haridas DSBDA2

March 5, 2025

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

```
[5]: hari=pd.read_csv("StudentsPerformance_m.csv")
```

```
[6]: hari
```

```
[6]:      gender race/ethnicity parental level of education         lunch  \
     0    female        group B           bachelor's degree      standard
     1    female        group C                some college      standard
     2    female        group B             master's degree      standard
     3      male        group A          associate's degree  free/reduced
     4      male        group C                some college      standard
     ..      …            …                         …           …
     995  female        group E             master's degree      standard
     996    male        group C                 high school  free/reduced
     997  female        group C                 high school  free/reduced
     998  female        group D                some college      standard
     999  female        group D                some college  free/reduced

         test preparation course  math score  reading score  writing score
     0                      none        72.0           72.0           74.0
     1                 completed        69.0           90.0           88.0
     2                      none        90.0           95.0           93.0
     3                      none        47.0           57.0           44.0
     4                      none        76.0           78.0           75.0
     ..                      …           …              …              …
     995               completed        88.0           99.0           95.0
     996                    none        62.0           55.0           55.0
     997               completed        59.0           71.0           65.0
     998               completed        68.0           78.0           77.0
     999                    none        77.0           86.0           86.0

     [1000 rows x 8 columns]
```

```
[7]: hari.isnull().sum()
```

```
[7]: gender                         0
     race/ethnicity                 0
     parental level of education    0
     lunch                          0
     test preparation course        0
     math score                     2
     reading score                  4
     writing score                  2
     dtype: int64
```

```
[8]: hari.dropna(inplace=True)
```

```
[9]: hari.isnull().sum()
```

```
[9]: gender                         0
     race/ethnicity                 0
     parental level of education    0
     lunch                          0
     test preparation course        0
     math score                     0
     reading score                  0
     writing score                  0
     dtype: int64
```

```
[10]: hari.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 992 entries, 0 to 999
Data columns (total 8 columns):
 #   Column                       Non-Null Count  Dtype
---  ------                       --------------  -----
 0   gender                       992 non-null    object
 1   race/ethnicity               992 non-null    object
 2   parental level of education  992 non-null    object
 3   lunch                        992 non-null    object
 4   test preparation course      992 non-null    object
 5   math score                   992 non-null    float64
 6   reading score                992 non-null    float64
 7   writing score                992 non-null    float64
dtypes: float64(3), object(5)
memory usage: 69.8+ KB
```

```
[11]:  hari[hari["math score"]=="?"]
```

```
[11]: Empty DataFrame
      Columns: [gender, race/ethnicity, parental level of education, lunch, test
      preparation course, math score, reading score, writing score]
      Index: []
```

[12]:
```
 hari["math score"]==pd.to_numeric(hari["math score"])
```

[12]:
```
0      True
1      True
2      True
3      True
4      True
       …
995    True
996    True
997    True
998    True
999    True
Name: math score, Length: 992, dtype: bool
```

[13]:
```
hari.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 992 entries, 0 to 999
Data columns (total 8 columns):
 #   Column                       Non-Null Count  Dtype
---  ------                       --------------  -----
 0   gender                       992 non-null    object
 1   race/ethnicity               992 non-null    object
 2   parental level of education  992 non-null    object
 3   lunch                        992 non-null    object
 4   test preparation course      992 non-null    object
 5   math score                   992 non-null    float64
 6   reading score                992 non-null    float64
 7   writing score                992 non-null    float64
dtypes: float64(3), object(5)
memory usage: 69.8+ KB
```

[15]:
```
hari["math score"]==pd.to_numeric(hari["reading score"])
```

[15]:
```
0       True
1      False
2      False
3      False
4      False
       …
995    False
996    False
997    False
998    False
999    False
Length: 992, dtype: bool
```

[16]:

```
hari.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 992 entries, 0 to 999
Data columns (total 8 columns):
 #   Column                       Non-Null Count  Dtype
---  ------                       --------------  -----
 0   gender                       992 non-null    object
 1   race/ethnicity               992 non-null    object
 2   parental level of education  992 non-null    object
 3   lunch                        992 non-null    object
 4   test preparation course      992 non-null    object
 5   math score                   992 non-null    float64
 6   reading score                992 non-null    float64
 7   writing score                992 non-null    float64
dtypes: float64(3), object(5)
memory usage: 69.8+ KB
```

[17]:

```
hari["math score"]==pd.to_numeric(hari["reading score"])
```

[17]:

```
0       True
1      False
2      False
3      False
4      False
       …
995    False
996    False
997    False
998    False
999    False
Length: 992, dtype: bool
```

[18]:

```
hari.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 992 entries, 0 to 999
Data columns (total 8 columns):
 #   Column                       Non-Null Count  Dtype
---  ------                       --------------  -----
 0   gender                       992 non-null    object
 1   race/ethnicity               992 non-null    object
 2   parental level of education  992 non-null    object
 3   lunch                        992 non-null    object
 4   test preparation course      992 non-null    object
 5   math score                   992 non-null    float64
 6   reading score                992 non-null    float64
 7   writing score                992 non-null    float64
```

```
dtypes: float64(3), object(5)
memory usage: 69.8+ KB
```

[19]:

```
def detect_outliers(hari,feature):
    q1=hari [feature].quantile(0.25)
    q3=hari [feature].quantile(0.75)
    iqr=q3-q1
    lowerlimit=q1-1.5*iqr
    upperlimit=q3+1.5*iqr
    return hari[(hari[feature]<lowerlimit) | (hari[feature]>upperlimit)]
```

[21]:

```
detect_outliers(hari,"math score")
```

[21]:

```
     gender race/ethnicity parental level of education         lunch  \
17   female        group B            some high school  free/reduced
59   female        group C            some high school  free/reduced
145  female        group C                some college  free/reduced
338  female        group B            some high school  free/reduced
466  female        group D          associate's degree  free/reduced
787  female        group B                some college      standard
842  female        group B                 high school  free/reduced
980  female        group B                 high school  free/reduced

    test preparation course  math score  reading score  writing score
17                     none        18.0           32.0           28.0
59                     none         0.0           17.0           10.0
145                    none        22.0           39.0           33.0
338                    none        24.0           38.0           27.0
466                    none        26.0           31.0           38.0
787                    none        19.0           38.0           32.0
842               completed        23.0           44.0           36.0
980                    none         8.0           24.0           23.0
```

[22]:

```
detect_outliers(hari,"reading score")
```

[22]:

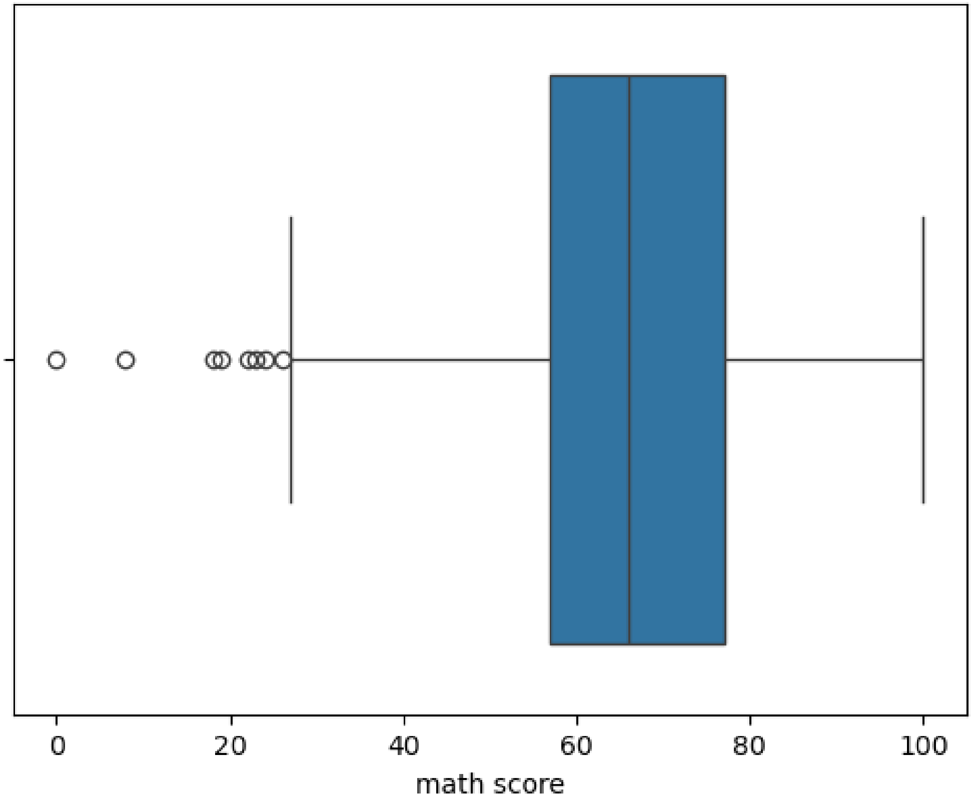
```
     gender race/ethnicity parental level of education         lunch  \
59   female        group C            some high school  free/reduced
76     male        group E            some high school      standard
211    male        group C                some college  free/reduced
327    male        group A                some college  free/reduced
596    male        group B                 high school  free/reduced
980  female        group B                 high school  free/reduced

    test preparation course  math score  reading score  writing score
59                     none         0.0           17.0           10.0
76                     none        30.0           26.0           22.0
211                    none        35.0           28.0           27.0
327                    none        28.0           23.0           19.0
```

```
596                       none          30.0          24.0           15.0
980                       none           8.0          24.0           23.0
```

[23]:
```
detect_outliers(hari,"writing score")
```

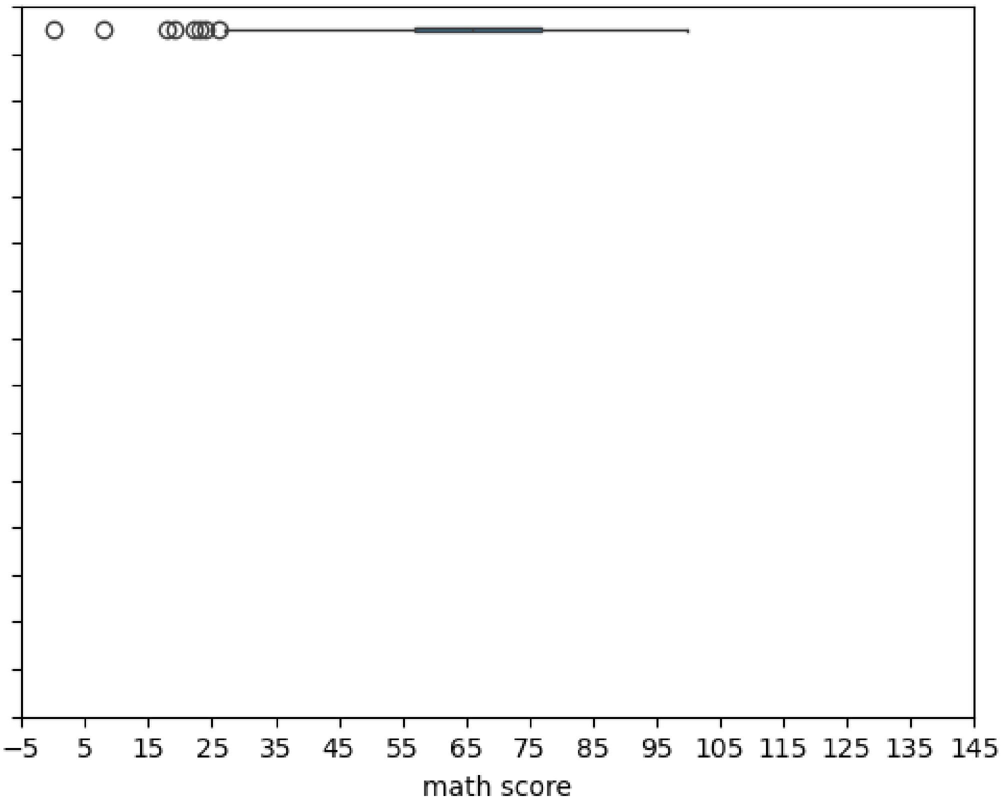
[23]:
```
     gender race/ethnicity parental level of education         lunch  \
59   female        group C            some high school  free/reduced
76     male        group E            some high school      standard
327    male        group A                some college  free/reduced
596    male        group B                 high school  free/reduced
980  female        group B                 high school  free/reduced

    test preparation course  math score  reading score  writing score
59                     none         0.0           17.0           10.0
76                     none        30.0           26.0           22.0
327                    none        28.0           23.0           19.0
596                    none        30.0           24.0           15.0
980                    none         8.0           24.0           23.0
```

[25]:
```
#boxplot
sns.boxplot(x="math score",data=hari)
plt.show()
```



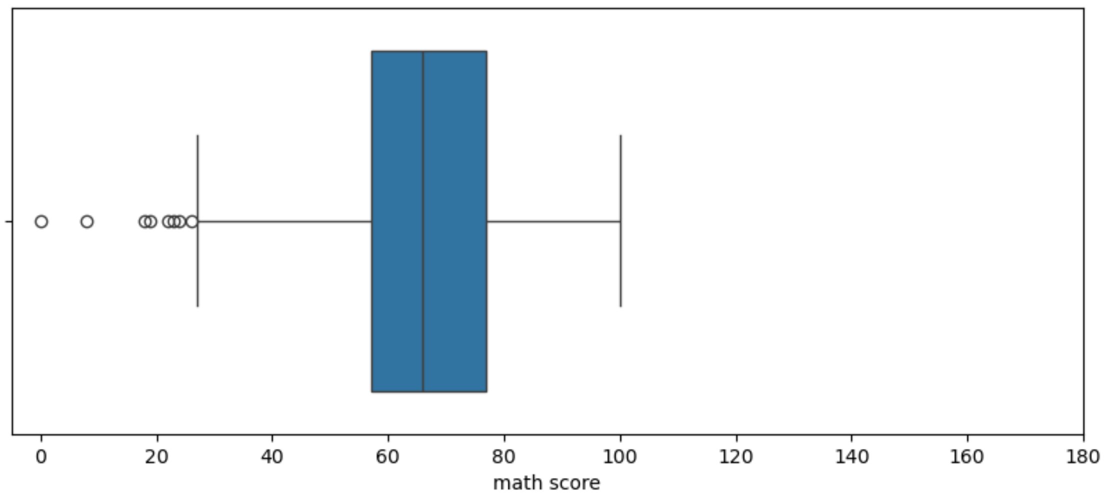
[26]:

```
bins=np.arange(-5,150,10)
sns.boxplot(x="math score",data=hari)
plt.xticks(bins)
plt.yticks(bins)
plt.show()
```

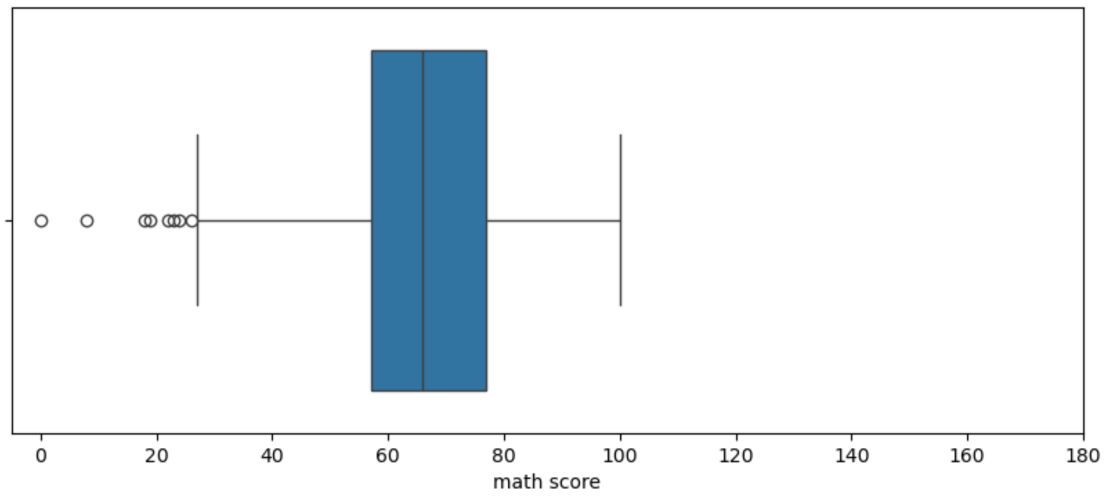


[27]:

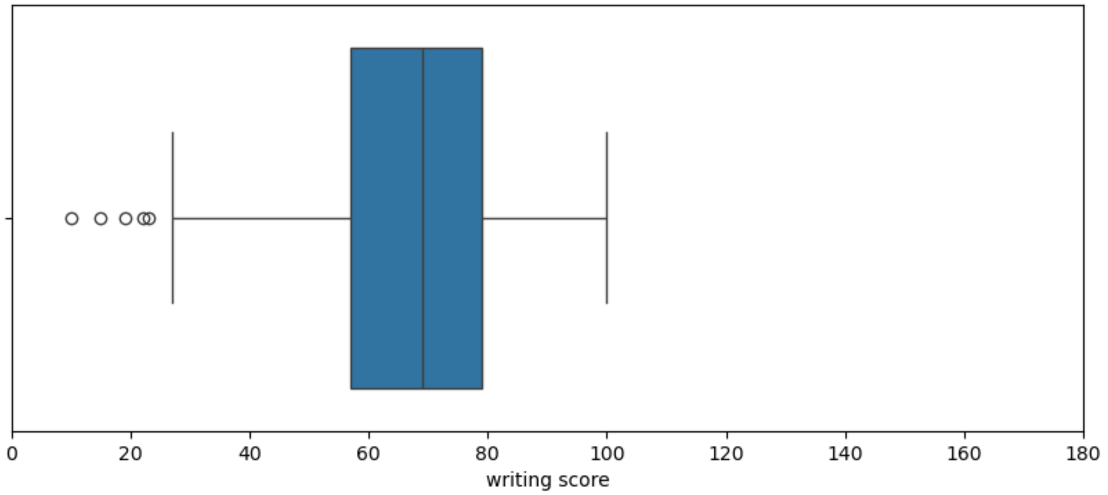
```
plt.figure(figsize=(10,4))
sns.boxplot(x="math score", data=hari)
plt.xticks(np.arange(0,200,20))
plt.show()
```



[28]:
```
plt.figure(figsize=(10,4))
sns.boxplot(x="math score", data=hari)
plt.xticks(np.arange(0,200,20))
plt.show()
```



[30]:
```
plt.figure(figsize=(10,4))
sns.boxplot(x="writing score", data=hari)
plt.xticks(np.arange(0,200,20))
plt.show()
```

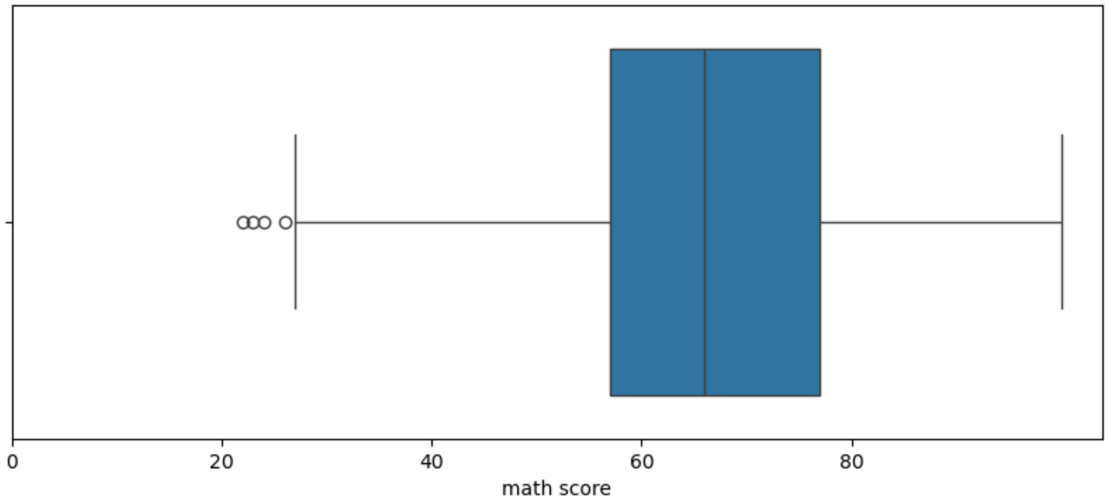


[32]:

```
#z-score
def trim(col:pd.core.series.Series):
     lowerlimit=col.mean()-3*col.std()
     upperlimit=col.mean()+3*col.std()
     new_col = col[(col<upperlimit)&(col>lowerlimit)]
     return new_col
```

[34]:

```
plt.figure(figsize=(10,4))
sns.boxplot(x=trim(hari["math score"]),data=hari)
plt.xticks(np.arange(0,100,20))
plt.show()
```



[35]:

```
#minmax scaler
#standard scaler
from sklearn.preprocessing import MinMaxScaler
```

[36]:

```
scaler=MinMaxScaler()
```

[37]:

```
hari["reading score"]=scaler.fit_transform(hari[["reading score"]])
```

[38]:

```
hari
```

[38]:

```
     gender race/ethnicity parental level of education         lunch  \
0    female        group B           bachelor's degree      standard
1    female        group C                some college      standard
2    female        group B             master's degree      standard
3      male        group A          associate's degree  free/reduced
4      male        group C                some college      standard
..      …            …                          …            …
995  female        group E             master's degree      standard
996    male        group C                 high school  free/reduced
997  female        group C                 high school  free/reduced
998  female        group D                some college      standard
999  female        group D                some college  free/reduced

    test preparation course  math score  reading score  writing score
0                      none        72.0       0.662651           74.0
1                 completed        69.0       0.879518           88.0
2                      none        90.0       0.939759           93.0
3                      none        47.0       0.481928           44.0
4                      none        76.0       0.734940           75.0
..                      …          …            …              …
995               completed        88.0       0.987952           95.0
996                    none        62.0       0.457831           55.0
997               completed        59.0       0.650602           65.0
998               completed        68.0       0.734940           77.0
999                    none        77.0       0.831325           86.0

[992 rows x 8 columns]
```

[39]:

```
hari["math score"]=scaler.fit_transform(hari[["math score"]])
```

[40]:

```
hari
```

[40]:

```
     gender race/ethnicity parental level of education         lunch  \
0    female        group B           bachelor's degree      standard
1    female        group C                some college      standard
2    female        group B             master's degree      standard
3      male        group A          associate's degree  free/reduced
```

```
4      male        group C                some college     standard
..      …            …                         …           …
995  female        group E             master's degree     standard
996    male        group C                 high school free/reduced
997  female        group C                 high school free/reduced
998  female        group D                some college     standard
999  female        group D                some college free/reduced

    test preparation course  math score  reading score  writing score
0                      none        0.72       0.662651           74.0
1                 completed        0.69       0.879518           88.0
2                      none        0.90       0.939759           93.0
3                      none        0.47       0.481928           44.0
4                      none        0.76       0.734940           75.0
..                      …         …            …            …
995               completed        0.88       0.987952           95.0
996                    none        0.62       0.457831           55.0
997               completed        0.59       0.650602           65.0
998               completed        0.68       0.734940           77.0
999                    none        0.77       0.831325           86.0

[992 rows x 8 columns]
```

[41]:
```
hari["writing score"]=scaler.fit_transform(hari[["writing score"]])
```

[42]:
```
hari
```

[42]:
```
     gender race/ethnicity parental level of education        lunch  \
0    female        group B           bachelor's degree     standard
1    female        group C                some college     standard
2    female        group B             master's degree     standard
3      male        group A          associate's degree free/reduced
4      male        group C                some college     standard
..      …            …                         …           …
995  female        group E             master's degree     standard
996    male        group C                 high school free/reduced
997  female        group C                 high school free/reduced
998  female        group D                some college     standard
999  female        group D                some college free/reduced

    test preparation course  math score  reading score  writing score
0                      none        0.72       0.662651       0.711111
1                 completed        0.69       0.879518       0.866667
2                      none        0.90       0.939759       0.922222
3                      none        0.47       0.481928       0.377778
4                      none        0.76       0.734940       0.722222
..                      …         …            …            …
```

```
995          completed    0.88  0.987952       0.944444
996               none    0.62  0.457831       0.500000
997          completed    0.59  0.650602       0.611111
998          completed    0.68  0.734940       0.744444
999               none    0.77  0.831325       0.844444

[992 rows x 8 columns]
```

```
[ ]:
```