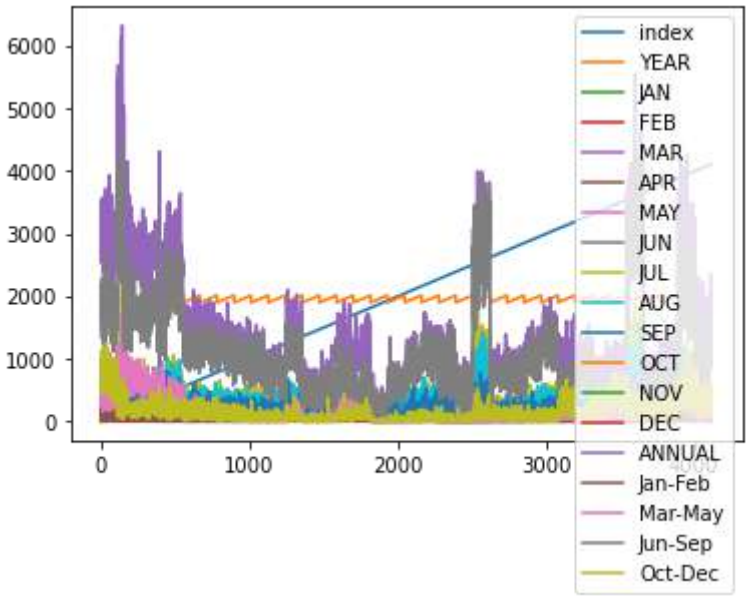
Out[11]:
```
array([<AxesSubplot:>, <AxesSubplot:>, <AxesSubplot:>, <AxesSubplot:>,
       <AxesSubplot:>, <AxesSubplot:>, <AxesSubplot:>, <AxesSubplot:>,
       <AxesSubplot:>, <AxesSubplot:>, <AxesSubplot:>, <AxesSubplot:>,
       <AxesSubplot:>, <AxesSubplot:>, <AxesSubplot:>, <AxesSubplot:>,
       <AxesSubplot:>, <AxesSubplot:>, <AxesSubplot:>], dtype=object)
```




# Line chart

In [12]:
```
df.plot.line()
```

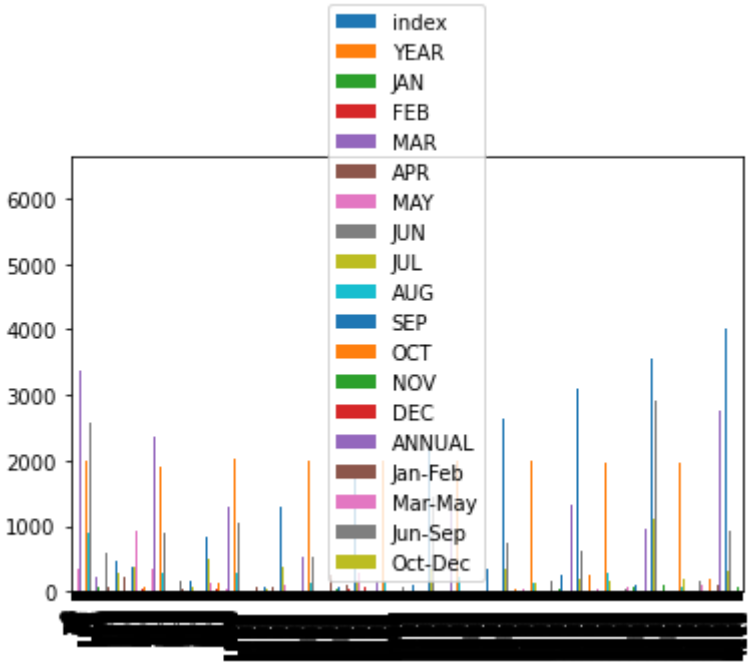
Out[12]: <AxesSubplot:>




# Bar chart

In [13]:
```
df.plot.bar()
```

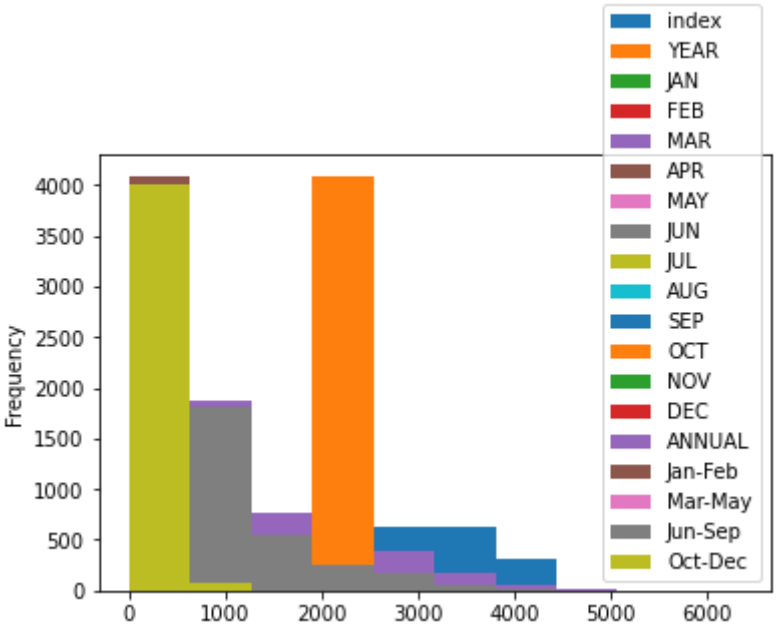
Out[13]: <AxesSubplot:>




# Histogram

In [14]:
```
df.plot.hist()
```

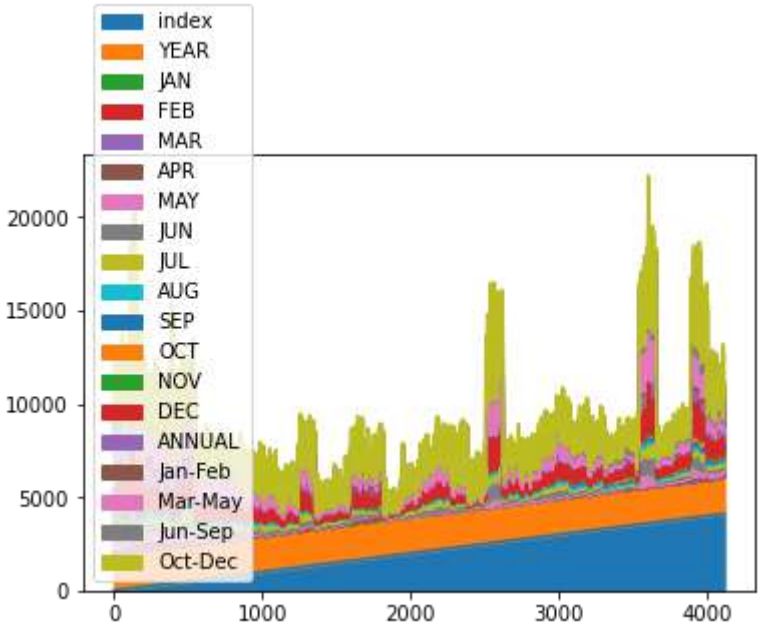
Out[14]: <AxesSubplot:ylabel='Frequency'>




# Area chart

In [15]:
```
df.plot.area()
```

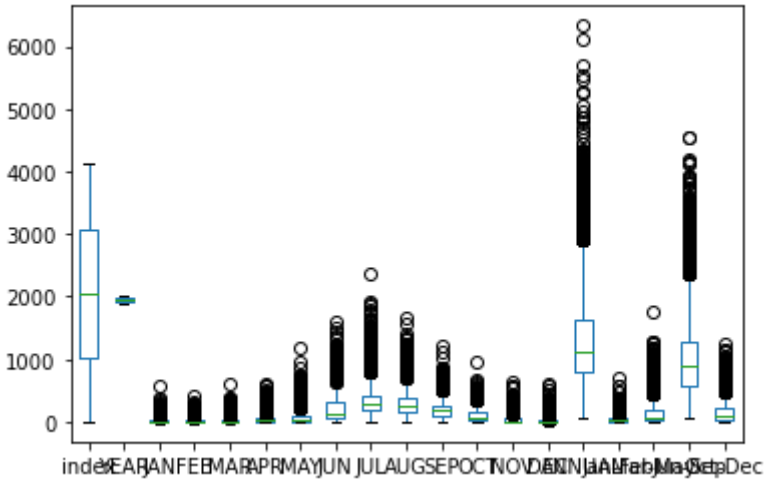
Out[15]: <AxesSubplot:>




# Box chart

In [16]:
```
df.plot.box()
```

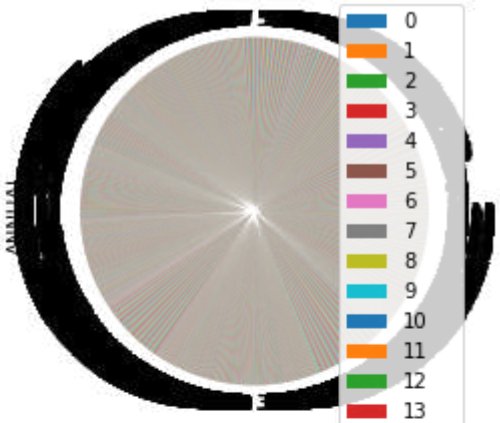
Out[16]: <AxesSubplot:>




# Pie chart

In [17]:
```
df.plot.pie(y='ANNUAL')
```

Out[17]: <AxesSubplot:ylabel='ANNUAL'>

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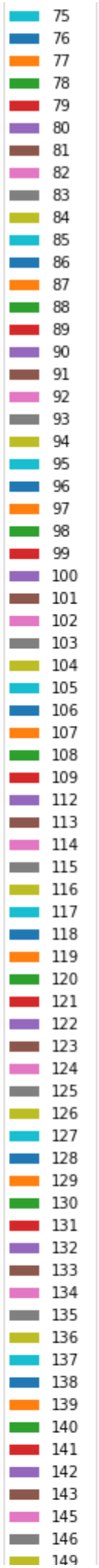
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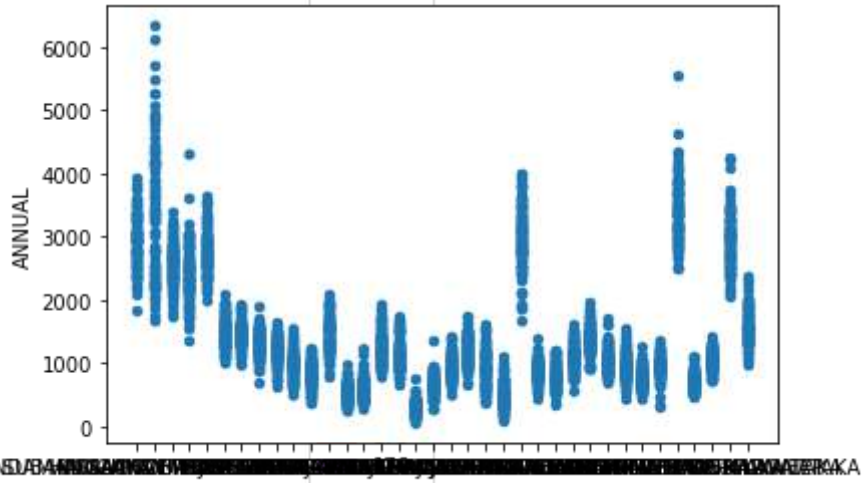
# Scatter chart

In [18]:
```
df.plot.scatter(x='SUBDIVISION' ,y='ANNUAL')
```

Out[18]:
```
<AxesSubplot:xlabel='SUBDIVISION', ylabel='ANNUAL'>
```




In [19]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 4090 entries, 0 to 4115
Data columns (total 20 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
 0   index        4090 non-null   int64
 1   SUBDIVISION  4090 non-null   object
 2   YEAR         4090 non-null   int64
 3   JAN          4090 non-null   float64
 4   FEB          4090 non-null   float64
 5   MAR          4090 non-null   float64
 6   APR          4090 non-null   float64
 7   MAY          4090 non-null   float64
 8   JUN          4090 non-null   float64
 9   JUL          4090 non-null   float64
 10  AUG          4090 non-null   float64
 11  SEP          4090 non-null   float64
 12  OCT          4090 non-null   float64
 13  NOV          4090 non-null   float64
 14  DEC          4090 non-null   float64
 15  ANNUAL       4090 non-null   float64
 16  Jan-Feb      4090 non-null   float64
 17  Mar-May      4090 non-null   float64
 18  Jun-Sep      4090 non-null   float64
 19  Oct-Dec      4090 non-null   float64
dtypes: float64(17), int64(2), object(1)
memory usage: 671.0+ KB
```

In [20]:
```
df.describe()
```

Out[20]:

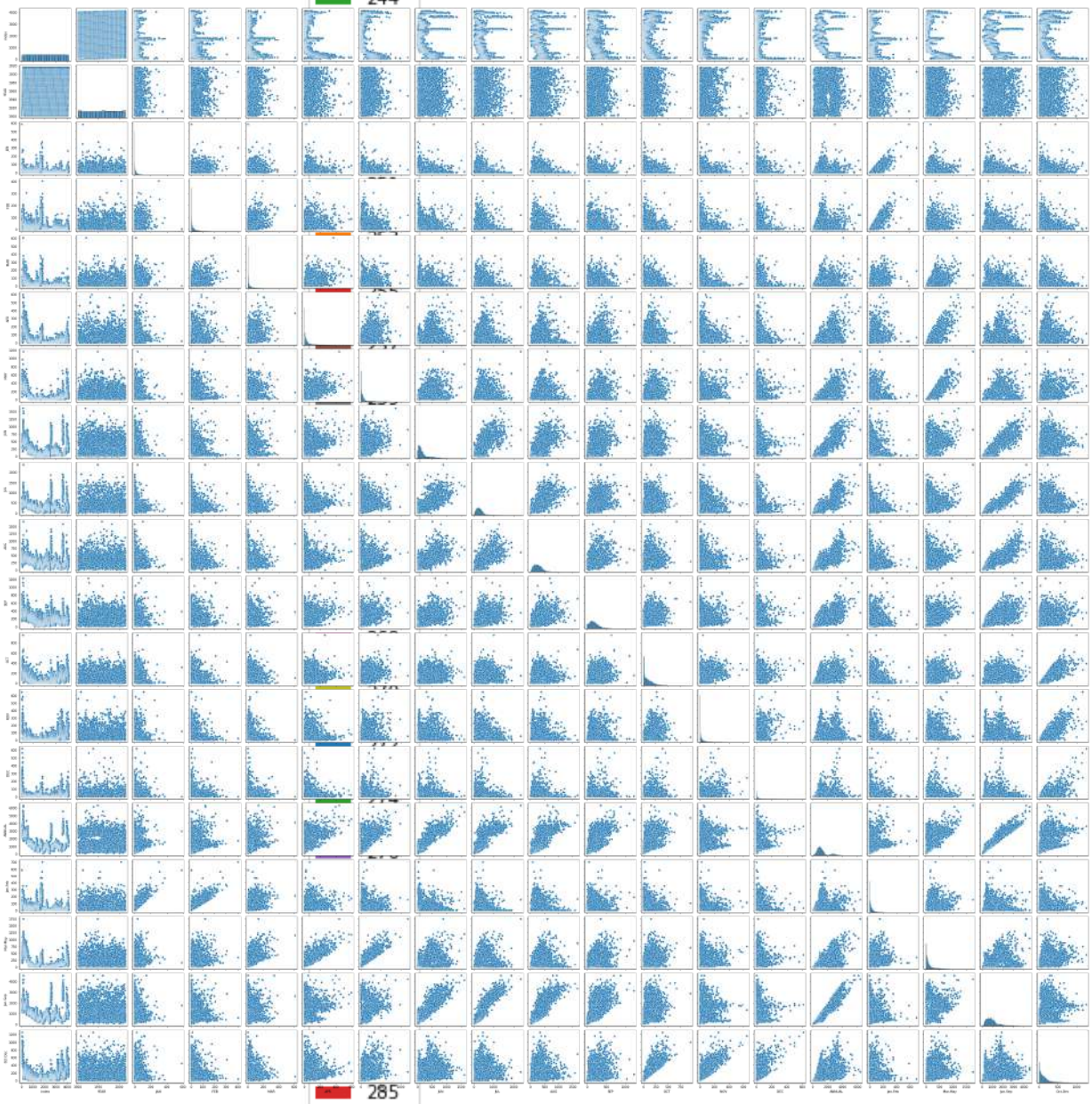
| | index | YEAR | JAN | FEB | MAR | APR | MAY | |
|---|---|---|---|---|---|---|---|---|
| **count** | 4090.000000 | 4090.000000 | 4090.000000 | 4090.000000 | 4090.000000 | 4090.000000 | 4090.000000 | 4 |
| **mean** | 2057.638875 | 1958.321271 | 18.818484 | 21.644792 | 27.252494 | 42.714548 | 84.868044 | |

| | index | YEAR | JAN | FEB | MAR | APR | MAY | |
|---|---|---|---|---|---|---|---|---|
| **std** | 1182.612736 | 33.148944 | 33.521719 | 35.762010 | 46.829179 | 67.264863 | 122.556801 | |
| **min** | 0.000000 | 1901.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | |
| **25%** | 1034.250000 | 1930.000000 | 0.600000 | 0.600000 | 1.000000 | 3.000000 | 8.500000 | |
| **50%** | 2057.500000 | 1959.000000 | 5.900000 | 6.600000 | 7.800000 | 15.500000 | 36.050000 | |
| **75%** | 3080.750000 | 1987.000000 | 21.950000 | 26.600000 | 31.100000 | 49.375000 | 94.975000 | |
| **max** | 4115.000000 | 2015.000000 | 583.700000 | 403.500000 | 605.600000 | 595.100000 | 1168.600000 | 1 |

# EDA AND VISUALIZATION

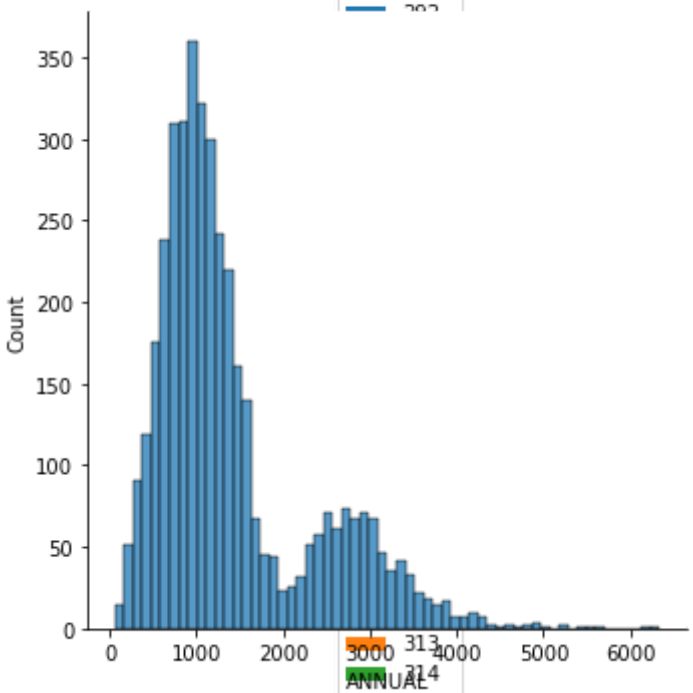
In [21]:
```
sns.pairplot(df)
```

Out[21]:
```
<seaborn.axisgrid.PairGrid at 0x1d7a1f06b50>
```



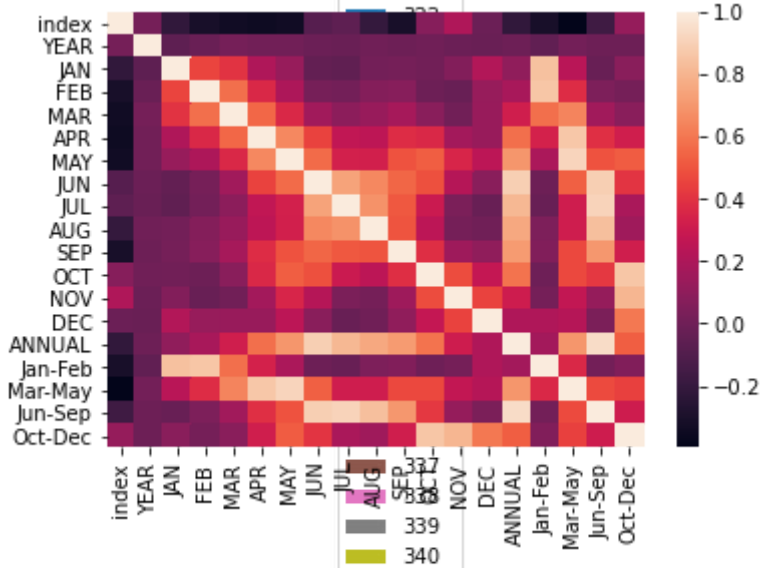
In [22]:
```
sns.displot(df['ANNUAL'])
```

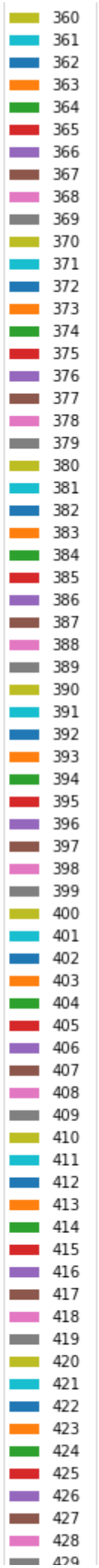
Out[22]: <seaborn.axisgrid.FacetGrid at 0x1d7af28fdc0>




In [23]:
```
sns.heatmap(df.corr())
```

Out[23]: <AxesSubplot:>

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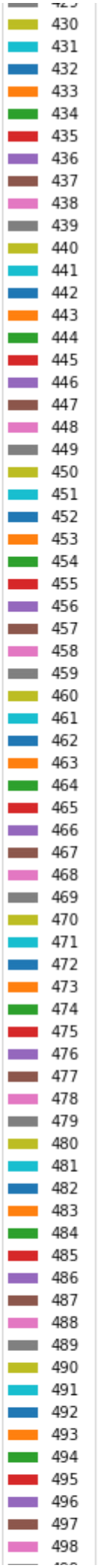
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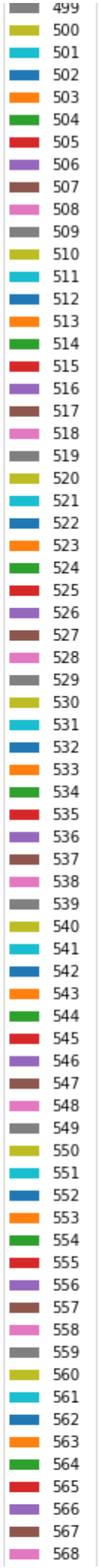
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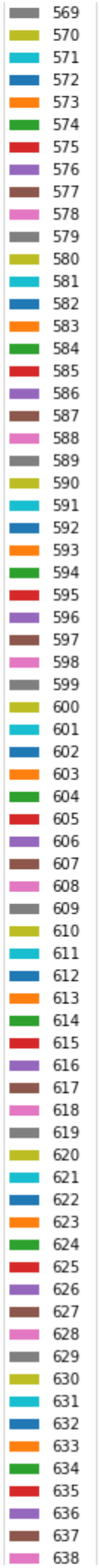
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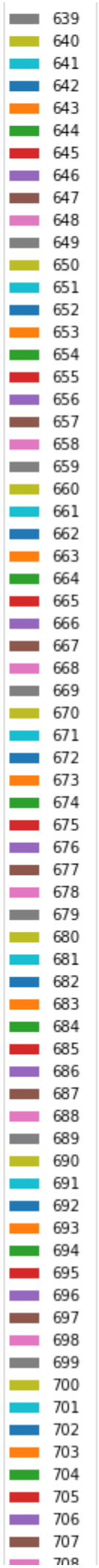
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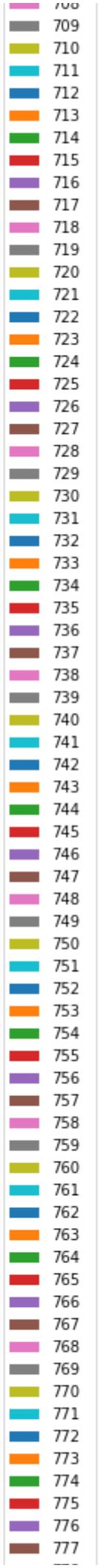
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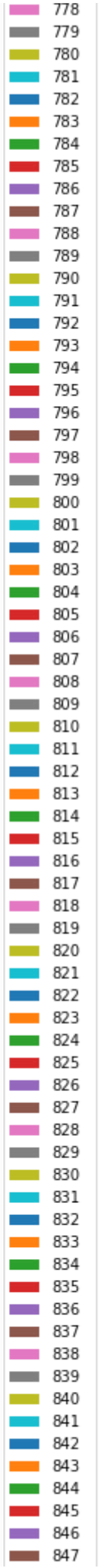
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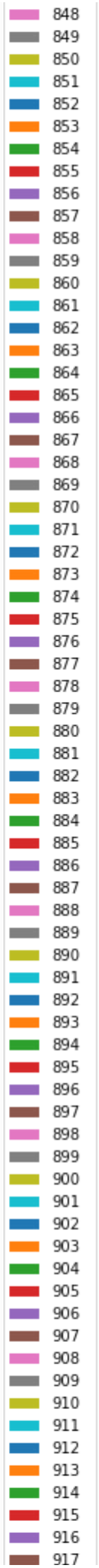
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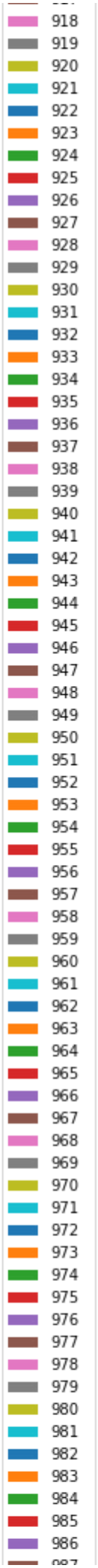
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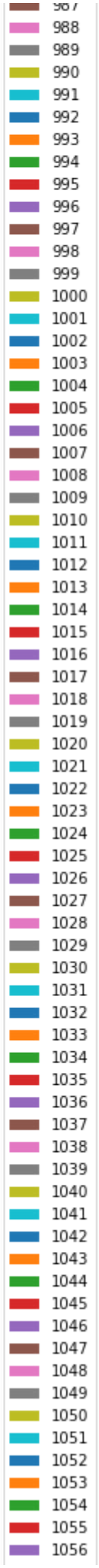
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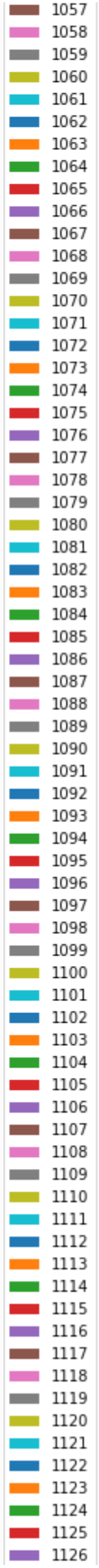
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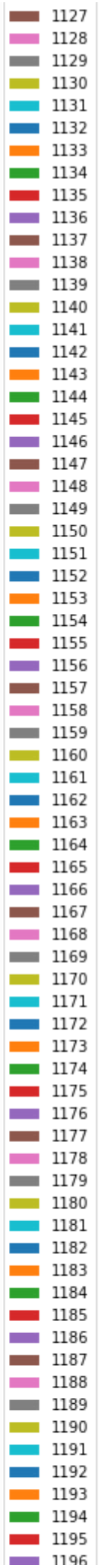
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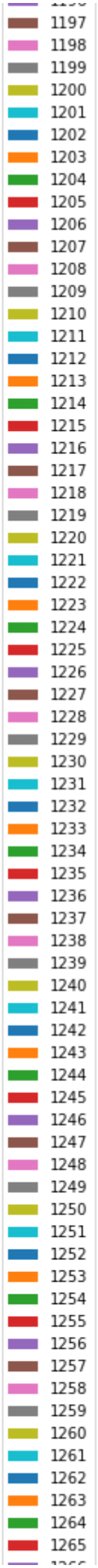
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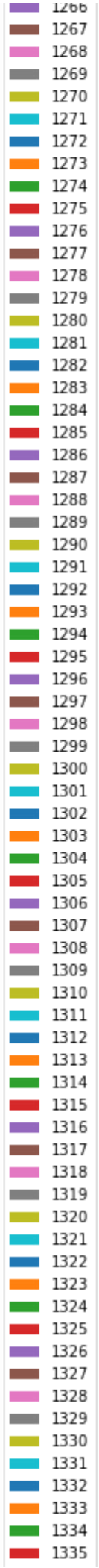
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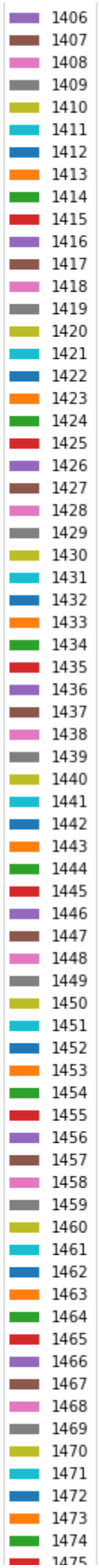
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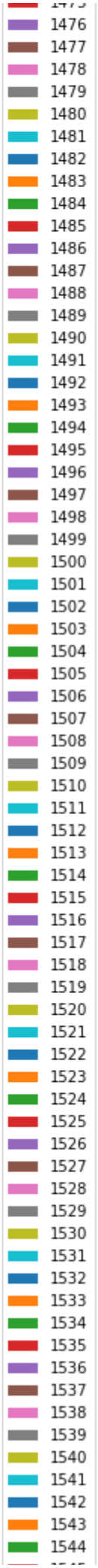
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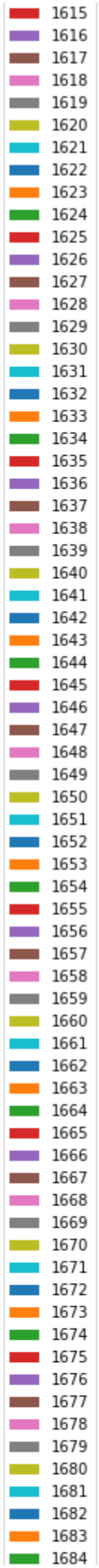
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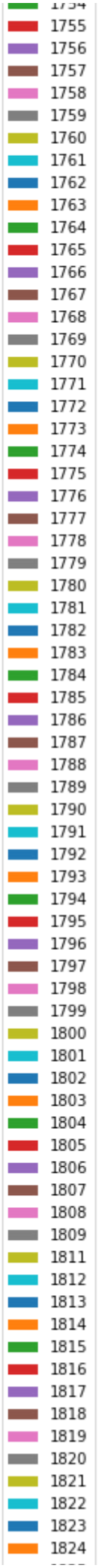
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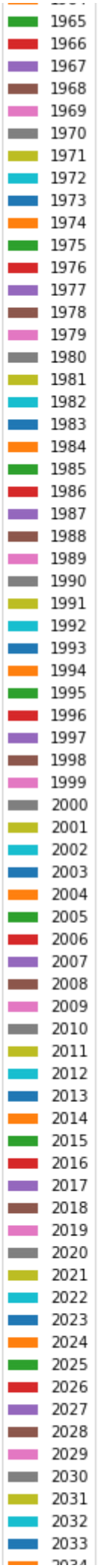
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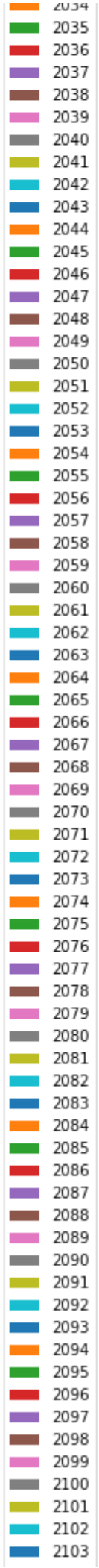
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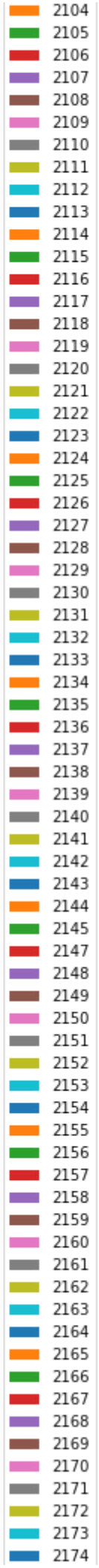
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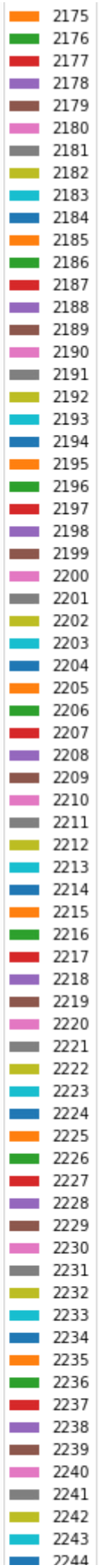
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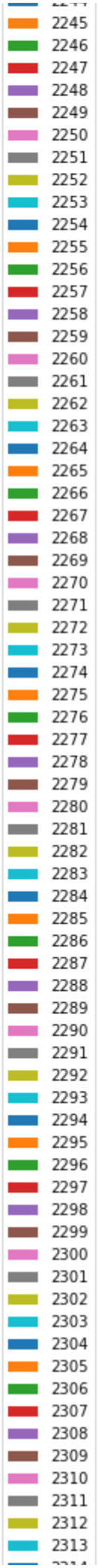
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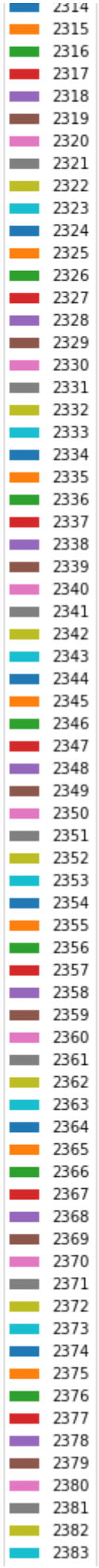
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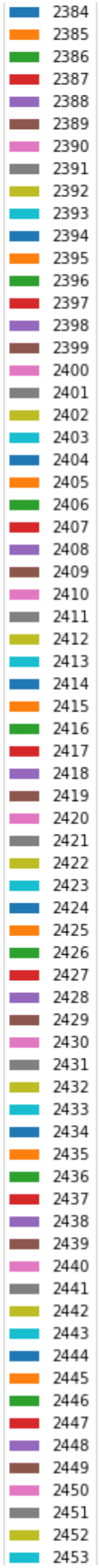
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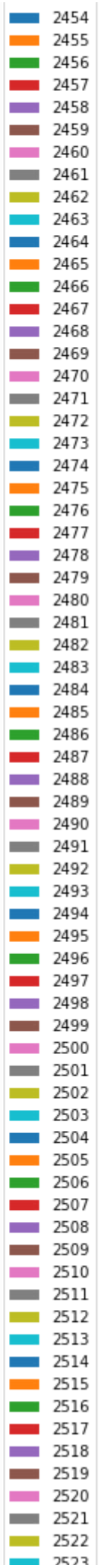
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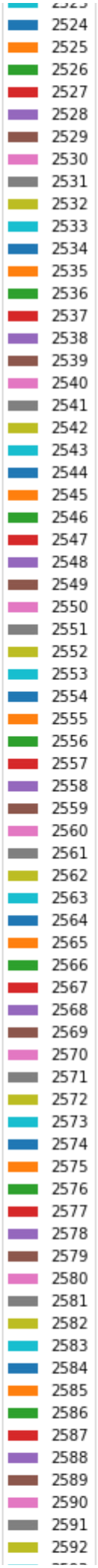
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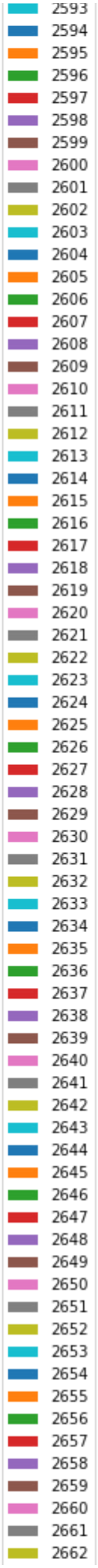
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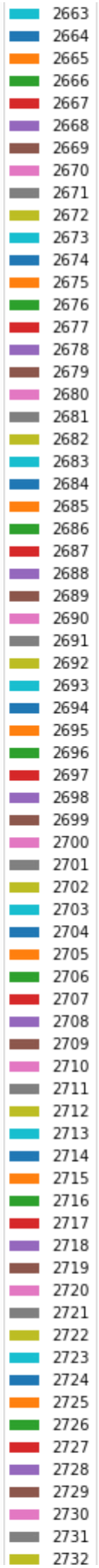
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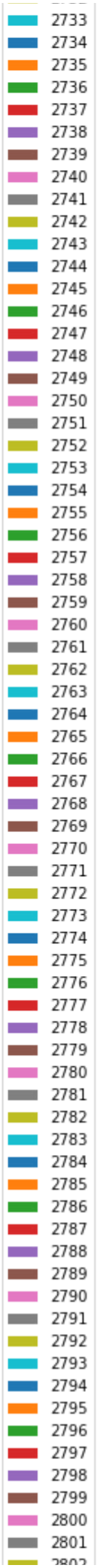
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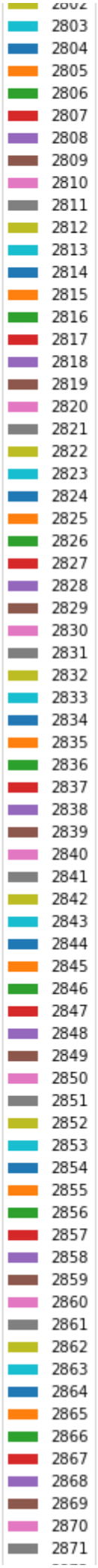
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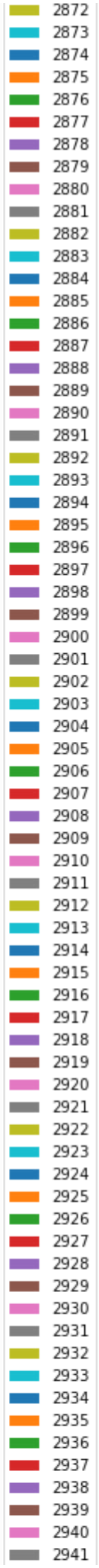
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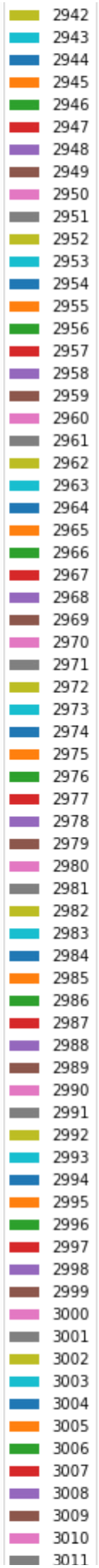
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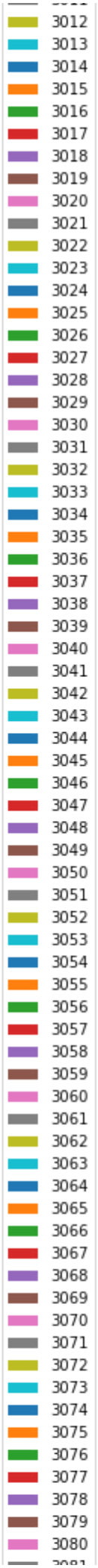
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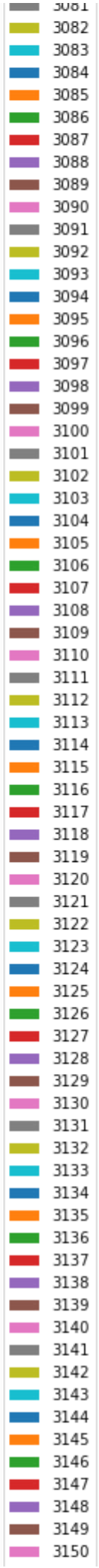
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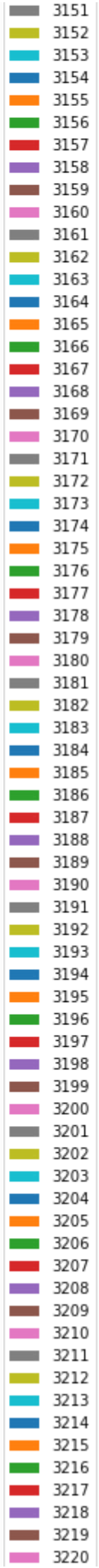
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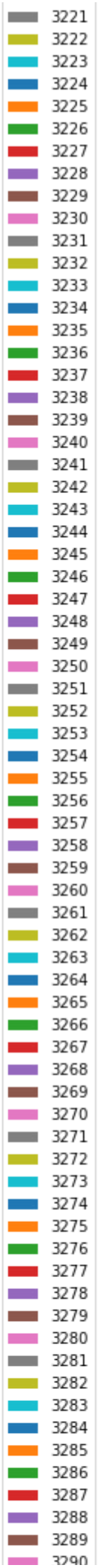
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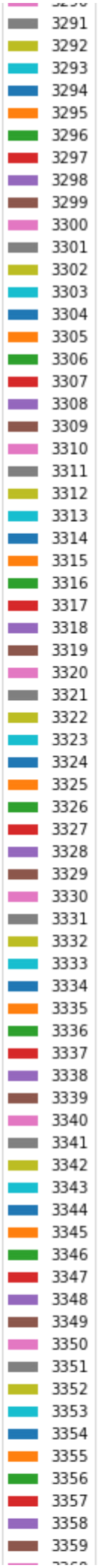
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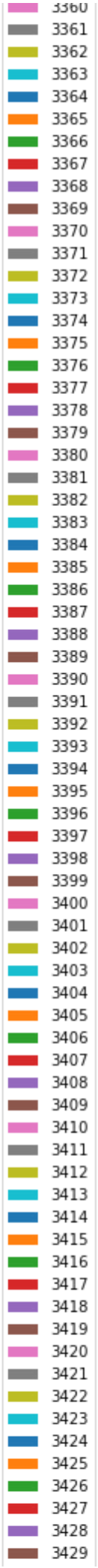
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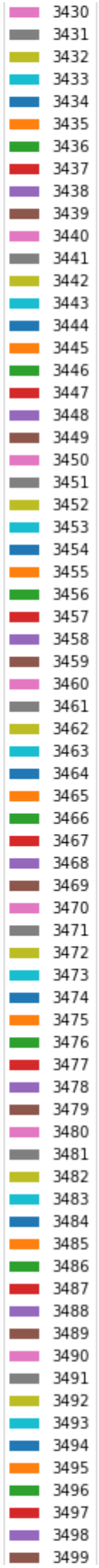
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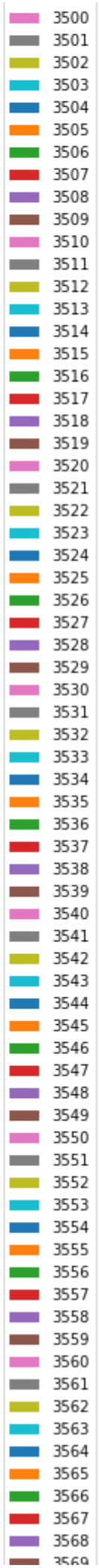
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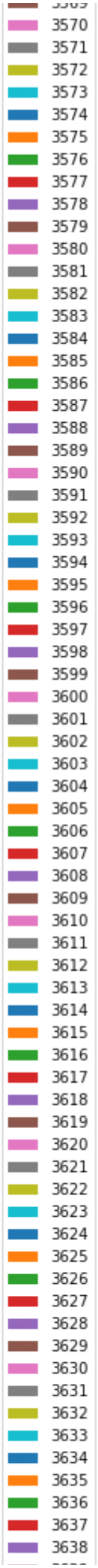
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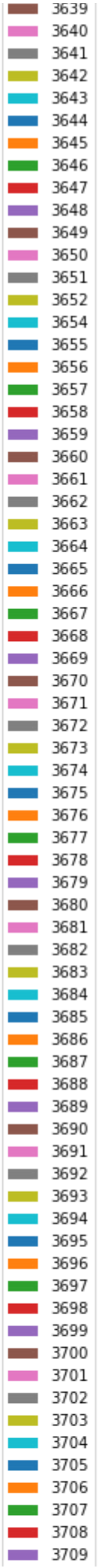
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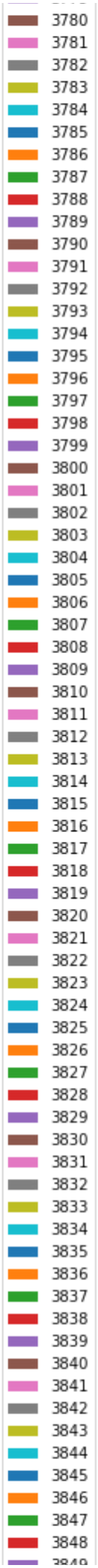
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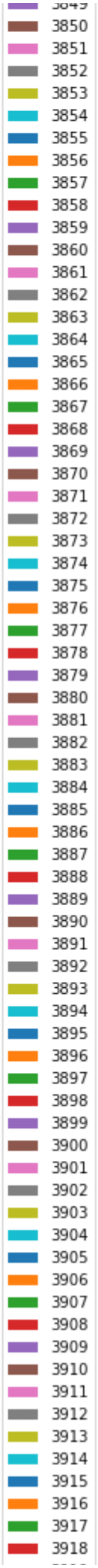
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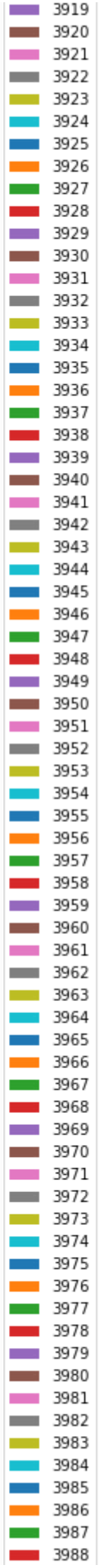
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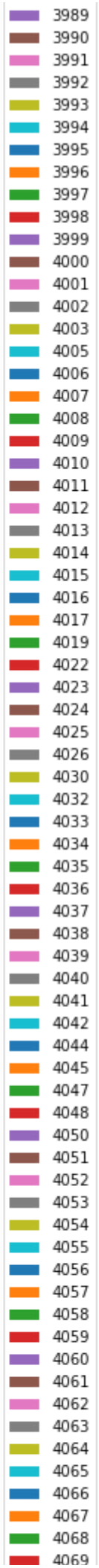
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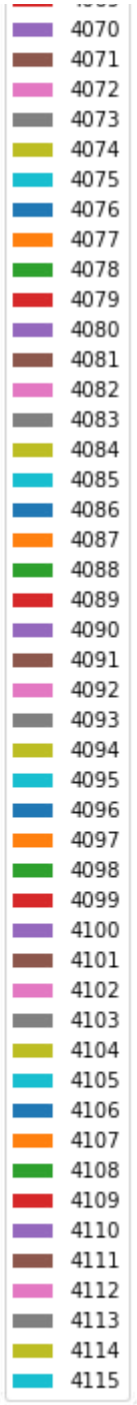
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