hr-plot

June 23, 2023

Importing matplotlib and numpy

[ ]:
```
import matplotlib.pyplot as plt
import numpy as np
```

Following is a function which gets the B-V value from the row of data corresponding to a star

Args:

row (array_like): Sequence of data corresponding to the attributes of a star

Returns:

float: Returns the B-V value (Color Index), which is the last element of the row of data

[ ]:
```
def BVal(row):
  return row[-1]
```

Following function gets the Absolute Magnitude value from the row of data corresponding to a star

Args:

row (array_like): Sequence of data corresponding to the attributes of a star

Returns:

float: Returns the Absolute Magnitude of a star, using the formula:

M = Vmag + 5*log(Plx/100)

Where,

Vmag -> Johnson Magnitude (Apparent magnitude in the visual part of EM spectrum)

Plx -> Parallax in milliarcsec

[ ]:
```
def AbsMag(row):
  return row[1]+5*np.log10(row[4]/100)
```

Loading the data of the stars (from whatsapp group), removing the rows with incomplete data, using the genfromtext function

[ ]:
```
data = np.genfromtxt(r'HR data.txt', skip_header=1, invalid_raise=False,␣
↪missing_values = "", filling_values=np.nan)
```

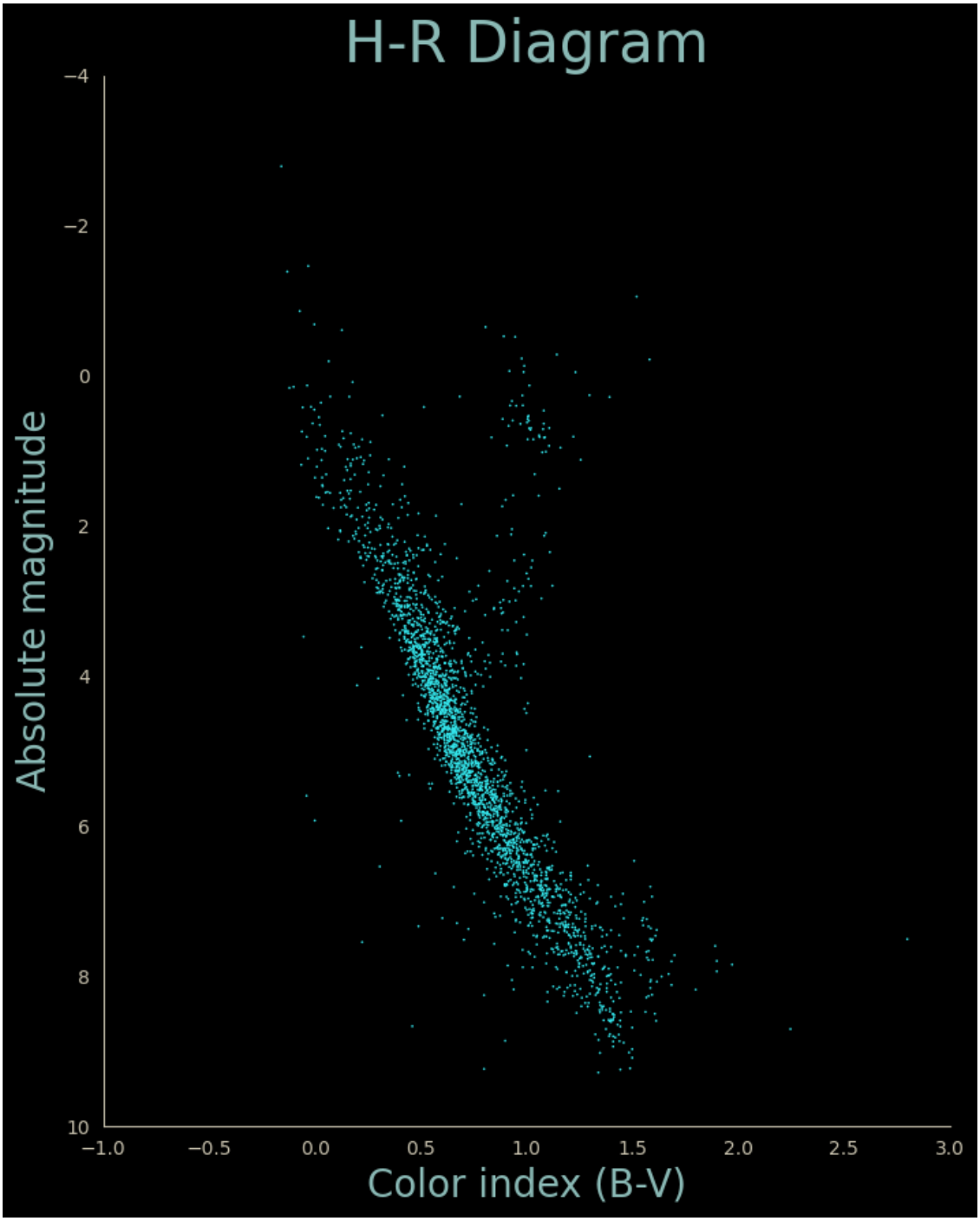
Using the vectorize method of numpy to obtain the B-V and Absolute Magnitude values from each row, and storing in a numpy array

[ ]:
```
BValvec = np.vectorize(BVal, signature='(n)->()')
x_cor = BValvec(data)
AbsMagvec = np.vectorize(AbsMag, signature='(n)->()')
y_cor = AbsMagvec(data)
```

The following code does the following

- Initializing fig and ax
- Defining the plot limits
- Defining the title, axes labels, and formatting them
- Defining the background color of the plot
- Defining the colors of the axes and parameter labels
- Plotting the points on the graph
- Displaying the graph, Absolute Magnitude vs B-V

[23]:
```
fig, ax = plt.subplots(figsize=(8,10))

ax.set_xlim(-1, 3)
ax.set_ylim(10, -4)

ax.set_title('H-R Diagram')
ax.title.set_color('#8AB9B5')
ax.title.set_fontsize(30)
ax.set_xlabel('Color index (B-V)')
ax.xaxis.label.set_fontsize(20)
ax.xaxis.label.set_color('#8AB9B5')
ax.set_ylabel('Absolute magnitude')
ax.yaxis.label.set_fontsize(20)
ax.yaxis.label.set_color('#8AB9B5')

ax.set_facecolor('black')
fig.patch.set_facecolor('black')

ax.spines['bottom'].set_color('#C8C2AE')
ax.spines['left'].set_color('#C8C2AE')
ax.tick_params(axis='x', labelcolor='#C8C2AE')
ax.tick_params(axis='y', labelcolor='#C8C2AE')

ax.scatter(x_cor, y_cor, s=1.5, edgecolors='none', c='#34E4EA')
plt.show()
```


H-R Diagram
Absolute magnitude
Color index (B-V)
−4
−2
0
2
4
6
8
10
−1.0
−0.5
0.0
0.5
1.0
1.5
2.0
2.5
3.0