time_distribution

June 7, 2024

1 Imports

[92]:
```
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
from collections import namedtuple
import geopy.distance
import datetime
```

2 Read File

[93]:
```
df = pd.read_csv('hcp1.csv',
                 #dtype={'Time', 'datetime'},
                 parse_dates=['Time'])
```

[94]:
```
#df
```

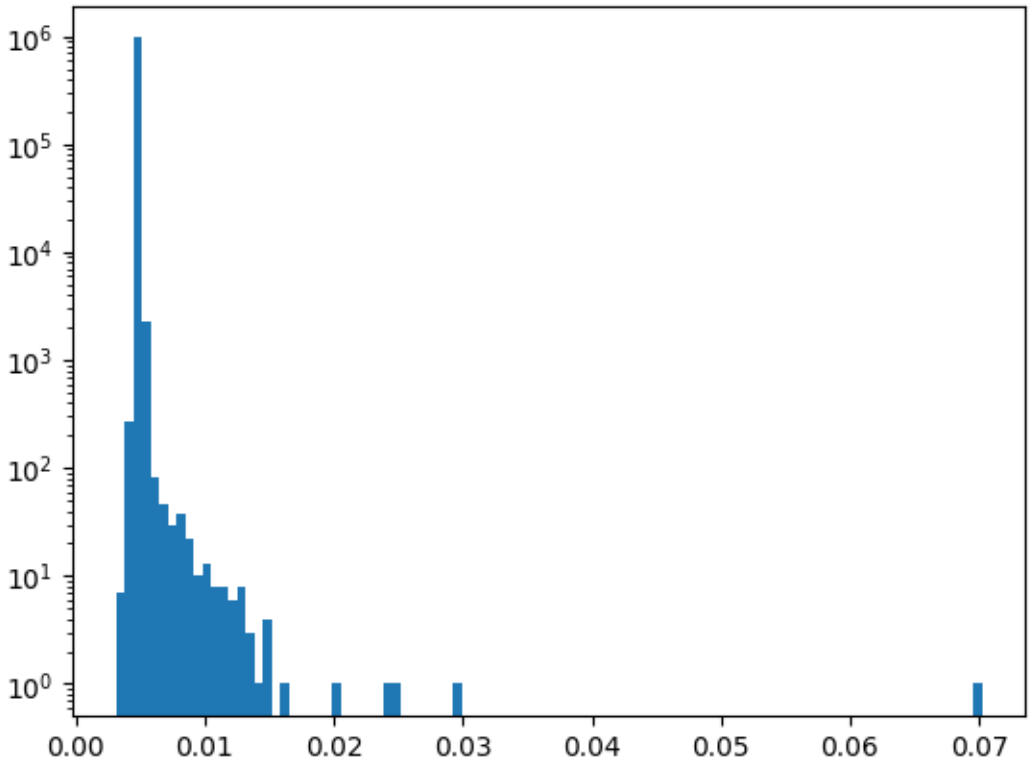
3 Time Plots

[ ]:
```
plt.plot(df.Time.dt.microsecond/1e6, 'bo-')
```

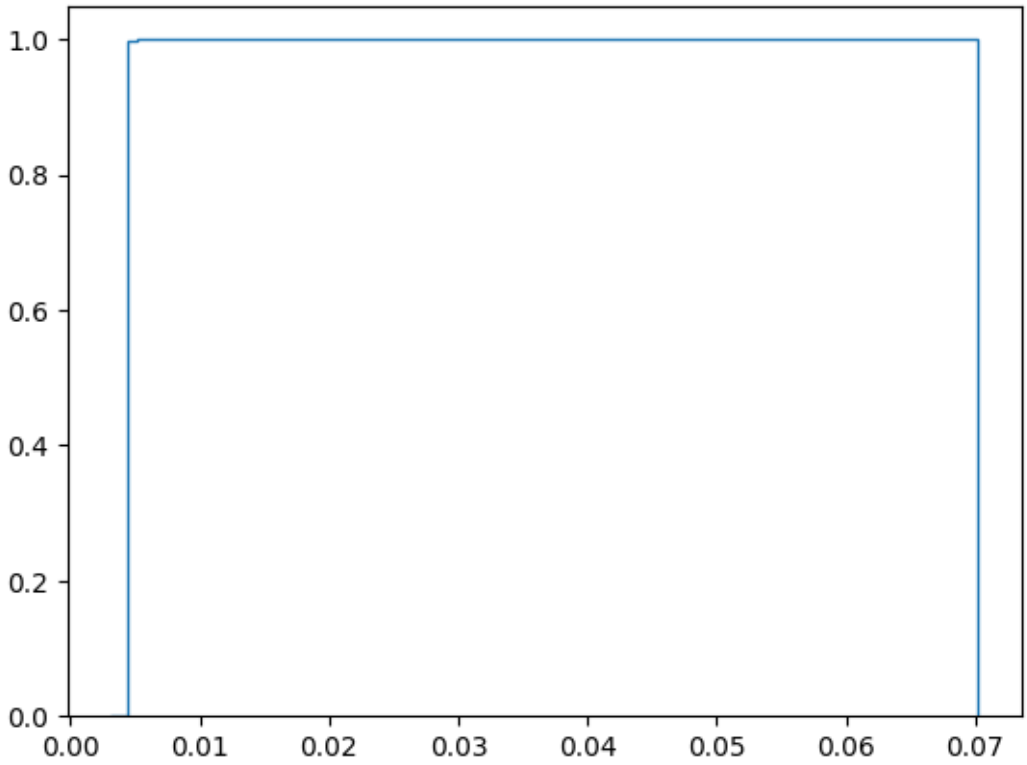
[ ]:
```
h = plt.hist(df.Time.dt.microsecond/1e6, bins=200)
```

[104]:
```
h = plt.hist(df.Time.diff().dt.total_seconds(),
             bins=100,
            )
plt.yscale('log')
print(f'mean: {df.Time.diff().dt.total_seconds().mean()}')
print(f'std : {df.Time.diff().dt.total_seconds().std()}')
print(f'min : {df.Time.diff().dt.total_seconds().min()}')
print(f'max : {df.Time.diff().dt.total_seconds().max()}')
```

```
mean: 0.005000930233493906
std : 0.0001032245858410899
min : 0.003114
max : 0.070196
```



[98]:
```
h = plt.hist(df.Time.diff().dt.total_seconds(),
             bins=100,
             density=True,
             histtype="step",
             cumulative=True,
            )
```

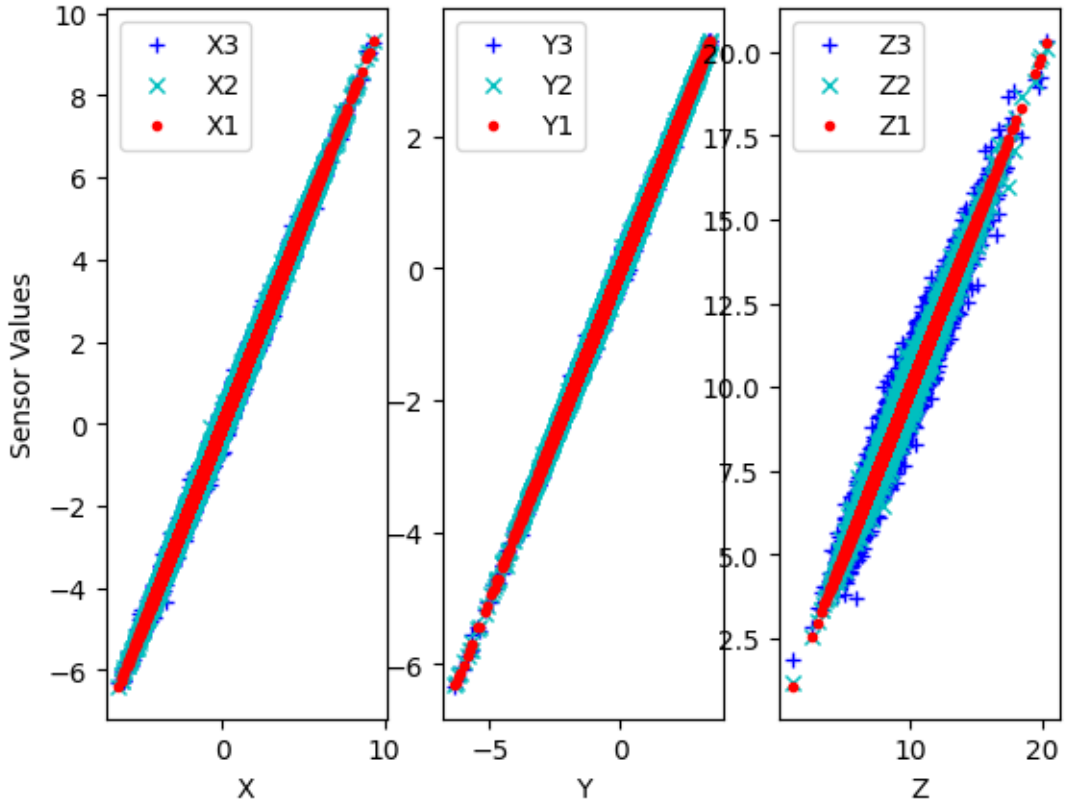


4 Sensor Comparison Plots

[99]:
```
fig, ax = plt.subplots(1, 3)

ax[0].plot(df.x, df.x3, 'b+',
         df.x, df.x2, 'cx',
         df.x, df.x, 'r.',
        )
ax[0].legend(['X3', 'X2', 'X1'])
ax[0].set_xlabel('X')
ax[0].set_ylabel('Sensor Values')

ax[1].plot(df.y, df.y3, 'b+',
         df.y, df.y2, 'cx',
         df.y, df.y, 'r.',
        )
ax[1].legend(['Y3', 'Y2', 'Y1'])
ax[1].set_xlabel('Y')

ax[2].plot(df.z, df.z3, 'b+',
         df.z, df.z2, 'cx',
```

```
         df.z, df.z, 'r.',
        )
ax[2].legend(['Z3', 'Z2', 'Z1'])
ax[2].set_xlabel('Z')
```

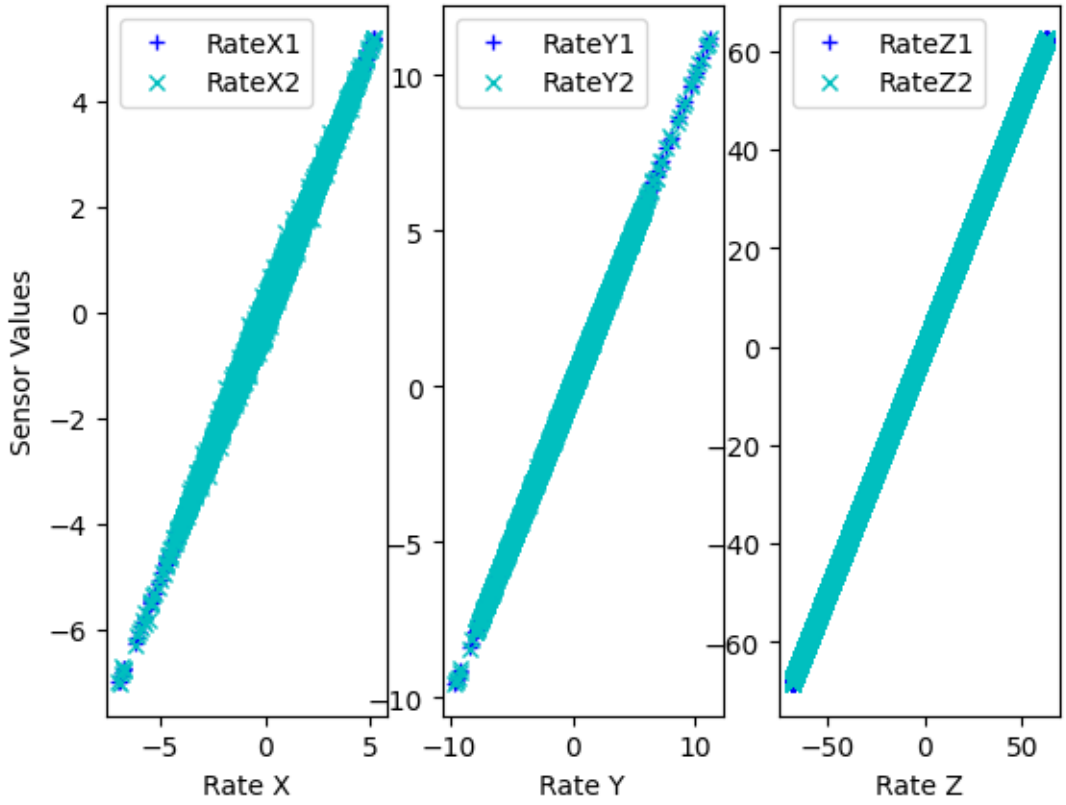
[99]: Text(0.5, 0, 'Z')



[100]:
```
fig, ax = plt.subplots(1, 3)

ax[0].plot(df.ratex, df.ratex, 'b+',
         df.ratex, df.ratex2, 'cx',
        )
ax[0].legend(['RateX1', 'RateX2'])
ax[0].set_xlabel('Rate X')
ax[0].set_ylabel('Sensor Values')

ax[1].plot(df.ratey, df.ratey, 'b+',
         df.ratey, df.ratey2, 'cx',
         )
ax[1].legend(['RateY1', 'RateY2'])
ax[1].set_xlabel('Rate Y')
```

```
ax[2].plot(df.ratez, df.ratez, 'b+',
         df.ratez, df.ratez2, 'cx',
        )
ax[2].legend(['RateZ1', 'RateZ2'])
ax[2].set_xlabel('Rate Z')
```

[100]: Text(0.5, 0, 'Rate Z')

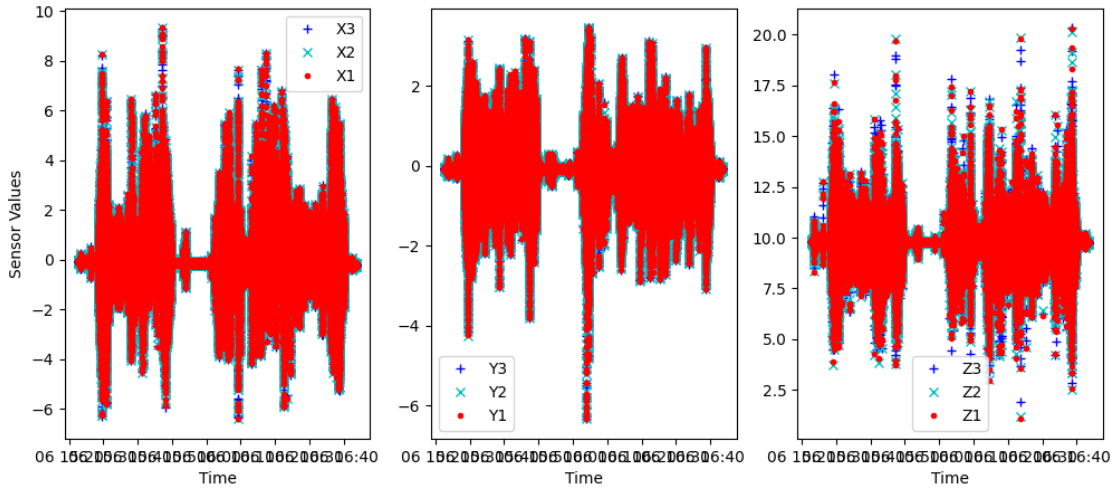


5 Acc Vs Time

[101]:
```
fig, ax = plt.subplots(1, 3, figsize=(12,5))

ax[0].plot(df.Time, df.x3, 'b+',
         df.Time, df.x2, 'cx',
         df.Time, df.x, 'r.',
        )
ax[0].legend(['X3', 'X2', 'X1'])
ax[0].set_xlabel('Time')
ax[0].set_ylabel('Sensor Values')
```

```
ax[1].plot(df.Time, df.y3, 'b+',
         df.Time, df.y2, 'cx',
         df.Time, df.y, 'r.',
        )
ax[1].legend(['Y3', 'Y2', 'Y1'])
ax[1].set_xlabel('Time')

ax[2].plot(df.Time, df.z3, 'b+',
         df.Time, df.z2, 'cx',
         df.Time, df.z, 'r.',
        )
ax[2].legend(['Z3', 'Z2', 'Z1'])
ax[2].set_xlabel('Time')
```

[101]: Text(0.5, 0, 'Time')



[102]:
```
df
```

[102]:

	Time	x	y	z	ratex	\
0	2024-06-06 15:22:48.097246	-0.083359	-0.080859	9.807187	0.014375	
1	2024-06-06 15:22:48.102075	-0.123320	-0.095156	9.843477	0.019375	
2	2024-06-06 15:22:48.107059	-0.113906	-0.103398	9.820000	0.033125	
3	2024-06-06 15:22:48.112061	-0.081328	-0.116562	9.790430	0.047500	
4	2024-06-06 15:22:48.117049	-0.044883	-0.114687	9.761445	0.061250	
…	…	…	…	…	…	
969229	2024-06-06 16:43:35.143697	-0.167422	-0.078164	9.742422	0.045625	
969230	2024-06-06 16:43:35.148696	-0.211562	-0.080547	9.749961	0.016250	
969231	2024-06-06 16:43:35.153938	-0.259023	-0.103477	9.807148	0.008750	
969232	2024-06-06 16:43:35.158862	-0.246797	-0.106836	9.804258	0.033125	

```
969233 2024-06-06 16:43:35.163859 -0.221914 -0.103906  9.797266  0.044375

           ratey     ratez  temperature        x2        y2        z2  \
0       0.027500  0.003125        30.63 -0.080469 -0.080469  9.802344
1       0.010000 -0.011875        30.64 -0.118750 -0.091563  9.839688
2      -0.010000 -0.020625        30.63 -0.116719 -0.101250  9.827500
3      -0.009375 -0.007500        30.63 -0.086094 -0.115781  9.793125
4      -0.008125  0.010625        30.64 -0.046406 -0.115469  9.764375
…            …         …           …        …         …         …
969229  0.021875  0.012500        34.33 -0.165625 -0.079687  9.744063
969230  0.024375  0.014375        34.32 -0.211875 -0.080156  9.747813
969231  0.023750  0.016875        34.33 -0.259375 -0.103438  9.805781
969232  0.003750  0.020625        34.33 -0.251406 -0.106563  9.803281
969233 -0.006875  0.017500        34.33 -0.224688 -0.104688  9.796563

          ratex2    ratey2    ratez2        x3        y3        z3
0       0.014687  0.027813  0.003750 -0.091875 -0.082500  9.815000
1       0.017812  0.014687 -0.007500 -0.124375 -0.096875  9.843125
2       0.031875 -0.009062 -0.021250 -0.111875 -0.106250  9.814375
3       0.046250 -0.009375 -0.009375 -0.076250 -0.117500  9.787500
4       0.058438 -0.008438  0.010000 -0.042500 -0.113125  9.756250
…            …         …         …        …         …         …
969229  0.044687  0.021875  0.012500 -0.178125 -0.075625  9.738750
969230  0.020938  0.024688  0.014687 -0.226250 -0.088125  9.762500
969231  0.008125  0.025625  0.016875 -0.261250 -0.105625  9.811875
969232  0.031250  0.005313  0.019688 -0.240625 -0.107500  9.798750
969233  0.044375 -0.006250  0.017500 -0.216875 -0.103125  9.798750

[969234 rows x 17 columns]
```

[ ]: