FINAL CAPSTONE PROJECT #1

- In this project, we will conduct basic Exploratory Data Analysis (EDA) on the Kyphosis disease dataset.
- Kyphosis is an abnormal excessive curvature of the spine.
- The dataset contains 81 rows and 4 columns of data from children who underwent corrective spinal surgery
  - INPUTS: 1. "Age": in months, 2. "Number": number of vertebrae involved, 3. "Start": number of the first (topmost) vertebra operated on.
  - OUTPUTS: "Kyphosis" with 2 unique values: "absent" and "present" indicating whether kyphosis (a type of deformity) is present after surgery.
- Using the 'kyphosis.csv' file provided in the appendix, write a Python script to perform the following tasks:
  1. Import the 'kyphosis.csv' file using Pandas.
  2. Perform Exploratory Data Analysis (EDA) on the data.
  3. Calculate the average, minimum, and maximum age (in years) using 2 methods.
  4. Plot a correlation matrix.
  5. Convert the data type of the "Age" column from int64 to float64.
  6. Define a function to convert age from months to years.
  7. Apply the function to the "Age" column and add the result to a new column titled "Age in Years".
  8. What are the characteristics of the oldest and youngest children in this study?
  9. Scale the raw "Age" column (in months) using standardization & normalization. Then, perform a sanity check.

Import the "kyphosis.csv" file using Pandas.

In [1]:
```
import pandas as pd

data = pd.read_csv("kyphosis.csv")
```

Perform Exploratory Data Analysis (EDA) on the data.

In [2]:
```
data
```

Out[2]:

	Kyphosis	Age	Number	Start
0	absent	71	3	5
1	absent	158	3	14
2	present	128	4	5
3	absent	2	5	1
4	absent	1	4	15
...	...	...	...	...
76	present	157	3	13
77	absent	26	7	13
78	absent	120	2	13
79	present	42	7	6
80	absent	36	4	13

81 rows × 4 columns

In [3]:
```
encode = pd.get_dummies(data['Kyphosis'])
print(encode)
```

```
    absent  present
0        1        0
1        1        0
2        0        1
3        1        0
4        1        0
..     ...      ...
76       0        1
77       1        0
78       1        0
79       0        1
80       1        0

[81 rows x 2 columns]
```

In [4]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 81 entries, 0 to 80
Data columns (total 4 columns):
 #   Column    Non-Null Count  Dtype 
---  ------    --------------  ----- 
 0   Kyphosis  81 non-null     object
 1   Age       81 non-null     int64 
 2   Number    81 non-null     int64 
 3   Start     81 non-null     int64 
dtypes: int64(3), object(1)
memory usage: 2.7+ KB
```

Calculate the average, minimum, and maximum age (in years) using 2 methods.

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

Out[5]:

	Age	Number	Start
count	81.000000	81.000000	81.000000
mean	83.654321	4.049383	11.493827
std	58.104251	1.619423	4.883962
min	1.000000	2.000000	1.000000
25%	26.000000	3.000000	9.000000
50%	87.000000	4.000000	13.000000
75%	130.000000	5.000000	16.000000
max	206.000000	10.000000	18.000000

In [6]:
```
data.mean()
```

```
C:\Users\OMEN\AppData\Local\Temp\ipykernel_9768\531903386.py:1: FutureWarning: The default value of numeric_only in DataFrame.mean is deprecated. In a future version, it will default to False. In addition, specifying 'numeric_only=None' is deprecated. Select only valid columns or specify the value of numeric_only to silence this warning.
  data.mean()
```

Out[6]:
```
Age       83.654321
Number     4.049383
Start     11.493827
dtype: float64
```

In [7]:
```
data.max()
```

Out[7]:
```
Kyphosis    present
Age             206
Number           10
Start            18
dtype: object
```

In [8]:
```
data.min()
```

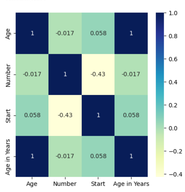
Out[8]:
```
Kyphosis    absent
Age              1
Number           2
Start            1
dtype: object
```

Plot a correlation matrix.

In [38]:
```
import matplotlib.pyplot as plt
import seaborn as sns

numeric_columns = data.select_dtypes(include=['float64', 'int64'])
correlations = numeric_columns.corr()
f, ax = plt.subplots(figsize = (5, 5))
sns.heatmap(correlations, annot = True, cmap='YlGnBu')
```

Out[38]:
```
<AxesSubplot: >
```



Convert the data type of the "Age" column from int64 to float64.

In [10]:
```
data['Age'] = data['Age'].astype('float64')
```

In [11]:
```
data['Age'].info()
```

```
<class 'pandas.core.series.Series'>
RangeIndex: 81 entries, 0 to 80
Series name: Age
Non-Null Count  Dtype  
--------------  -----  
81 non-null     float64
dtypes: float64(1)
memory usage: 776.0 bytes
```

Define a function to convert age from months to years.

In [12]:
```
def convert_age(month):
    month = month/12
    return month
```

Apply the function to the "Age" column and add the result to a new column titled "Age in Years".

In [13]:
```
convert_data = data['Age'].apply(convert_age)
```

In [14]:
```
data['Age'].describe()
```

Out[14]:
```
count     81.000000
mean      83.654321
std       58.104251
min        1.000000
25%       26.000000
50%       87.000000
75%      130.000000
max      206.000000
Name: Age, dtype: float64
```

In [15]:
```
data = pd.concat([data, convert_data], axis=1)
```

In [16]:
```
data.columns.values[4] = "Age in Years"
```

In [17]:
```
data
```

Out[17]:

	Kyphosis	Age	Number	Start	Age in Years
0	absent	71.0	3	5	5.916667
1	absent	158.0	3	14	13.166667
2	present	128.0	4	5	10.666667
3	absent	2.0	5	1	0.166667
4	absent	1.0	4	15	0.083333
...	...	...	...	...	...
76	present	157.0	3	13	13.083333
77	absent	26.0	7	13	2.166667
78	absent	120.0	2	13	10.000000
79	present	42.0	7	6	3.500000
80	absent	36.0	4	13	3.000000

81 rows × 5 columns

In [18]:
```
data
```

Out[18]:

	Kyphosis	Age	Number	Start	Age in Years
0	absent	71.0	3	5	5.916667
1	absent	158.0	3	14	13.166667
2	present	128.0	4	5	10.666667
3	absent	2.0	5	1	0.166667
4	absent	1.0	4	15	0.083333
...	...	...	...	...	...
76	present	157.0	3	13	13.083333
77	absent	26.0	7	13	2.166667
78	absent	120.0	2	13	10.000000
79	present	42.0	7	6	3.500000
80	absent	36.0	4	13	3.000000

81 rows × 5 columns

What are the characteristics of the oldest and youngest children in this study?

In [21]:
```
pd.reset_option('display.max_rows')
pd.reset_option('display.max_columns')
pd.reset_option('display.width')
```

In [19]:
```
# pd.set_option('display.max_rows', None)
# pd.set_option('display.max_columns', None)
# pd.set_option('display.width', None)
```

In [45]:
```
data[data["Age"] == data['Age'].min()]
```

Out[45]:

	Kyphosis	Age	Number	Start	Age in Years
4	absent	1.0	4	15	0.083333
5	absent	1.0	2	16	0.083333
13	absent	1.0	4	12	0.083333
15	absent	1.0	3	16	0.083333
36	absent	1.0	3	9	0.083333

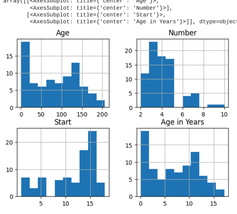
In [46]:
```
data[data["Age"] == data['Age'].max()]
```

Out[46]:

	Kyphosis	Age	Number	Start	Age in Years
73	absent	206.0	4	10	17.166667

In [23]:
```
data.hist()
```

Out[23]:
```
array([[<AxesSubplot: title={'center': 'Age'}>,
        <AxesSubplot: title={'center': 'Number'}>],
       [<AxesSubplot: title={'center': 'Start'}>,
        <AxesSubplot: title={'center': 'Age in Years'}>]], dtype=object)
```



Scale the raw "Age" column (in months) using standardization & normalization. Then, perform a sanity check.

In [24]:
```
from sklearn.preprocessing import MinMaxScaler
from sklearn.preprocessing import StandardScaler

standarisasi = StandardScaler()
normalisasi = MinMaxScaler()

standar = standarisasi.fit_transform(data['Age'].values.reshape(-1,1))

normal = normalisasi.fit_transform(data["Age"].values.reshape(-1,1))
```

In [34]:
```
standar
standar.max()
```

Out[34]:
```
2.1187428136604636
```

In [35]:
```
standar.min()
```

Out[35]:
```
-1.4313807404693644
```

In [36]:
```
normal
normal.min()
```

Out[36]:
```
0.0
```

In [37]:
```
normal.max()
```

Out[37]:
```
1.0
```