ex1-1

March 21, 2025

1 ex1-1 *Exercise Svetoslav Botev*

[9]:
```
a = [23, 56, 2, 4, 3]
b = np.mean(a)
print(b)
```

```
17.6
```

1.1 ex1-1 *installation block*

[2]:
```
!pip install numpy
!pip install matplotlib
!pip install astropy

import numpy as np
import matplotlib.pyplot as plt
from astropy.io import fits
from astropy.table import Table
plt.ion()
import os
```

```
Requirement already satisfied: numpy in
/home/botev/my_project_dir/my_project_env/lib/python3.12/site-packages (2.2.3)
Requirement already satisfied: matplotlib in
/home/botev/my_project_dir/my_project_env/lib/python3.12/site-packages (3.10.1)
Requirement already satisfied: contourpy>=1.0.1 in
/home/botev/my_project_dir/my_project_env/lib/python3.12/site-packages (from
matplotlib) (1.3.1)
Requirement already satisfied: cycler>=0.10 in
/home/botev/my_project_dir/my_project_env/lib/python3.12/site-packages (from
matplotlib) (0.12.1)
Requirement already satisfied: fonttools>=4.22.0 in
/home/botev/my_project_dir/my_project_env/lib/python3.12/site-packages (from
matplotlib) (4.56.0)
Requirement already satisfied: kiwisolver>=1.3.1 in
/home/botev/my_project_dir/my_project_env/lib/python3.12/site-packages (from
matplotlib) (1.4.8)
Requirement already satisfied: numpy>=1.23 in
/home/botev/my_project_dir/my_project_env/lib/python3.12/site-packages (from
```

```
matplotlib) (2.2.3)
Requirement already satisfied: packaging>=20.0 in
/home/botev/my_project_dir/my_project_env/lib/python3.12/site-packages (from
matplotlib) (24.2)
Requirement already satisfied: pillow>=8 in
/home/botev/my_project_dir/my_project_env/lib/python3.12/site-packages (from
matplotlib) (11.1.0)
Requirement already satisfied: pyparsing>=2.3.1 in
/home/botev/my_project_dir/my_project_env/lib/python3.12/site-packages (from
matplotlib) (3.2.1)
Requirement already satisfied: python-dateutil>=2.7 in
/home/botev/my_project_dir/my_project_env/lib/python3.12/site-packages (from
matplotlib) (2.9.0.post0)
Requirement already satisfied: six>=1.5 in
/home/botev/my_project_dir/my_project_env/lib/python3.12/site-packages (from
python-dateutil>=2.7->matplotlib) (1.17.0)
Requirement already satisfied: astropy in
/home/botev/my_project_dir/my_project_env/lib/python3.12/site-packages (7.0.1)
Requirement already satisfied: numpy>=1.23.2 in
/home/botev/my_project_dir/my_project_env/lib/python3.12/site-packages (from
astropy) (2.2.3)
Requirement already satisfied: pyerfa>=2.0.1.1 in
/home/botev/my_project_dir/my_project_env/lib/python3.12/site-packages (from
astropy) (2.0.1.5)
Requirement already satisfied: astropy-iers-data>=0.2025.1.31.12.41.4 in
/home/botev/my_project_dir/my_project_env/lib/python3.12/site-packages (from
astropy) (0.2025.3.10.0.29.26)
Requirement already satisfied: PyYAML>=6.0.0 in
/home/botev/my_project_dir/my_project_env/lib/python3.12/site-packages (from
astropy) (6.0.2)
Requirement already satisfied: packaging>=22.0.0 in
/home/botev/my_project_dir/my_project_env/lib/python3.12/site-packages (from
astropy) (24.2)
```

1.2 ex1-1 *initialisation and parametrisation block*

[13]:
```
t = Table.read("hst_results_nd.fits")
ra = t["RA"]
dec = t["DEC"]
av = t["Av_p50"]
age = t["logA_p50"]
mass=t["M_ini_p50"]
temp = t["logT_p50"]
f475w = t["F475_VEGA"]
f418w = t["F814_VEGA"]
#t[0].colnames
```

```
---------------------------------------------------------------------------
FileNotFoundError                         Traceback (most recent call last)
Cell In[13], line 1
----> 1 t = Table.read(                          )
      2 ra = t["RA"]
      3 dec = t["DEC"]

File ~/my_project_dir/my_project_env/lib/python3.12/site-packages/astropy/table
 ↪connect.py:62, in TableRead.__call__(self, *args, **kwargs)
     59 units = kwargs.pop("units", None)
     60 descriptions = kwargs.pop("descriptions", None)
---> 62 out = self.registry.read(cls, *args, **kwargs)
     64 # For some readers (e.g., ascii.ecsv), the returned `out` class is not
     65 # guaranteed to be the same as the desired output `cls`.  If so,
     66 # try coercing to desired class without copying (io.registry.read
     67 # would normally do a copy).  The normal case here is swapping
     68 # Table <=> QTable.
     69 if cls is not out.__class__:

File ~/my_project_dir/my_project_env/lib/python3.12/site-packages/astropy/io/
 ↪registry/core.py:200, in UnifiedInputRegistry.read(self, cls, format, cache,␣
 ↪*args, **kwargs)
    196 try:
    197     ctx = get_readable_fileobj(
    198         args[0], encoding="binary", cache=cache
    199     )
--> 200     fileobj = ctx.__enter__()
    201 except OSError:
    202     raise

File /usr/lib/python3.12/contextlib.py:137, in _GeneratorContextManager.
 ↪__enter__(self)
    135 del self.args, self.kwds, self.func
    136 try:
--> 137     return next(self.gen)
    138 except StopIteration:
    139     raise RuntimeError("generator didn't yield") from None

File ~/my_project_dir/my_project_env/lib/python3.12/site-packages/astropy/utils
 ↪data.py:365, in get_readable_fileobj(name_or_obj, encoding, cache,␣
 ↪show_progress, remote_timeout, sources, http_headers, use_fsspec,␣
 ↪fsspec_kwargs, close_files)
    356 if is_url:
    357     name_or_obj = download_file(
    358         name_or_obj,
    359         cache=cache,
   (…)    363         http_headers=http_headers,
```

```
    364     )
--> 365 fileobj = io.FileIO(name_or_obj,    )
    366 if is_url and not cache:
    367     delete_fds.append(fileobj)

FileNotFoundError: [Errno 2] No such file or directory: 'hst_results_nd.fits'
```

1.3 ex1-1 *Plotting block*

[9]:
```
young_stars = age (age < 8.0)
old_strs = age(age > 9.5)
#f475w_ys = f475[young]
#print(old_stars[0:100])
plt.figure()
plt.plot(f475w  - f814w, f475w, ',', color = 'gray'. ls = ''label = "all stars")
plt.ylim(26.5, 17.3)
plt.plot (young_stars["F475_VEGA"] - young_stars ["F814_VEGA"],␣
 ↪young_stars["F475_VEGA"], 'b.', ls = '', label='log(age) < 8.5 dex')
plt.plot (old_stars["F475_VEGA"] - old_stars ["F814_VEGA"],␣
 ↪old_stars["F475_VEGA"], 'r.', ls = '', label='log(age) > 10 dex')
plt.legend()
plt.savefig("cmd_by_age.pdf")
```

```
  Cell In[9], line 6
    plt.plot(f475w  - f814w, f475w, ',', color = 'gray'. ls = ''label = "all␣
 ↪stars")
                                                                        ^

SyntaxError: invalid syntax
```

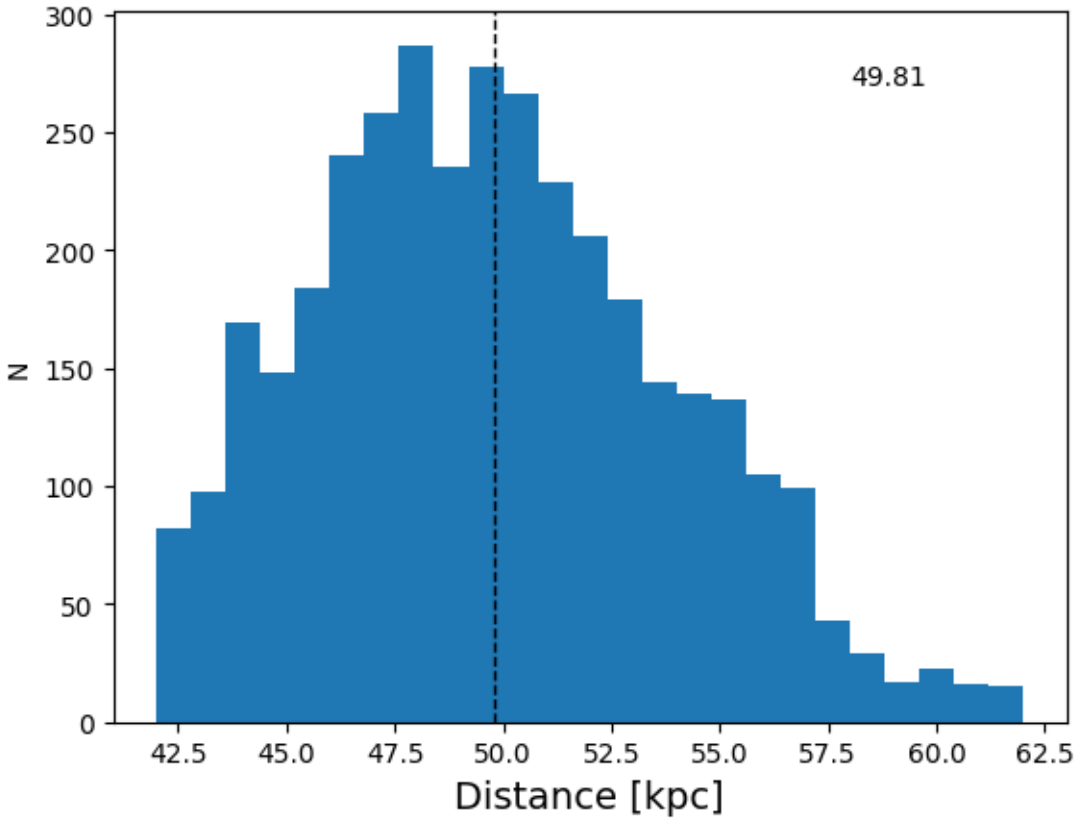
[10]:
```
plt.figure()
#plt.plot(ra, dec, '.b',ls='')
cb =plt.scatter(ra, dec, c=av, marker='o', cmap='magma', vmin=0, vmax=1)
plt.colorbar(cb, label='A(V)')
plt.xlabel("RA", fontsize=14)
plt.ylabel("DEC", fontsize=14)
plt.savefig("lmc_av_spatial.eps")
```

[12]:
```
dist=t["distance_p50"]
```

[13]:
```
plt.figure()
plt.hist(dist/1000, bins=25)
plt.xlabel("Distance [kpc]", fontsize=14)
plt.ylabel("N")
d_mean= np.mean(dist/1000)
```

```
print(d_mean)
plt.axvline(d_mean, color='k', ls='--', lw=1)
plt.text(58, 270, '%s' % np.around(d_mean, decimals=2))
plt.savefig("hist.pdf")
```

```
49.806221103883765
```

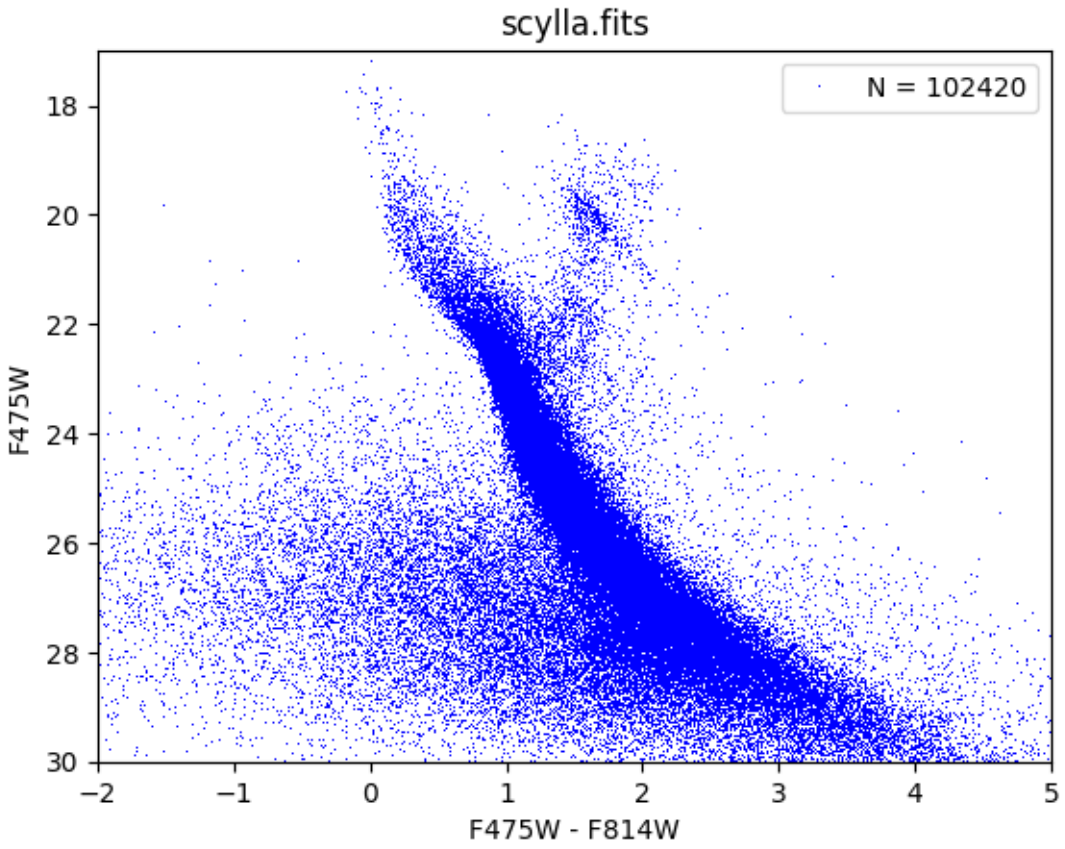


[14]:
```
cat = Table.read("scylla.fits")
f = "scylla.fits"
```

[15]:
```
#t[0].colnames
f475 = cat["F475W_VEGA"]
f814 = cat["F814W_VEGA"]
```

[16]:
```
col = f475 - f814
mag = f475
n = len(f475)
plt.figure()
plt.plot(col, mag, ',b',ls='', label='N = %s' % n)
plt.legend()
plt.xlim(-2, 5)
```

```
plt.ylim(30, 17)
plt.xlabel('F475W - F814W')
plt.ylabel('F475W')
plt.title('%s' % f)
plt.savefig("cmd_scylla.pdf")
```



[ ]: