Untitled

May 9, 2022

0.1 InPTA Test eccentricity data and plotting

0.1.1 adding the libraries for analysis

[1]:
```
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
```

0.2 importing the file using pandas

[156]:
```
exoplanet = pd.read_csv('exoplanet.eu_catalog_1000.csv', index_col=False)␣
↪#exoplanet data
exoplanet.shape
exoplanet.head()
```

[156]:

	# name	planet_status	mass	mass_error_min	mass_error_max	mass_sini	\
0	11 Com b	Confirmed	NaN	NaN	NaN	16.1284	
1	11 Oph b	Confirmed	21.0	3.0	3.0	NaN	
2	11 UMi b	Confirmed	NaN	NaN	NaN	11.0873	
3	14 And b	Confirmed	NaN	NaN	NaN	4.6840	
4	14 Her b	Confirmed	9.1	NaN	NaN	5.2150	

	mass_sini_error_min	mass_sini_error_max	radius	radius_error_min	…	\
0	1.50	1.50	NaN	NaN	…	
1	NaN	NaN	NaN	NaN	…	
2	1.10	1.10	NaN	NaN	…	
3	0.23	0.23	NaN	NaN	…	
4	NaN	NaN	NaN	NaN	…	

	star_sp_type	star_age	star_age_error_min	star_age_error_max	star_teff	\
0	G8 III	NaN	NaN	NaN	4742.0	
1	M9	0.011	0.002	0.002	2375.0	
2	K4III	1.560	0.540	0.540	4340.0	
3	K0III	NaN	NaN	NaN	4813.0	
4	K0 V	5.100	NaN	NaN	5311.0	

	star_teff_error_min	star_teff_error_max	star_detected_disc	\
0	100.0	100.0	NaN	

```
1                175.0                175.0                NaN
2                 70.0                 70.0                NaN
3                 20.0                 20.0                NaN
4                 87.0                 87.0                NaN

   star_magnetic_field    star_alternate_names
0                  NaN                     NaN
1                  NaN  Oph 1622-2405, Oph 11A
2                  NaN                     NaN
3                  NaN                     NaN
4                  NaN                     NaN

[5 rows x 98 columns]
```

0.3 extracting eccentricity column from the data

[157]:
```
e = exoplanet['eccentricity']
e.head()
```

[157]:
```
0    0.231
1      NaN
2    0.080
3    0.000
4    0.369
Name: eccentricity, dtype: float64
```

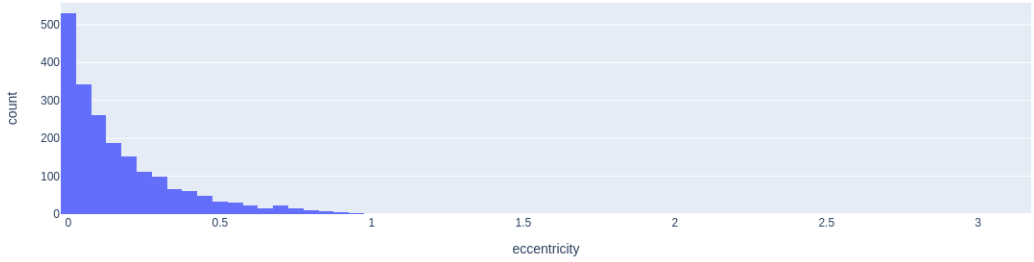
0.4 removing the NaN values from the list using dropna() function

[159]:
```
e_non_nan = e.dropna()
e_non_nan.head()
```

[159]:
```
0    0.231
2    0.080
3    0.000
4    0.369
5    0.640
Name: eccentricity, dtype: float64
```

0.5 plotting the histogram of the eccentricity data

[160]:
```
import plotly.express as px
fig = px.histogram(e_non_nan, nbins=100, x="eccentricity")
fig.show()
```



0.6 replotting the after Gaussianization of the distribution using Box-transformation either using scipy.stats.boxcox or from first principles

[161]:
```
from scipy.stats import boxcox
e_non_nan
```

[161]:
```
0       0.23100
2       0.08000
3       0.00000
4       0.36900
5       0.64000
          …
5023    0.01186
5024    0.24450
5025    0.31600
5026    0.00536
5027    0.32000
Name: eccentricity, Length: 2027, dtype: float64
```

0.6.1 ecentricity values contains a 0 eccentric orbit and boxcox needs purely positive values to function. need to do something with 0

[163]:
```
e = e_non_nan.values
idx = np.where(e==0)

#perturbing the 0 eccentric orbits with an epsilon quantity for boxcox to work
for i in idx:
    epsilon = 1e-20 #very small perturbation
    e[i] = epsilon
```

[142]:
```
e_gauss = boxcox(e)[0] #gaussianized eccentricities with pertubation for the 0␣
↪eccentricity
```

[164]:
```
plt.hist(e_gauss, bins=20, range = [-3, 0])
plt.xlabel('bins')
plt.ylabel('dN')
plt.show()
```