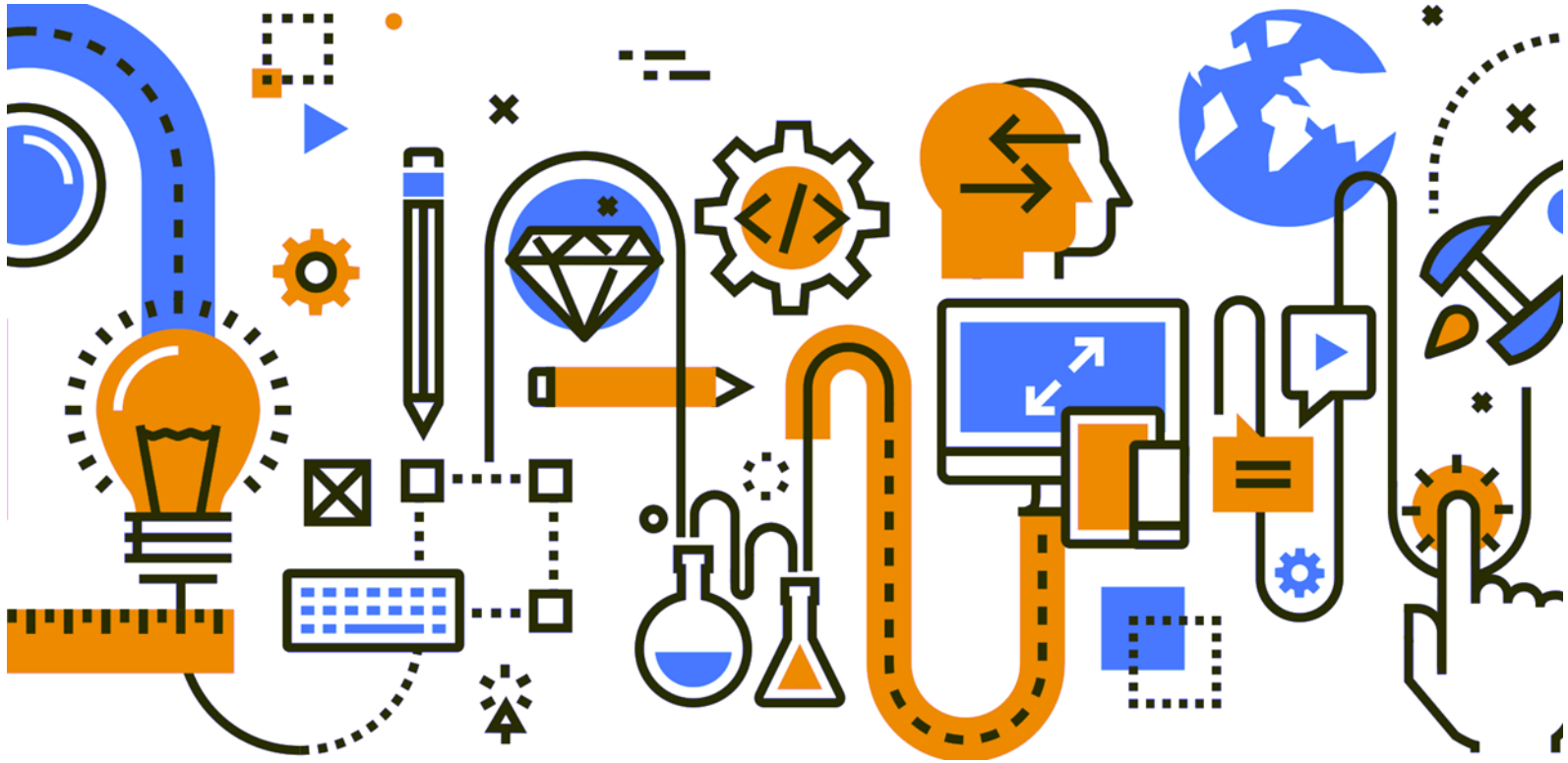
데이터 분석 및 시각화

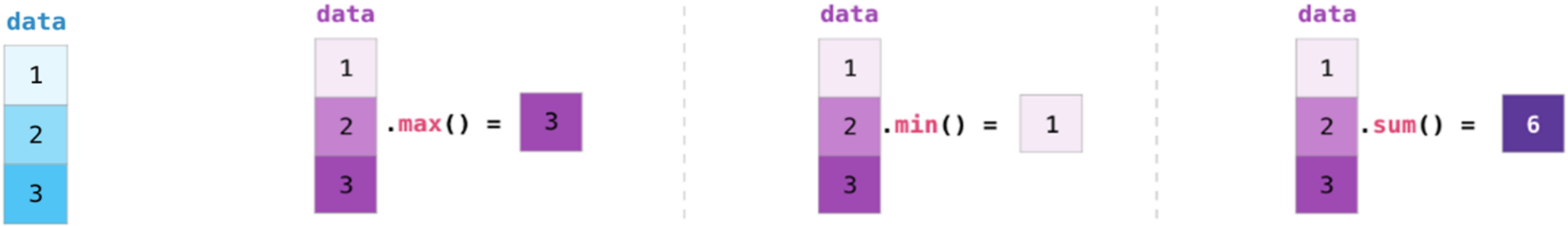


박경규

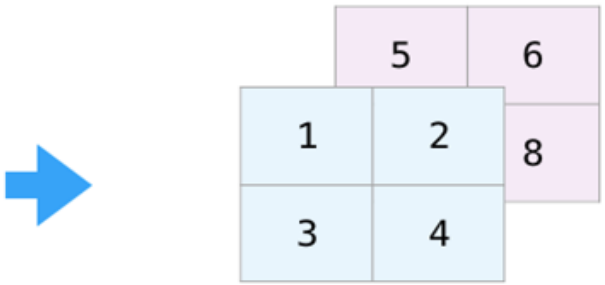
넘파이(Numpy)

NumPy(Numerical Python)는 데이터 분석, 수학/과학연산을 위한 파이썬 기본 패키지로 고성능의 다차원 배열 객체와 다양한 객체에 대해 고속 연산을 가능하게 합니다.

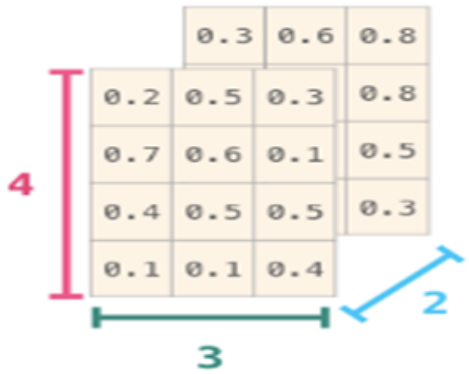
```
data = np.array([1,2,3])
```




```
np.array([ [[1,2],[3,4]],
           [[5,6],[7,8]] ])
```




```
np.random.random((4,3,2))
```



출처 : http://jalammar.github.io/visual-numpy/

넘파이(Numpy)

NumPy.ipynb

■ Numpy 라이브러리 임포트

```
import numpy as np
```

■ Numpy Array 생성

```
my_list = [1, 2, 3]
np.array(my_list)
[Out] array([1, 2, 3])

my_matrix = [[1, 2, 3],[4, 5, 6],[7, 8, 9]]
np.array(my_matrix)
[Out] array([[1, 2, 3],
             [4, 5, 6],
             [7, 8, 9]])
```

데이터 분석 필수 라이브러리 판다스(Pandas)

판다스(Pandas)는 데이타 처리와 분석을 위해 널리 사용되는 파이썬 라이브러리

데이터사이언티스트에게 필요한 기본적이면서도 아주 중요한 도구

행과 열로 이루어진 데이터 객체를 만들어 다룰 수 있음

데이터를 수집하고 정리하는 데 최적화 된 도구

판다스는 시리즈(Series)와 데이터프레임(DataFrame)이라는 구조화된 데이터 형식을 제공

시리즈(Series) : 1차원 배열

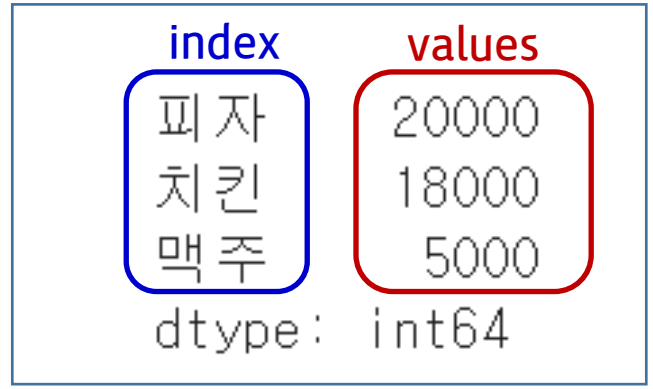
데이터프레임(DataFrame) : 2차원 배열

판다스 시리즈(Series)

1차원의 배열의 값(values)과 각 값에 대응하는 인덱스(index)를 부여할 수 있는 데이터 구조

```
import pandas as pd

sr = pd.Series([20000, 18000, 5000])
print(sr)
```




```
sr = pd.Series([20000, 18000, 5000], index = ['피자', '치킨', '맥주'])
print(sr.index)
print(sr.values)
print(sr)

sr = pd.Series({'피자': 20000, '치킨': 18000, '맥주': 5000})
print(sr)
```

판다스 데이터프레임(DataFrame)

데이터프레임은 행과 열을 가지는 자료구조로 인덱스(index), 열(columns), 값(values)으로 구성

열(columns)

	customerID	gender	SeniorCitizen	Partner	Dependents	tenure	PhoneService	MultipleLines	InternetService
0	7590-VHVEG	Female	0	Yes	No	1	No	No phone service	DSL
1	5575-GNVDE	Male	0	No	No	34	Yes	No	DSL
2	3668-QPYBK	Male	0	No	No	2	Yes	No	DSL
3	7795-CFOCW	Male	0	No	No	45	No	No phone service	DSL
4	9237-HQITU	Female	0	No	No	2	Yes	No	Fiber optic

인덱스(index)

값(values)

판다스 실습

- Pandas_Series.ipynb
- Pandas_DataFrame.ipynb
- Pandas_MissingData.ipynb
- Pandas_Groupby.ipynb
- Pandas_DataInputOutput.ipynb
- Pandas_Operation.ipynb

판다스 Exercise

https://bit.ly/3bnwEHT

출처 : http://jalammar.github.io/gentle-visual-intro-to-data-analysis-python-pandas/

판다스 Q&A

Question 1 – Define Python Pandas.

Question 2 – What Are The Different Types Of Data Structures In Pandas?

Question 6 – What Are The Most Important Features Of The Pandas Library?

Question 8 – What are the different ways of creating DataFrame in pandas? Explain with examples.

Question 9 – Explain Categorical Data In Pandas?

Question 14 – How Can You Iterate Over Dataframe In Pandas?

Questin 17 – What Is Groupby Function In Pandas?

출처 : https://www.upgrad.com/blog/pandas-interview-questions-answers-for-freshers-experienced/

데이터 분석 실습 - 타이타닉 데이터셋

DataAnalysis_Titanic.ipynb

Seaborn 라이브러리 임포트

```
import seaborn as sns
```

파일에서 데이터를 로드

```
df = sns.load_dataset('titanic')
```

데이터 확인

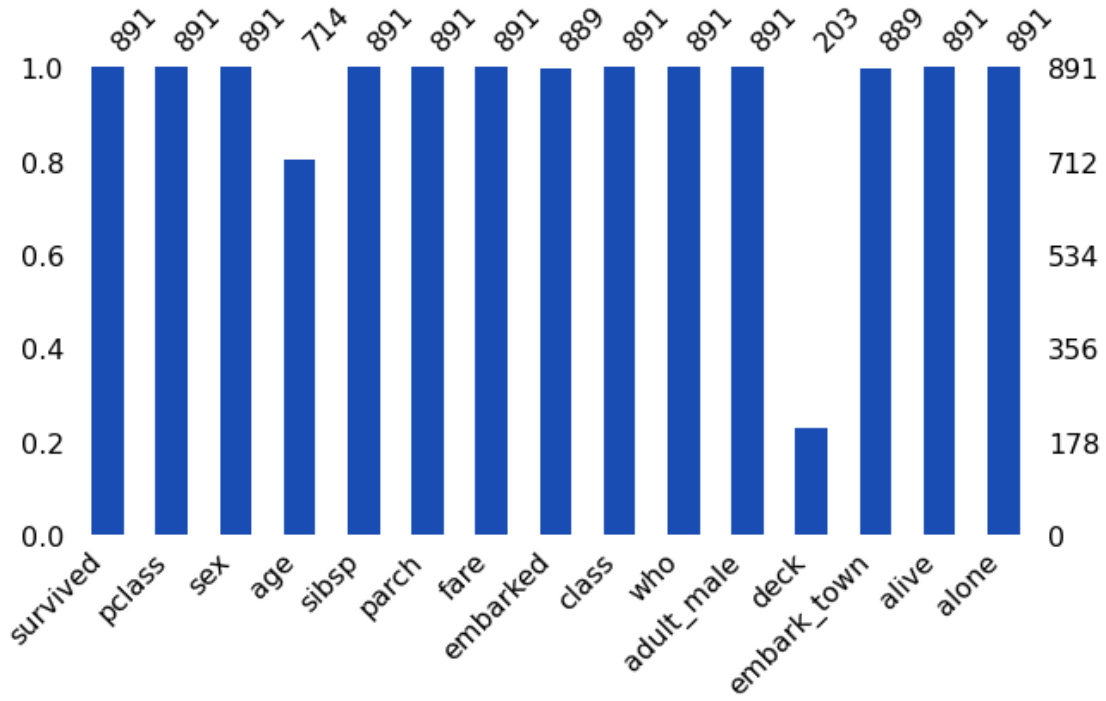
```
df.head()          df.head(20)          df.tail()
```

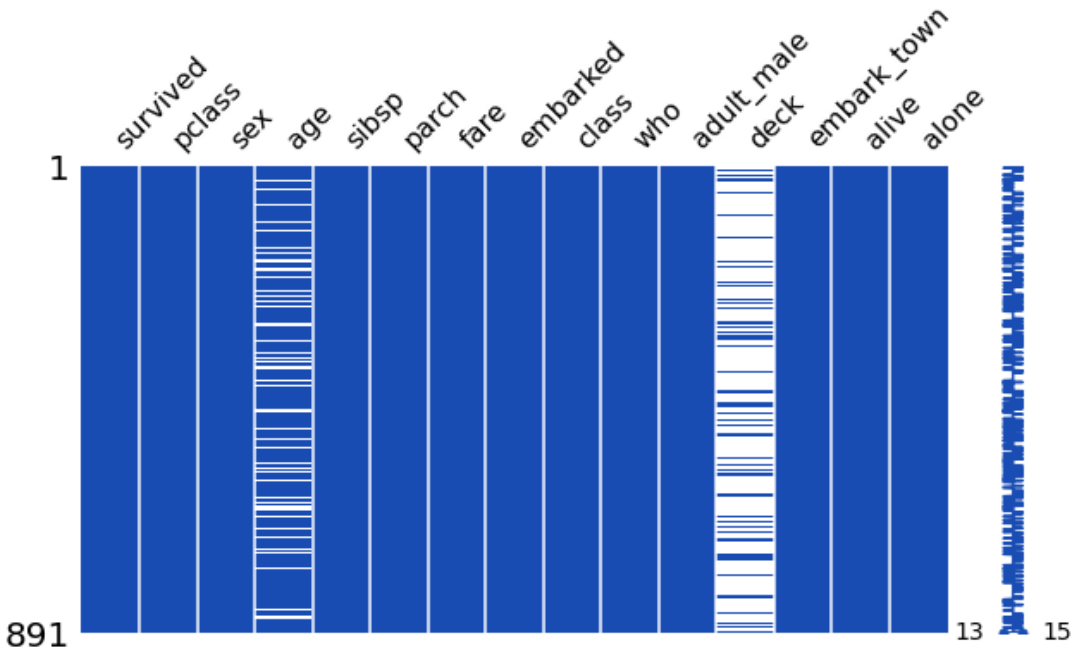
	survived	pclass	sex	age	sibsp	parch	fare	embarked	class	who	adult_male
0	0	3	male	22.0	1	0	7.2500	S	Third	man	True
1	1	1	female	38.0	1	0	71.2833	C	First	woman	False
2	1	3	female	26.0	0	0	7.9250	S	Third	woman	False
3	1	1	female	35.0	1	0	53.1000	S	First	woman	False
4	0	3	male	35.0	0	0	8.0500	S	Third	man	True

데이터 분석 실습 - 타이타닉 데이터셋

■ 결측값 확인

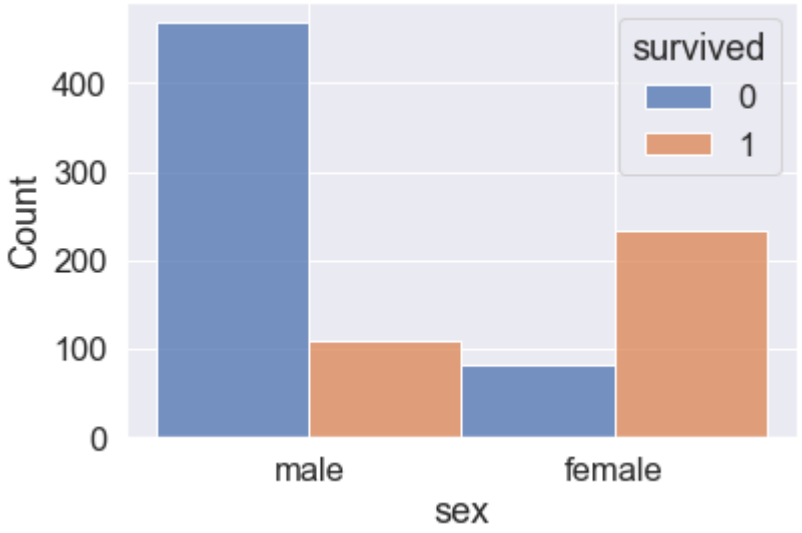
```
!pip install missingno
import missingno as msno
msno.bar(df, figsize=(10, 5), color=(0.1, 0.3, 0.7))
msno.matrix(df, figsize=(10, 5), color=(0.1, 0.3, 0.7))
```





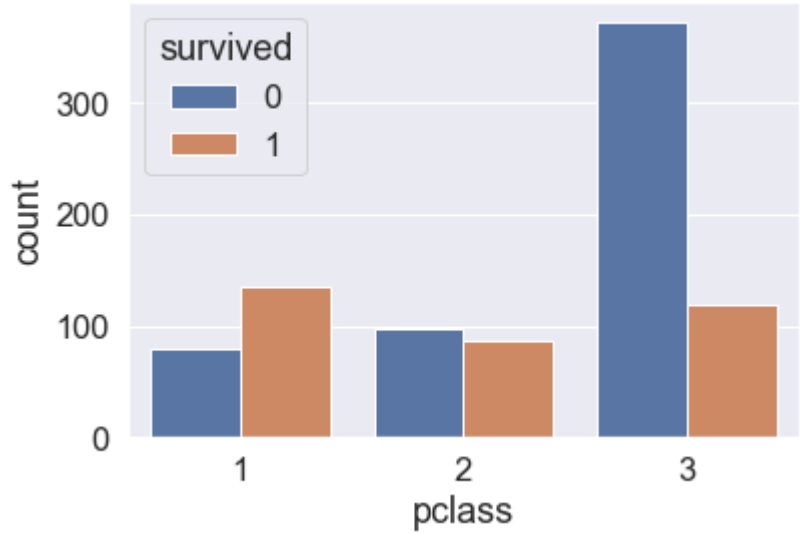
데이터 분석 실습 - 타이타닉 데이터셋

■ 성별(sex)에 따른 생존율 분포



■ 승객 나이와 생존 여부와의 관계

■ 객실등급과 생존율




```
sns.histplot(x='sex', hue='survived', multiple='dodge', data=df)
sns.violinplot(x='sex', y='age', hue='survived', data=df,  split=True)
sns.countplot(x='pclass', hue='survived', data=df)
```

데이터 분석 실습 - 통신사 이탈고객 데이터셋

DataAnalysis_Telecom.ipynb

■ Pandas 라이브러리 임포트

```
import pandas as pd
```

■ 파일에서 데이터 로드

```
df = pd.read_csv('churn_data.csv')
```

■ 데이터 확인

```
df.head()          df.head(20)          df.tail()
```

	customerID	gender	SeniorCitizen	Partner	Dependents	tenure	PhoneService	MultipleLines
0	7590-VHVEG	Female	0	Yes	No	1	No	No phone service
1	5575-GNVDE	Male	0	No	No	34	Yes	No

데이터 분석 실습 - 통신사 이탈고객 데이터셋

■ 데이터구조 파악

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 7043 entries, 0 to 7042
Data columns (total 21 columns):
 #   Column            Non-Null Count  Dtype
---  ------            --------------  -----
 0   customerID        7043 non-null   object
 1   gender            7043 non-null   object
 2   SeniorCitizen     7043 non-null   int64
 3   Partner           7043 non-null   object
 4   Dependents        7043 non-null   object
 5   tenure            7043 non-null   int64

                .....

 18  MonthlyCharges    7043 non-null   float64
 19  TotalCharges      7043 non-null   object
 20  Churn             7043 non-null   object
dtypes: float64(1), int64(2), object(18)
memory usage: 1.1+ MB
```

■ 데이터 타입 확인

```
df.dtypes
```

```
customerID          object
gender              object
SeniorCitizen        int64
Partner             object
Dependents          object
tenure               int64
PhoneService        object
MultipleLines       object
InternetService     object
OnlineSecurity      object
OnlineBackup        object
DeviceProtection    object
TechSupport         object
StreamingTV         object
StreamingMovies     object
Contract            object
PaperlessBilling    object
PaymentMethod       object
MonthlyCharges     float64
TotalCharges        object
Churn               object
dtype: object
```

■ Null 데이터 확인

```
df.isnull().sum()
```

```
customerID          0
gender              0
SeniorCitizen       0
Partner             0
Dependents          0
tenure              0
PhoneService        0
MultipleLines       0
InternetService     0
OnlineSecurity      0
OnlineBackup        0
DeviceProtection    0
TechSupport         0
StreamingTV         0
StreamingMovies     0
Contract            0
PaperlessBilling    0
PaymentMethod       0
MonthlyCharges      0
TotalCharges        0
Churn               0
dtype: int64
```

데이터 분석 실습 - 통신사 이탈고객 데이터셋

■ 통계 정보

```
df.describe()
```

	SeniorCitizen	tenure	MonthlyCharges
count	7043.000000	7043.000000	7043.000000
mean	0.162147	32.371149	64.761692
std	0.368612	24.559481	30.090047
min	0.000000	0.000000	18.250000
25%	0.000000	9.000000	35.500000
50%	0.000000	29.000000	70.350000
75%	0.000000	55.000000	89.850000
max	1.000000	72.000000	118.750000

■ 데이터 상관관계 분석

```
df.corr()
```

	SeniorCitizen	tenure	MonthlyCharges
SeniorCitizen	1.000000	0.016567	0.220173
tenure	0.016567	1.000000	0.247900
MonthlyCharges	0.220173	0.247900	1.000000

데이터 분석 /전처리 실습 - 통신사 이탈고객 데이터셋

■ 데이터 전처리

입력 데이터에서 제외: drop()

Null 데이터 처리: dropna(), fillna()

누락데이터 처리: replace()

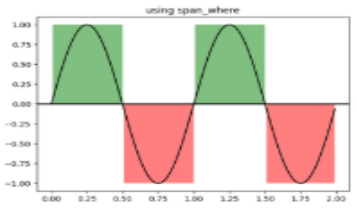
데이터타입 변환 : astype()

특성 추출 (feature engineering) : df['new_feature'] = df['f_1']/df['f_2']

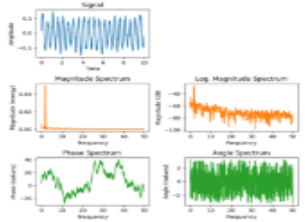
```
df.drop('customerID', axis=1, inplace=True)
df['TotalCharges'].replace([' '], ['0'], inplace=True)
df['TotalCharges'] = df['TotalCharges'].astype(float)
df['Churn'].replace(['Yes', 'No'], [1, 0], inplace=True)
```

데이터 시각화 – 맷플롯립(Matplotlib)

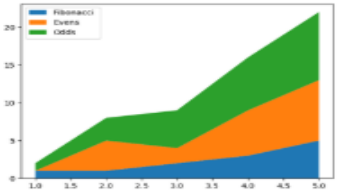
데이터를 차트나 플롯(Plot)으로 표시할 때 가장 많이 사용되는 데이터 시각화 라이브러리



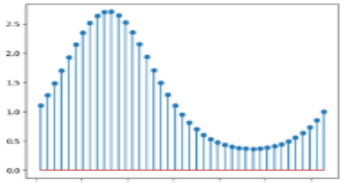
Using span_where



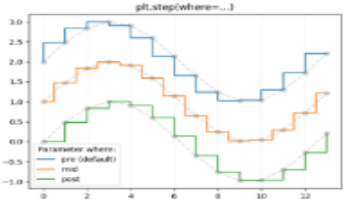
Spectrum Representations



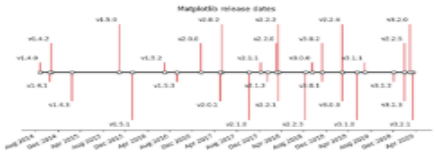
Stackplot Demo



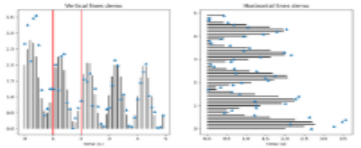
Stem Plot



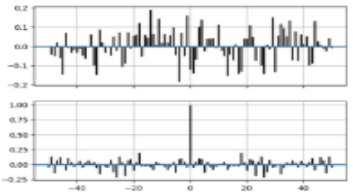
Step Demo



Creating a timeline with lines, dates, and text



hlines and vlines



Cross- and Auto-Correlation Demo

출처 : https://matplotlib.org/gallery/index.html

데이터 시각화 – 맷플롯립(Matplotlib)

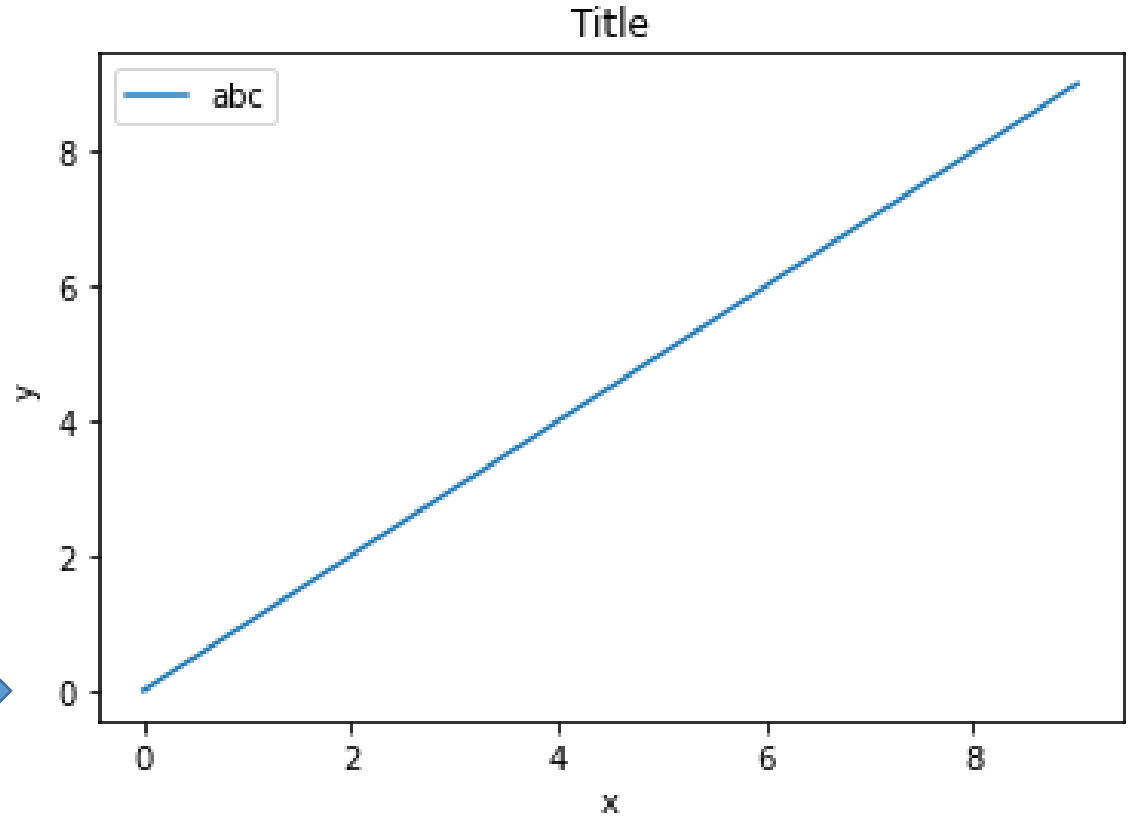
■ 라이브러리 임포트

```
import matplotlib.pyplot as plt
%matplotlib inline
```

■ Matplotlib 사용법(예시)

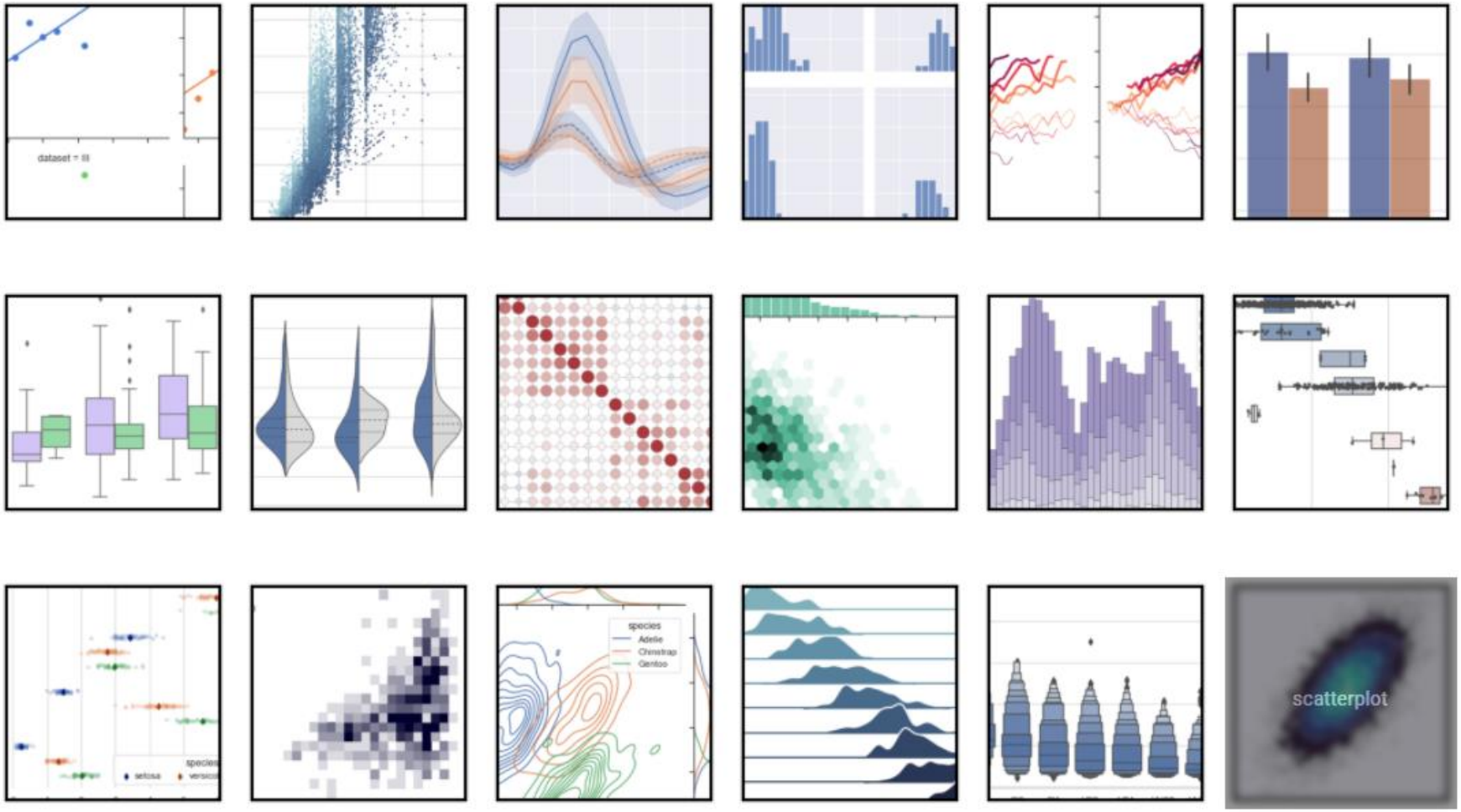
```
x = [0, 1, 2, 3, 4, 5, 6, 7, 8, 9]
y = [0, 1, 2, 3, 4, 5, 6, 7, 8, 9]

plt.plot(x, y)
plt.title('Title')
plt.xlabel('x')
plt.ylabel('y')
plt.legend(['abc'])
plt.show()
```



데이터 시각화 – 씨본(Seaborn)

Matplotlib을 기반으로 다양한 색상 테마와 통계용 차트 등의 기능을 추가한 시각화 라이브러리



출처 : https://seaborn.pydata.org/examples/index.html

데이터 시각화 – 씨본(Seaborn)

■ 패키지 설치

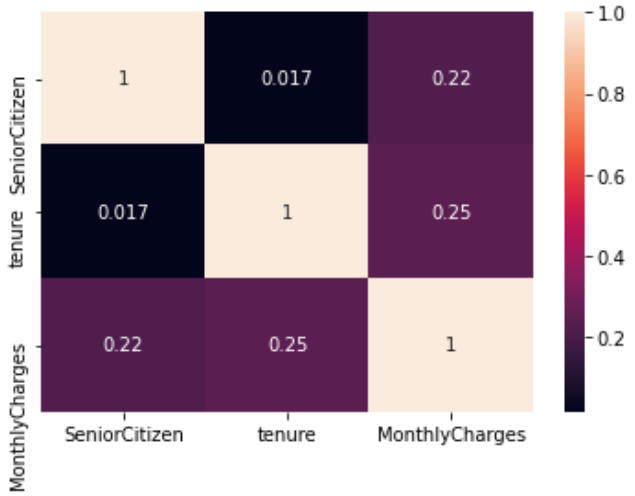
```
!pip install seaborn
```

■ 라이브러리 임포트

```
import seaborn as sns
```

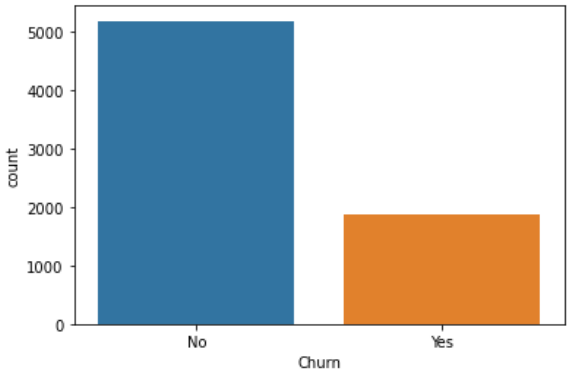
■ 상관관계 히트맵

```
sns.heatmap(df.corr(), annot=True)
```



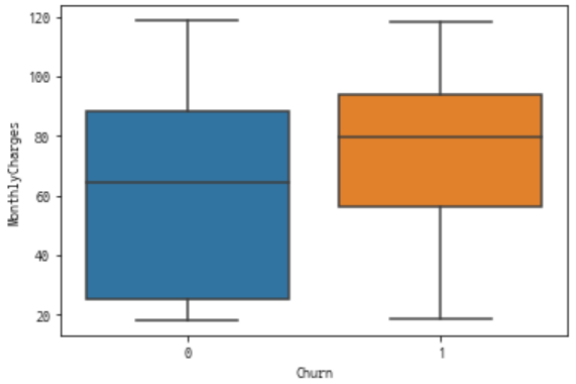
■ 카운트 플롯

```
sns.countplot(x='Churn',data=df)
```



■ 박스 플롯

```
sns.boxplot(x='Churn',
    y='MonthlyCharges',data=df)
```

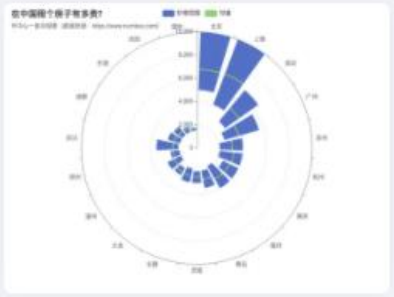


JavaScript Graphing Library – ECharts

https://echarts.apache.org/examples/en/index.html

Finance Indices 2002

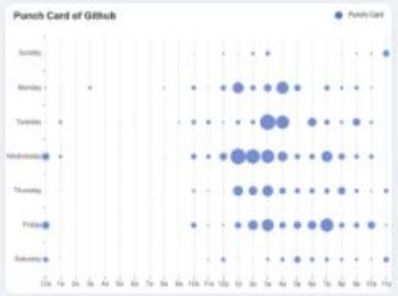
Watermark - ECharts Download

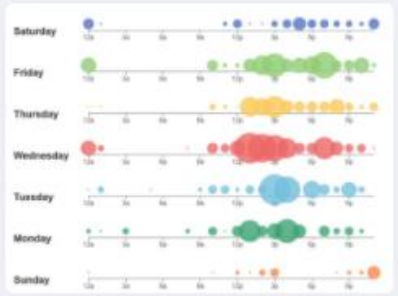


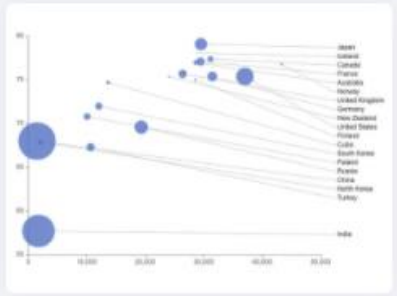
Bar Chart on Polar

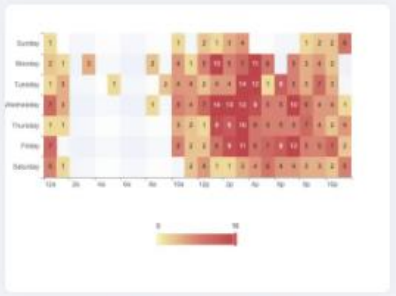
Stacked Bar Chart on Polar

ShangHai Index



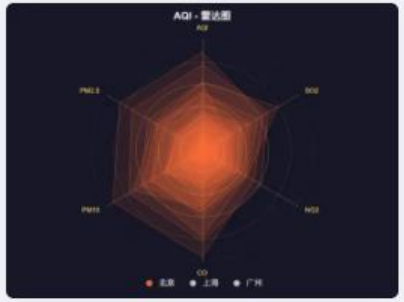




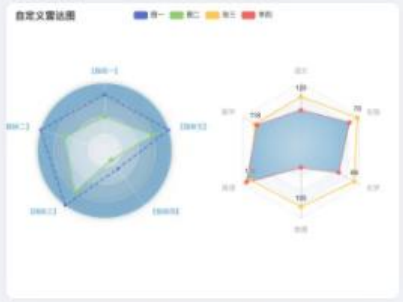


Heatmap on Cartesian

Basic Radar Chart

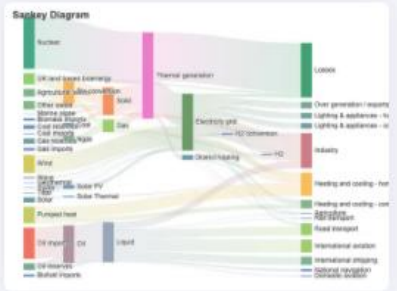


AQI - Radar Chart



Customized Radar Chart

Proportion of Browsers



Gradient Edge

JavaScript Graphing Library – Plotly

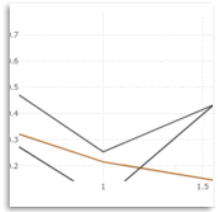
https://plot.ly/javascript/

Fundamentals

More Fundamentals »


Configuration Options


Responsive / Fluid Layouts

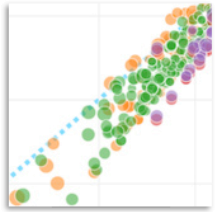

uirevision in Plotly.react

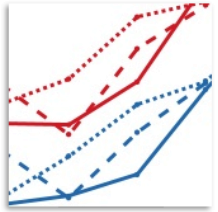

React Plotly.js

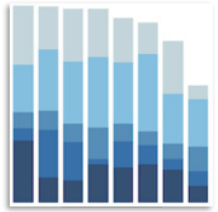

Analytical Apps with Dash

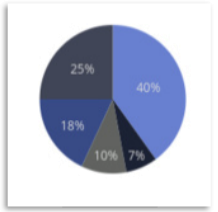
Basic Charts

More Basic Charts »


Scatter Plots


Line Charts


Bar Charts

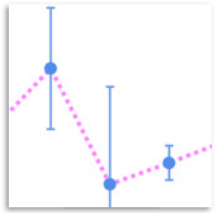


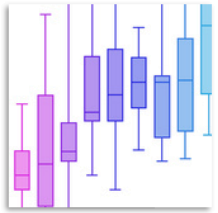
Pie Charts

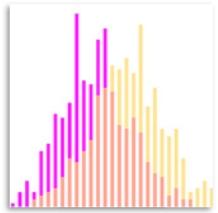
Bubble Charts

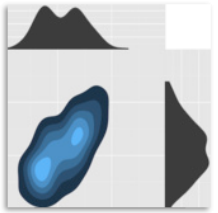
Statistical Charts

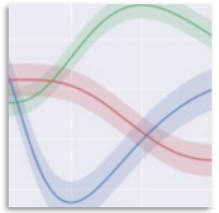
More Statistical Charts »


Error Bars


Box Plots

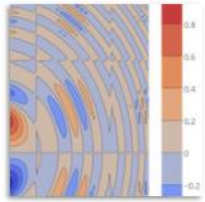

Histograms

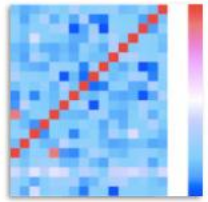

2d Density Plots


Continuous Error

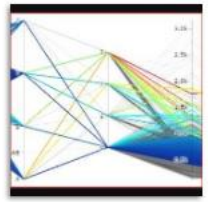
Scientific Charts

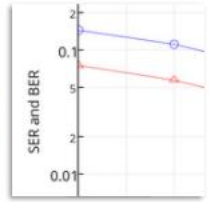
More Scientific Charts »


Contour Plots


Heatmaps


Ternary Plots


Parallel Coordinates Plot



Log Plots

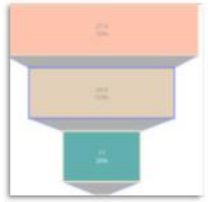
Financial Charts

More Financial Charts »


Waterfall Charts

Indicators


Candlestick Charts

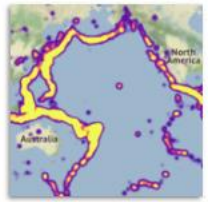

Funnel and Funnelarea Charts

Time Series

Maps

More Maps »


Mapbox Map Layers


Mapbox Density

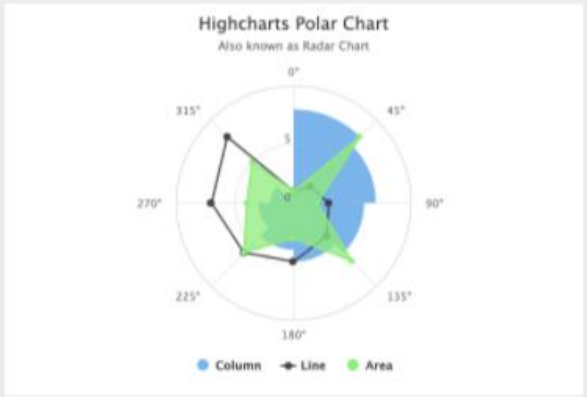

Choropleth Mapbox


Lines on Maps

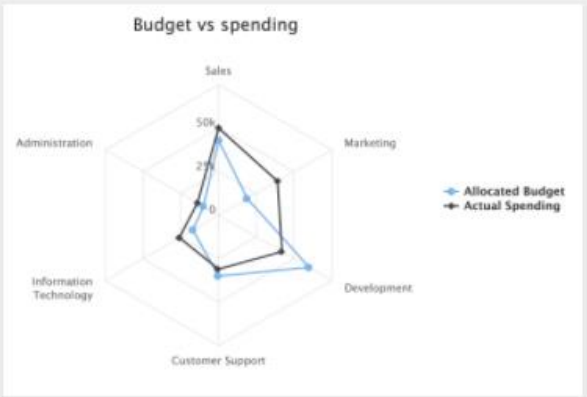

Bubble Maps

JavaScript Graphing Library – Highcharts

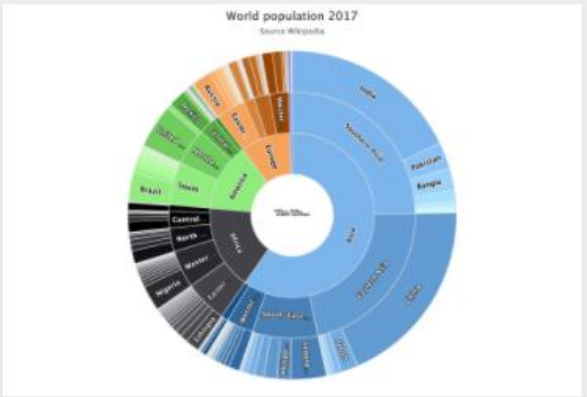
https://www.highcharts.com/demo



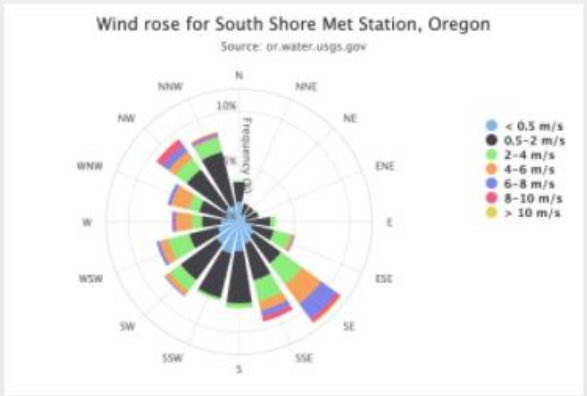
Polar (radar) chart



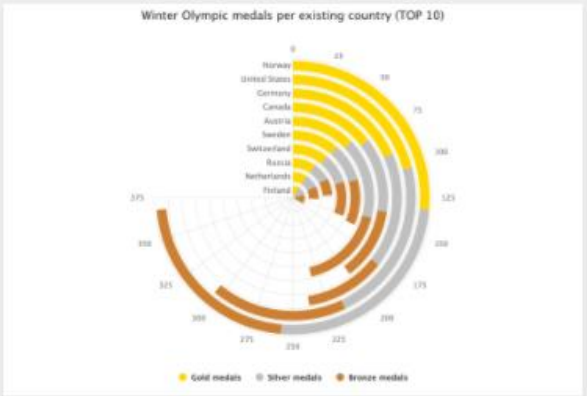
Spiderweb



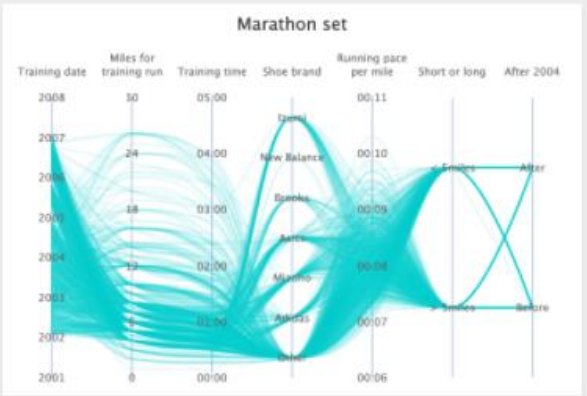
Sunburst



Wind rose

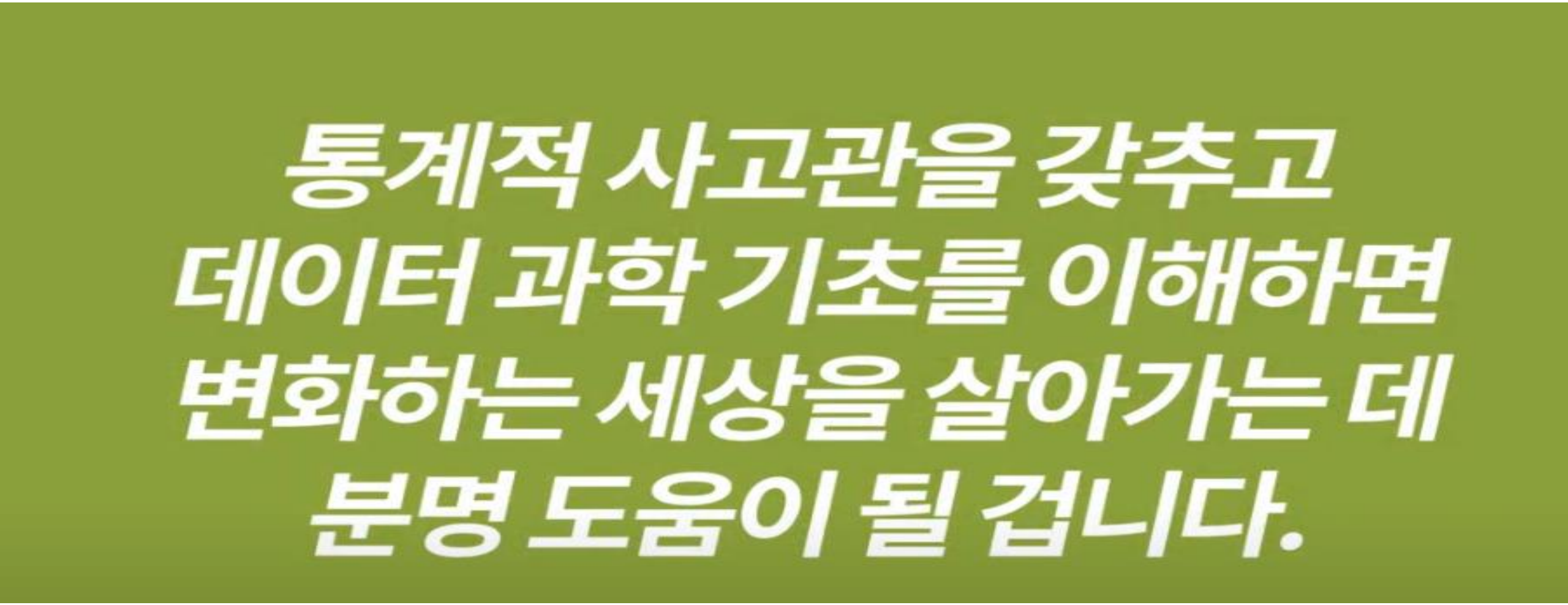


Radial bar chart



Parallel coordinates

알쓸新JOB 데이터 과학자



https://youtu.be/dZZfDj_ieEU

Thank you

kgpark88@gmail.com