In [265…

```python
import pandas as pd
import cufflinks as cf
import seaborn as sn
from IPython.display import display, HTML

cf.set_config_file(sharing="public", theme="space", offline=True)
```

In [266…

```python
# Importing dataframes
df_internet = pd.read_csv("final.csv")
df_gdp = pd.read_csv("world_gdp.csv")
```

The data above were retrieved from kaggle:

- df_internet = https://www.kaggle.com/datasets/ashishraut64/internet-users
- df_gdp = https://www.kaggle.com/datasets/tmishinev/world-country-gdp-19602021

In [267…

```python
df_internet.sample(5)
```

Out[267]:

	Unnamed: 0	Entity	Code	Year	Cellular Subscription	Internet Users(%)	No. of Internet Users	Broadband Subscription
855	855	Bermuda	BMU	2009	129.427170	83.250000	52760	60.906902
8042	8042	Trinidad and Tobago	TTO	2009	139.776138	44.299999	620730	9.845866
8527	8527	Uruguay	URY	2009	122.745003	41.799999	1397859	9.478051
5428	5428	Mongolia	MNG	1989	0.000000	0.000000	0	0.000000
704	704	Belarus	BLR	2020	123.861610	85.089996	8197353	34.452755

In [268…

```python
df_gdp.sample(5)
```

Out[268]:

	Country Name	Country Code	year	GDP_USD	GDP_per_capita_USD
7935	Slovak Republic	SVK	1989	NaN	NaN
5606	Bangladesh	BGD	1981	2.024969e+10	247.649617
8483	Timor-Leste	TLS	1991	NaN	NaN
12153	Other small states	OSS	2005	1.836270e+11	8008.480303
10304	West Bank and Gaza	PSE	1998	4.067800e+09	1465.046057

In [269…

```python
# Renaming column for merging dataframes and reference
df_gdp.rename(columns={"year":"Year",
                "Country Code":"Country_Code"}, inplace=True)

df_internet.rename(columns={"Code":"Country_Code"}, inplace=True)

# Merge dataframes
df_main = df_internet.merge(df_gdp[["Year", "Country_Code", "GDP_USD", "GDP_per_capita_USD"]], on=["Year", "Country_Code"], how="left")
df_main.sample(5)
```

Out[269]:

	Unnamed: 0	Entity	Country_Code	Year	Cellular Subscription	Internet Users(%)	No. of Internet Users	Broadband Subscription	GDP_USD	GDP_per_capita_USD
4915	4915	Malaysia	MYS	1997	9.275236	2.307393	490302	0.000000	1.000050e+11	4637.865661
208	208	Angola	AGO	2002	0.799113	0.270377	47360	0.000000	1.528559e+10	872.494442
6489	6489	Poland	POL	2008	114.520454	53.130001	20467209	11.634671	5.336090e+11	13996.025150
6169	6169	Oman	OMN	2016	153.291458	76.845390	3379722	6.354836	7.512874e+10	16772.739210
4022	4022	Jordan	JOR	1992	0.036755	0.000000	0	0.000000	5.311329e+09	1335.287511

In [270…

```python
# Filter ASEAN Countries
asean_list = ["IDN", "KHM", "SGP", "VNM", "MMR", "THA", "BRN", "LAO", "MYS", "PHL"]
df_asean = df_main[df_main["Country_Code"].isin(asean_list)]
df_asean
df_asean.sample(5)
```

Out[270]:

	Unnamed: 0	Entity	Country_Code	Year	Cellular Subscription	Internet Users(%)	No. of Internet Users	Broadband Subscription	GDP_USD	GDP_per_capita_USD
1121	1121	Brunei	BRN	2009	107.547684	49.000000	191258	5.217163	1.073237e+10	27956.005140
3723	3723	Indonesia	IDN	2011	101.913231	12.280000	30343842	1.116361	8.929690e+11	3643.047176
7166	7166	Singapore	SGP	2020	144.347122	92.004349	5437341	25.805328	3.452960e+11	60729.450350
6448	6448	Philippines	PHL	2008	74.934761	6.220000	5675895	1.150378	1.816250e+11	1998.026920
3718	3718	Indonesia	IDN	2006	27.822910	4.764813	11044714	0.084759	3.645710e+11	1589.801489

In [271…

```python
# checking for null values
df_asean.isnull().sum()
```

Out[271]:

```
Unnamed: 0                0
Entity                    0
Country_Code              0
Year                      0
Cellular Subscription     0
Internet Users(%)         0
No. of Internet Users     0
Broadband Subscription    0
GDP_USD                  22
GDP_per_capita_USD       22
dtype: int64
```

In [272…

```python
# finding null locations
temp = df_asean.isnull().any(axis=1)
temp[temp].index
```

Out[272]:

```
Index([1256, 1257, 1258, 1259, 1260, 1261, 1262, 1263, 1264, 1265, 1266, 1267,
       1268, 4262, 4263, 4264, 4265, 8662, 8663, 8664, 8665, 8666],
      dtype='int64')
```

In [273…

```python
# reviewing null values
df_asean.loc[[1256, 1257, 1258, 1259, 1260, 1261, 1262, 1263, 1264, 1265, 1266, 1267,
       1268, 4262, 4263, 4264, 4265, 8662, 8663, 8664, 8665, 8666], :]
```

Out[273]:

	Unnamed: 0	Entity	Country_Code	Year	Cellular Subscription	Internet Users(%)	No. of Internet Users	Broadband Subscription	GDP_USD	GDP_per_capita_USD
1256	1256	Cambodia	KHM	1980	0.0	0.0	0	0.0	NaN	NaN
1257	1257	Cambodia	KHM	1981	0.0	0.0	0	0.0	NaN	NaN
1258	1258	Cambodia	KHM	1982	0.0	0.0	0	0.0	NaN	NaN
1259	1259	Cambodia	KHM	1983	0.0	0.0	0	0.0	NaN	NaN
1260	1260	Cambodia	KHM	1984	0.0	0.0	0	0.0	NaN	NaN
1261	1261	Cambodia	KHM	1985	0.0	0.0	0	0.0	NaN	NaN
1262	1262	Cambodia	KHM	1986	0.0	0.0	0	0.0	NaN	NaN
1263	1263	Cambodia	KHM	1987	0.0	0.0	0	0.0	NaN	NaN
1264	1264	Cambodia	KHM	1988	0.0	0.0	0	0.0	NaN	NaN
1265	1265	Cambodia	KHM	1989	0.0	0.0	0	0.0	NaN	NaN
1266	1266	Cambodia	KHM	1990	0.0	0.0	0	0.0	NaN	NaN
1267	1267	Cambodia	KHM	1991	0.0	0.0	0	0.0	NaN	NaN
1268	1268	Cambodia	KHM	1992	0.0	0.0	0	0.0	NaN	NaN
4262	4262	Laos	LAO	1980	0.0	0.0	0	0.0	NaN	NaN
4263	4263	Laos	LAO	1981	0.0	0.0	0	0.0	NaN	NaN
4264	4264	Laos	LAO	1982	0.0	0.0	0	0.0	NaN	NaN
4265	4265	Laos	LAO	1983	0.0	0.0	0	0.0	NaN	NaN
8662	8662	Vietnam	VNM	1980	0.0	0.0	0	0.0	NaN	NaN
8663	8663	Vietnam	VNM	1981	0.0	0.0	0	0.0	NaN	NaN
8664	8664	Vietnam	VNM	1982	0.0	0.0	0	0.0	NaN	NaN
8665	8665	Vietnam	VNM	1983	0.0	0.0	0	0.0	NaN	NaN
8666	8666	Vietnam	VNM	1984	0.0	0.0	0	0.0	NaN	NaN

In [274…

```python
df_asean.dropna().head()
```

Out[274]:

	Unnamed: 0	Entity	Country_Code	Year	Cellular Subscription	Internet Users(%)	No. of Internet Users	Broadband Subscription	GDP_USD	GDP_per_capita_USD
1093	1093	Brunei	BRN	1980	0.0	0.0	0	0.0	4.928825e+09	25422.03919
1094	1094	Brunei	BRN	1981	0.0	0.0	0	0.0	4.366214e+09	21828.12245
1095	1095	Brunei	BRN	1982	0.0	0.0	0	0.0	4.264252e+09	20693.82491
1096	1096	Brunei	BRN	1983	0.0	0.0	0	0.0	3.844723e+09	18129.24390
1097	1097	Brunei	BRN	1984	0.0	0.0	0	0.0	3.782523e+09	17337.02648

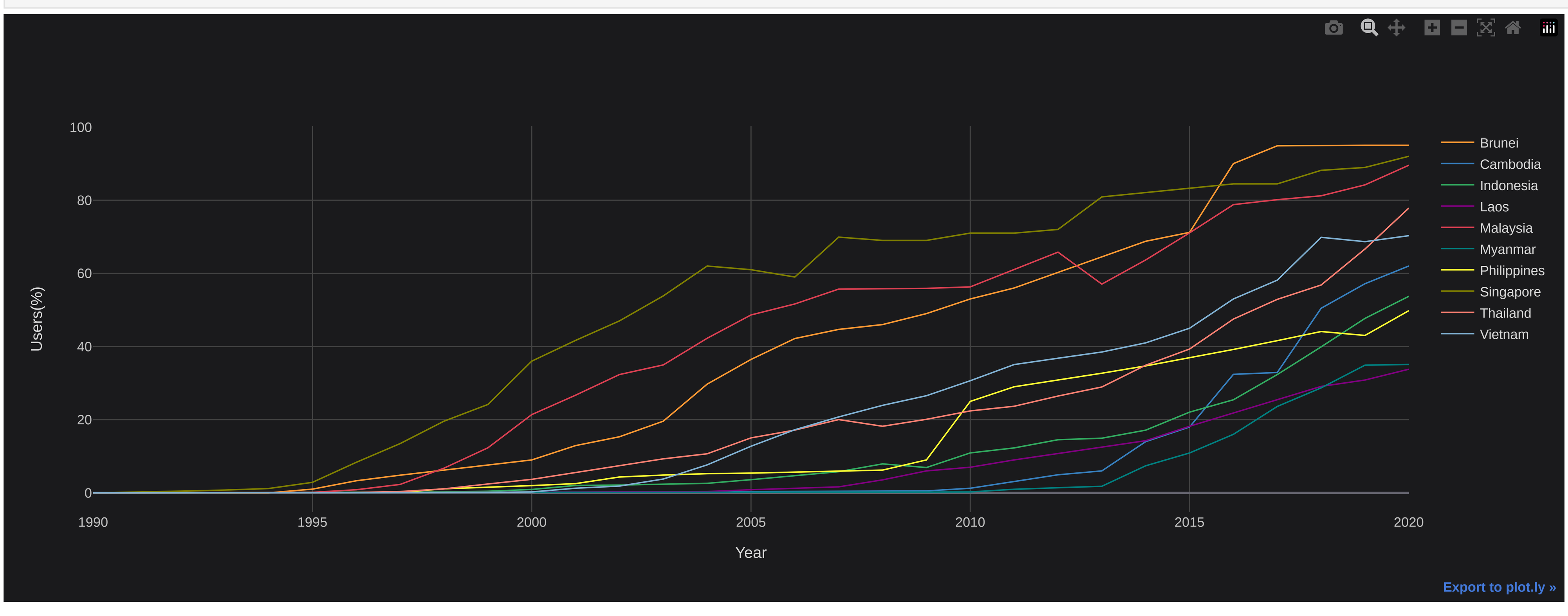
In [275…

```python
# filter year
df_asean = df_asean[df_asean["Year"] > 1989]
```

Southeast Asia Internet User Growth

In [276…

```python
# pivot table
a = df_asean.pivot(index="Year", columns="Entity", values="Internet Users(%)")

# fill 0 values
a.loc[2018, "Cambodia"] = a.loc[2018, :].median()
a.loc[2019, "Cambodia"] = a.loc[2019, :].median()
a.loc[2020, "Cambodia"] = a.loc[2020, :].median()

a.iplot(kind="line",  xTitle="Year", yTitle="Users(%)")
```

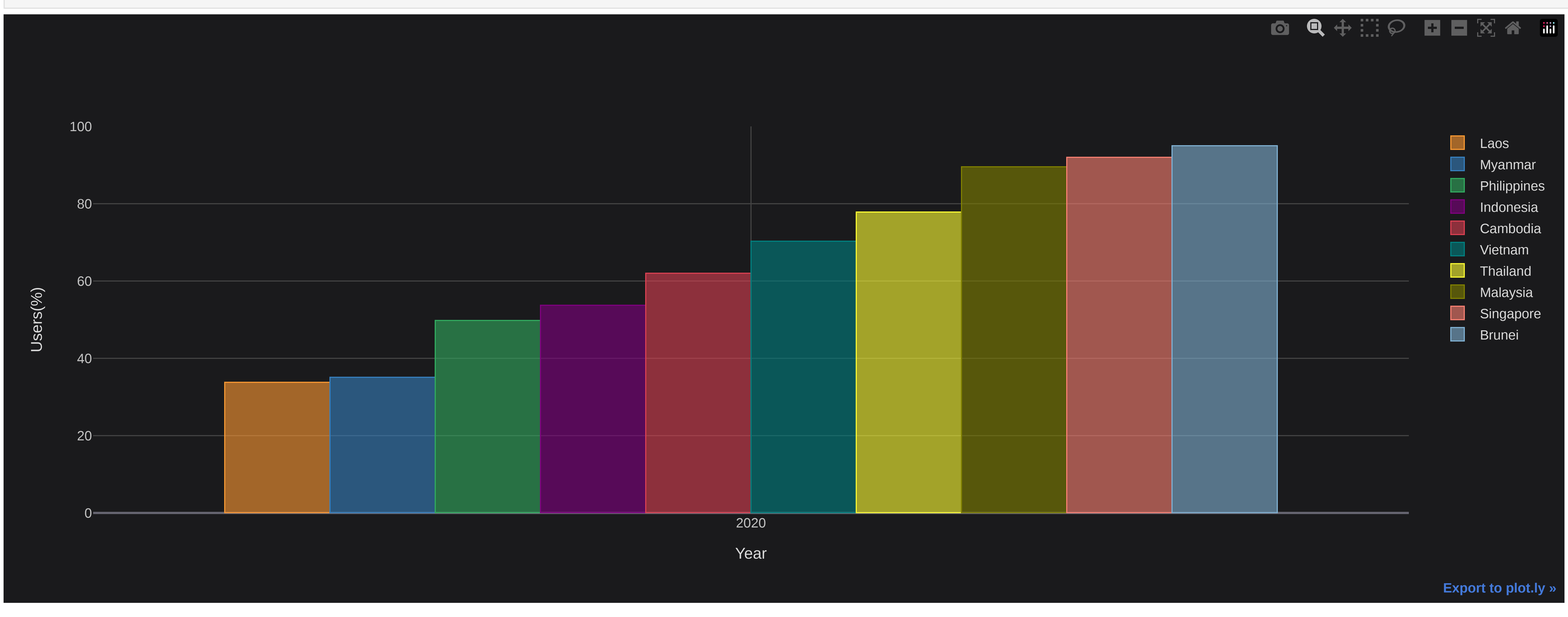


Countries that were early adopters of the internet, such as Brunei, Singapore, and Malaysia, generally have a higher percentage of internet users than others. Additionally, in 2015, there was a significant increase in user percentages in each country. There is a possibility that this sharp increase was caused by several factors, such as increased smartphone adoption, the rise of social media, and e-commerce growth.

Internet User Percentage Rank in Southeast Asia (2020)

In [277…

```python
a[a.index.isin([2020])].sort_values(2020, axis=1).iplot(kind="bar", xTitle="Year", yTitle="Users(%)")
```

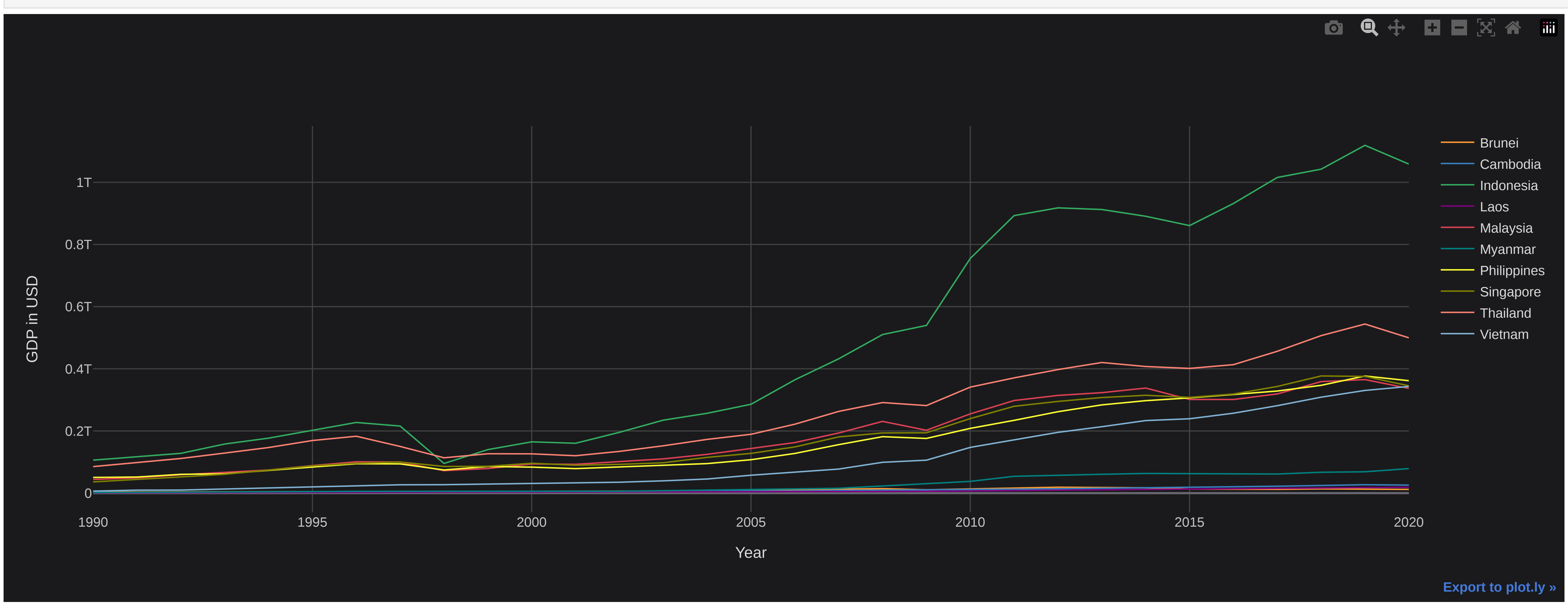


Despite Indonesia contributing 40.8% to the total population of the ASEAN region, it ranks among the countries with the lowest internet usage percentage with numbers barely reach 50%

GDP Growth in Southeast Asia

In [278…

```python
b = df_asean.pivot(index="Year", columns="Entity", values="GDP_USD")

b.iplot(kind="line", yTitle="GDP in USD", xTitle="Year")
```

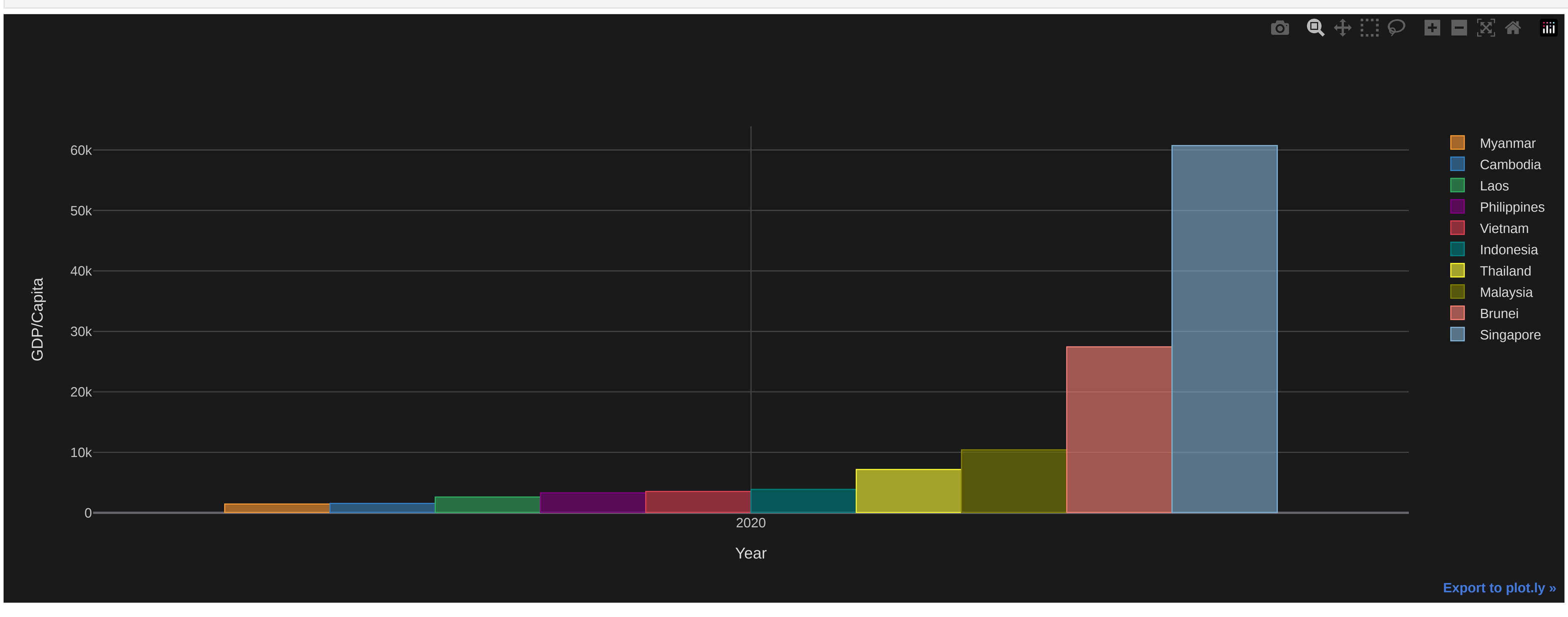


Although Indonesia has the highest GDP, only 53.73% of the population in Indonesia uses the internet. This data may indicate that there is a significant economic disparity in Indonesia or a low level of digital literacy.

GDP per Capita In Southeast Asia

In [279…

```python
c = df_asean.pivot(index="Year", columns="Entity", values="GDP_per_capita_USD")

c[c.index.isin([2020])].sort_values(2020, axis=1).iplot(kind="bar", yTitle="GDP/Capita", xTitle="Year")
```



By examining the GDP per Capita and internet User Percentage (2020) barchart, we can conclude that countries with a high GDP per capita tend to have higher internet user percentage. Also, the chart above confirms the hypothesis about the economic disparity that is happening in Indonesia is true

Linear Regression Model

In [280…

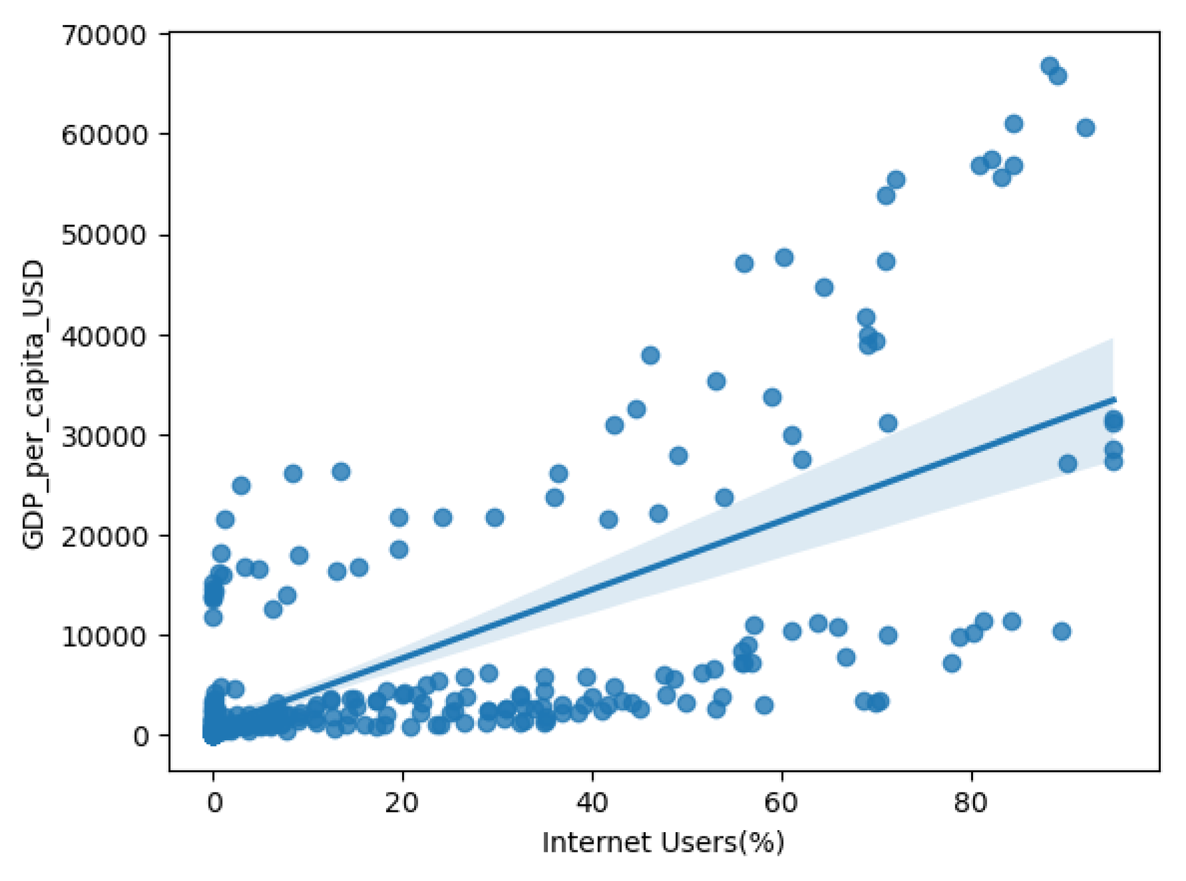
```python
# removing outliers
max_limit = df_asean["Internet Users(%)"].mean() + 3 * df_asean["Internet Users(%)"].std()
min_limit = df_asean["Internet Users(%)"].mean() - 3 * df_asean["Internet Users(%)"].std()

df_asean2 = df_asean[(df_asean["Internet Users(%)"] < max_limit) & (df_asean["Internet Users(%)"] > min_limit)]
```

In [281…

```python
sn.regplot(data=df_asean2, x="Internet Users(%)", y="GDP_per_capita_USD")
```

Out[281]:

```
<Axes: xlabel='Internet Users(%)', ylabel='GDP_per_capita_USD'>
```



The model above shows that the GDP per capita of a country has a significant influence on the percentage of internet users in that respective country.

In [ ]: