In [13]:
```python
import pandas as pd
import numpy as np
```

In [14]:
```python
df = pd.read_csv('Iot_30min_norm.csv')
df.head()
```

Out[14]:

	TIME	FM1	PE1	PE2	PE3	PE4	TP1	TP2	EPOCH
0	2020-07-05 21:00:00+00:00	0.291841	0.944212	0.969845	0.909817	0.752879	0.128703	0.729592	1593982800
1	2020-07-05 21:30:00+00:00	0.290384	0.947971	0.971459	0.913576	0.753741	0.117572	0.723905	1593984600
2	2020-07-05 22:00:00+00:00	0.279458	0.944138	0.968994	0.912516	0.753187	0.111242	0.720671	1593986400
3	2020-07-05 22:30:00+00:00	0.288927	0.950337	0.976253	0.915991	0.756699	0.102464	0.716186	1593988200
4	2020-07-05 23:00:00+00:00	0.299610	0.950226	0.975747	0.916188	0.756563	0.093201	0.711454	1593990000

In [15]:
```python
df.describe()
```

Out[15]:

	FM1	PE1	PE2	PE3	PE4	TP1	TP2	EPOCH
count	720.000000	720.000000	720.000000	720.000000	720.000000	720.000000	720.000000	7.200000e+02
mean	0.401405	0.935561	0.960597	0.907572	0.789629	0.375372	0.606721	1.594630e+09
std	0.113317	0.006896	0.038904	0.042093	0.051314	0.217120	0.138403	3.743825e+05
min	0.000000	0.922572	0.277070	0.023603	0.000000	0.000000	0.000000	1.593983e+09
25%	0.314962	0.931487	0.959694	0.905535	0.781885	0.201964	0.512354	1.594306e+09
50%	0.385196	0.934538	0.963252	0.910945	0.789128	0.343614	0.599224	1.594630e+09
75%	0.455849	0.938069	0.966236	0.917138	0.811603	0.511152	0.714562	1.594953e+09
max	1.000000	0.974454	1.000000	0.944446	0.840141	1.000000	1.000000	1.595277e+09

In [16]:
```python
df.isnull().sum()
```

Out[16]:
```
TIME     0
FM1      0
PE1      0
PE2      0
PE3      0
PE4      0
TP1      0
TP2      0
EPOCH    0
dtype: int64
```

In [17]:
```python
df.dtypes
```

Out[17]:
```
TIME      object
FM1      float64
PE1      float64
PE2      float64
PE3      float64
PE4      float64
TP1      float64
TP2      float64
EPOCH      int64
dtype: object
```

In [18]:
```python
df['FM1'].unique()
```

Out[18]:
```
array([0.29184058, 0.29038382, 0.27945802, 0.28892702, 0.29961005,
       0.2963323 , 0.2741165 , 0.2799436 , 0.2957051 , 0.29681793,
       0.27824405, 0.28504232, 0.29354015, 0.27628142, 0.27581608,
       0.28751075, 0.28759167, 0.27798098, 0.2908694 , 0.30640832,
       0.2973035 , 0.27496627, 0.277111  , 0.2816027 , 0.29402575,
       0.28722748, 0.2705757 , 0.27921522, 0.27751562, 0.26792517,
       0.27897242, 0.27703005, 0.27096015, 0.2888056 , 0.2783654 ,
       0.27002943, 0.28176457, 0.2746021 , 0.26288718, 0.28127897,
       0.2676824 , 0.26845124, 0.28309992, 0.28067195, 0.27314532,
       0.29111218, 0.28164318, 0.2738737 , 0.28471857, 0.2935199 ,
       0.27787983, 0.28212875, 0.29693928, 0.27638257, 0.27520907,
       0.29596812, 0.26574   , 0.27229553, 0.28285715, 0.29147637,
       0.2583348 , 0.26658982, 0.27484486, 0.27338812, 0.28929123,
       0.28977683, 0.2671968 , 0.26513305, 0.27545187, 0.28577068,
       0.268775  , 0.26571977, 0.27666584, 0.25930595, 0.26986757,
       0.28394973, 0.26175416, 0.27618024, 0.27593747, 0.26646844,
       0.27927592, 0.28710607, 0.27023172, 0.28057963, 0.2875512 ,
       0.26464745, 0.27800122, 0.        , 0.7071429 , 0.81542975,
       0.78289515, 0.7513317 , 0.70216554, 0.69773453, 0.6897829 ,
       0.6817707 , 0.6539706 , 0.6335757 , 0.62799144, 0.6350325 ,
       0.6110564 , 0.59302884, 0.5950926 , 0.59090436, 0.5717842 ,
       0.57057023, 0.57846105, 0.5711772 , 0.55448496, 0.5589767 ,
       0.5558811 , 0.5426487 , 0.5283237 , 0.5334224 , 0.53876394,
       0.5273525 , 0.5186119 , 0.5153342 , 0.5176205 , 0.49773145,
       0.4934825 , 0.49724585, 0.51047826, 0.5120564 , 0.49032617,
       0.49044758, 0.49748865, 0.49311835, 0.47806498, 0.48996195,
       0.47284487, 0.4764868 , 0.47976455, 0.45973387, 0.46240464,
       0.4717523 , 0.45896503, 0.45817596, 0.46586448, 0.45722502,
       0.4489295 , 0.45936972, 0.4660466 , 0.4482011 , 0.44164562,
       0.45160022, 0.4526928 , 0.4353329 , 0.44443777, 0.44480196,
       0.42671368, 0.44358796, 0.4297486 , 0.42877743, 0.43800366,
       0.4485653 , 0.4354543 , 0.4296272 , 0.4370325 , 0.44540897,
       0.42634946, 0.4268351 , 0.43339056, 0.42622808, 0.41032496,
       0.42270753, 0.43181238, 0.4182158 , 0.40753278, 0.41712323,
       0.42173636, 0.4009773 , 0.40559042, 0.42161494, 0.4126315 ,
       0.39769956, 0.40874678, 0.40692583, 0.39345062, 0.39709255,
       0.4063188 , 0.39964193, 0.38993007, 0.41335988, 0.3901729 ,
       0.39794236, 0.40716863, 0.38823053, 0.37961125, 0.38689515,
       0.39867076, 0.4004917 , 0.3848314 , 0.37985405, 0.38555977,
       0.39721397, 0.37912568, 0.38288903, 0.3892017 , 0.39733538,
       0.38725936, 0.37402695, 0.4095966 , 0.6211932 , 0.5892654 ,
       0.56219375, 0.5613439 , 0.546412  , 0.5181263 , 0.52103984,
       0.51448435, 0.49578905, 0.5116922 , 0.4995524 , 0.48097852,
       0.4876554 , 0.48194972, 0.46094787, 0.46216184, 0.4719951 ,
       0.46896014, 0.44504476, 0.45135745, 0.45912692, 0.43861067,
       0.43933904, 0.44832247, 0.43290493, 0.44116   , 0.44188842,
       0.4240429 , 0.4314482 , 0.41493806, 0.42719924, 0.406683  ,
       0.41554505, 0.42853463, 0.41578785, 0.40158427, 0.40376946,
       0.41639486, 0.40996075, 0.3910227 , 0.39466462, 0.40401223,
       0.40583324, 0.417973  , 0.4111747 , 0.38653094, 0.39854935,
       0.41166034, 0.4003703 , 0.3838602 , 0.39915636, 0.40510482,
       0.39442185, 0.3787615 , 0.39757818, 0.39381483, 0.37366277,
       0.3732986 , 0.38665235, 0.38434577, 0.3658933 , 0.36370814,
       0.38058245, 0.36710727, 0.37475538, 0.38604537, 0.36989945,
       0.35678846, 0.3673501 , 0.37706193, 0.3555745 , 0.34780502,
       0.35848805, 0.36977807, 0.35326794, 0.35933784, 0.36807847,
       0.35096136, 0.34404168, 0.3488976 , 0.35909504, 0.35181114,
       0.33602944, 0.34477007, 0.35338932, 0.36249417, 0.34379888,
       0.3445273 , 0.34574124, 0.60855556, 0.6006769 , 0.57858247,
       0.57093436, 0.5547885 , 0.5342722 , 0.5371858 , 0.5286879 ,
       0.5045297 , 0.5070791 , 0.51594114, 0.50198036, 0.48219252,
       0.4891122 , 0.48425627, 0.46956712, 0.4603409 , 0.45791292,
       0.46908152, 0.44722992, 0.43836787, 0.45050764, 0.4468657 ,
       0.431691  , 0.42732066, 0.41056776, 0.4309626 , 0.4236787 ,
       0.41663763, 0.41590926, 0.4253783 , 0.4061974 , 0.41105333,
       0.42295033, 0.41178173, 0.3950288 , 0.40741137, 0.40243408,
       0.3964856 , 0.40194848, 0.38677374, 0.399644  , 0.3836174 ,
       0.37357685, 1.        , 0.8507566 , 0.7882367 , 0.77160513,
       0.73324347, 0.7089638 , 0.7065359 , 0.6926965 , 0.6608903 ,
       0.66052604, 0.65045   , 0.62884116, 0.61330223, 0.6179154 ,
       0.6054114 , 0.5954568 , 0.5956996 , 0.57785404, 0.5624365 ,
       0.5753047 , 0.58295274, 0.5681423 , 0.5536959 , 0.5532103 ,
       0.5575806 , 0.5417989 , 0.5309945 , 0.5376713 , 0.5341508 ,
       0.51958305, 0.5212826 , 0.5292949 , 0.50792885, 0.5035586 ,
       0.51484853, 0.5011306 , 0.49809563, 0.4991882 , 0.48668423,
       0.49421093, 0.49506068, 0.48801962, 0.49251133, 0.4958793 ,
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       0.40486205, 0.4128743 , 0.39782098, 0.40279827, 0.38118944,
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       0.39150828, 0.39138687, 0.3909013 , 0.38191783, 0.37184182,
       0.3714776 , 0.37232742, 0.3775475 , 0.36819986, 0.38774493,
       0.39272225, 0.37669772, 0.3831318 , 0.36953524, 0.37973267,
       0.38701653, 0.36540774, 0.3599448 , 0.36297977, 0.35751686,
       0.3614016 , 0.35059717, 0.3655291 , 0.35436052, 0.35132557,
       0.3611588 , 0.3498688 , 0.36310118, 0.36917105, 0.35788104,
       0.37087062, 0.37111345, 0.35897362, 0.34962597, 0.35690987,
       0.36832127, 0.35217535, 0.36904964, 0.36455792, 0.35314652,
       0.35351074, 0.3387002 , 0.34052116, 0.36237276, 0.34901902,
       0.34528688, 0.3369362 , 0.33020234, 0.3482906 , 0.3355438 ,
       0.3445049 , 0.34513426, 0.33432984, 0.33008093, 0.34173512,
       0.3423421 , 0.33311588, 0.34464866, 0.34064254, 0.32777438,
       0.34537706, 0.3376076 , 0.335301  , 0.34161374, 0.3367578 ,
       0.32607478, 0.33153772, 0.31575596, 0.3266818 , 0.33954996,
       0.32741016, 0.32595342, 0.34222072, 0.3374862 , 0.3150276 ,
       0.32717007, 0.33469406, 0.32983813, 0.31709135, 0.3327517 ,
       0.3297167 , 0.3261962 , 0.32182586, 0.32765296, 0.3495046 ,
       0.3442845 , 0.34088534, 0.33481544, 0.32789576, 0.31866953,
       0.31017166, 0.30725813, 0.32291844, 0.32935256, 0.33032373,
       0.31917027, 0.31917873, 0.31918716, 0.31919557, 0.31920403,
       0.31921244, 0.31922087, 0.3192293 , 0.31923774, 0.31924614,
       0.3192546 , 0.31926304, 0.31927145, 0.3192799 , 0.3192883 ,
       0.31929675, 0.31930518, 0.31931362, 0.31932202, 0.31933048,
       0.3193389 , 0.31934732, 0.3193558 , 0.3193642 , 0.31937262,
       0.31938103, 0.3193895 , 0.3193979 , 0.3182402 , 0.31708246,
       0.31592473, 0.314767  , 0.3136093 , 0.31245154, 0.31129384,
       0.3101361 , 0.30897838, 0.30782068, 0.30666295, 0.30550525,
       0.3043475 , 0.30318978, 0.30203202, 0.30087432, 0.2997166 ,
       0.2985589 , 0.29740113, 0.29624343, 0.29508567, 0.29392797,
       0.29277024, 0.29161254, 0.2904548 , 0.28929707, 0.29946312,
       0.29888168, 0.2841925 , 0.29426855, 0.29924583, 0.28455672,
       0.29256895, 0.27957937, 0.28097853, 0.2998286 , 0.30222875,
       0.30130383, 0.30037892, 0.29945397, 0.29852903, 0.2976041 ,
       0.29667917, 0.29575422, 0.29482928, 0.29390433, 0.28965542,
       0.29536113, 0.3037796 , 0.30318072, 0.30258188, 0.301983  ,
       0.30138412, 0.30078524, 0.3001864 , 0.29958752, 0.29898864,
       0.29329738, 0.28479952, 0.278851  , 0.27715147, 0.302038  ,
       0.29900306, 0.28358552, 0.2790938 , 0.2962109 , 0.2803078 ,
       0.26440462, 0.2844353 , 0.2900196 , 0.2727811 , 0.2922048 ,
       0.26051992, 0.2715671 , 0.28079337, 0.27071735, 0.2851637 ,
       0.26938197, 0.27687475, 0.28749537, 0.26054677, 0.88134885,
       0.81142366, 0.77621824, 0.72608095, 0.7037437 , 0.6888118 ,
       0.674851  , 0.64401597, 0.63721764, 0.6386744 , 0.6152446 ,
       0.59582096, 0.5914507 , 0.59667075, 0.57421213, 0.5390067 ,
       0.5506609 , 0.5428915 , 0.53172284, 0.53682154, 0.5330582 ,
       0.51545554, 0.5086572 , 0.5188547 , 0.4999166 , 0.50987124,
       0.4946965 , 0.48304227, 0.49538246, 0.49513024])
```
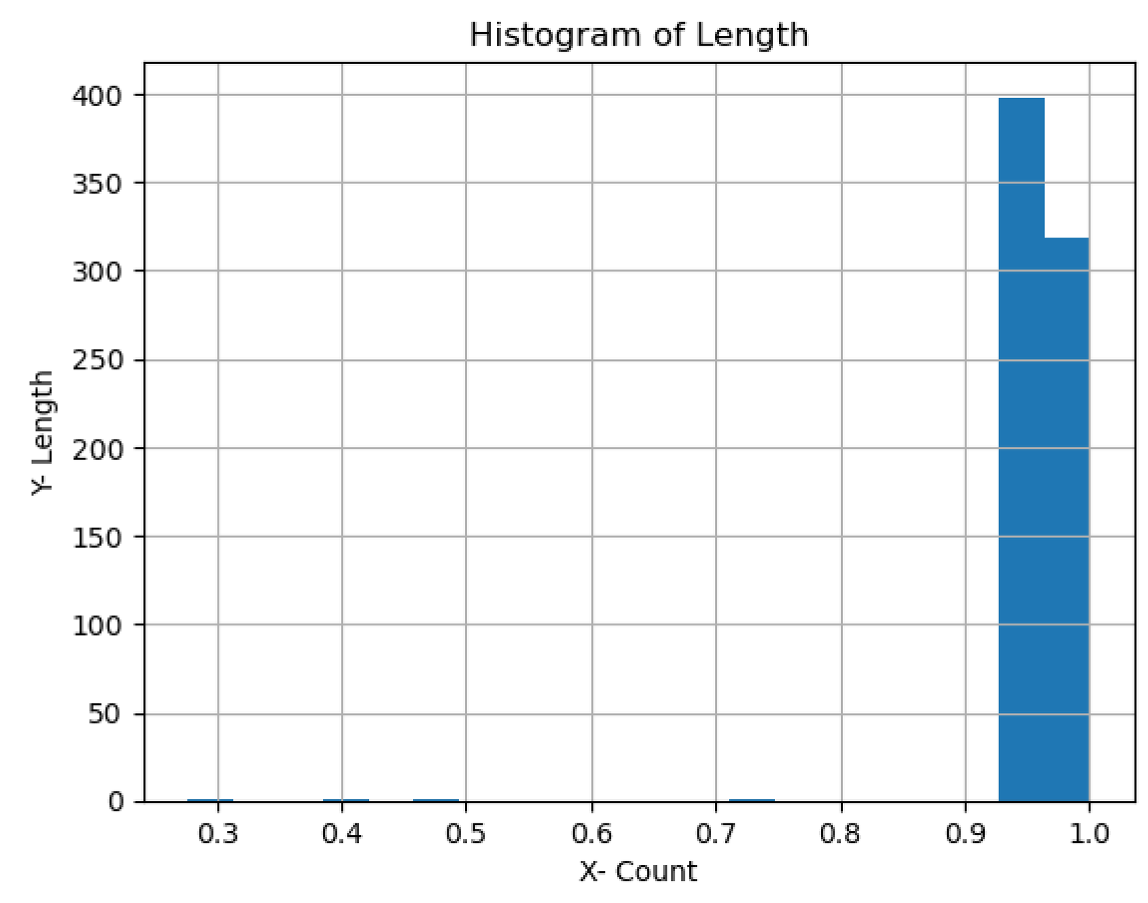
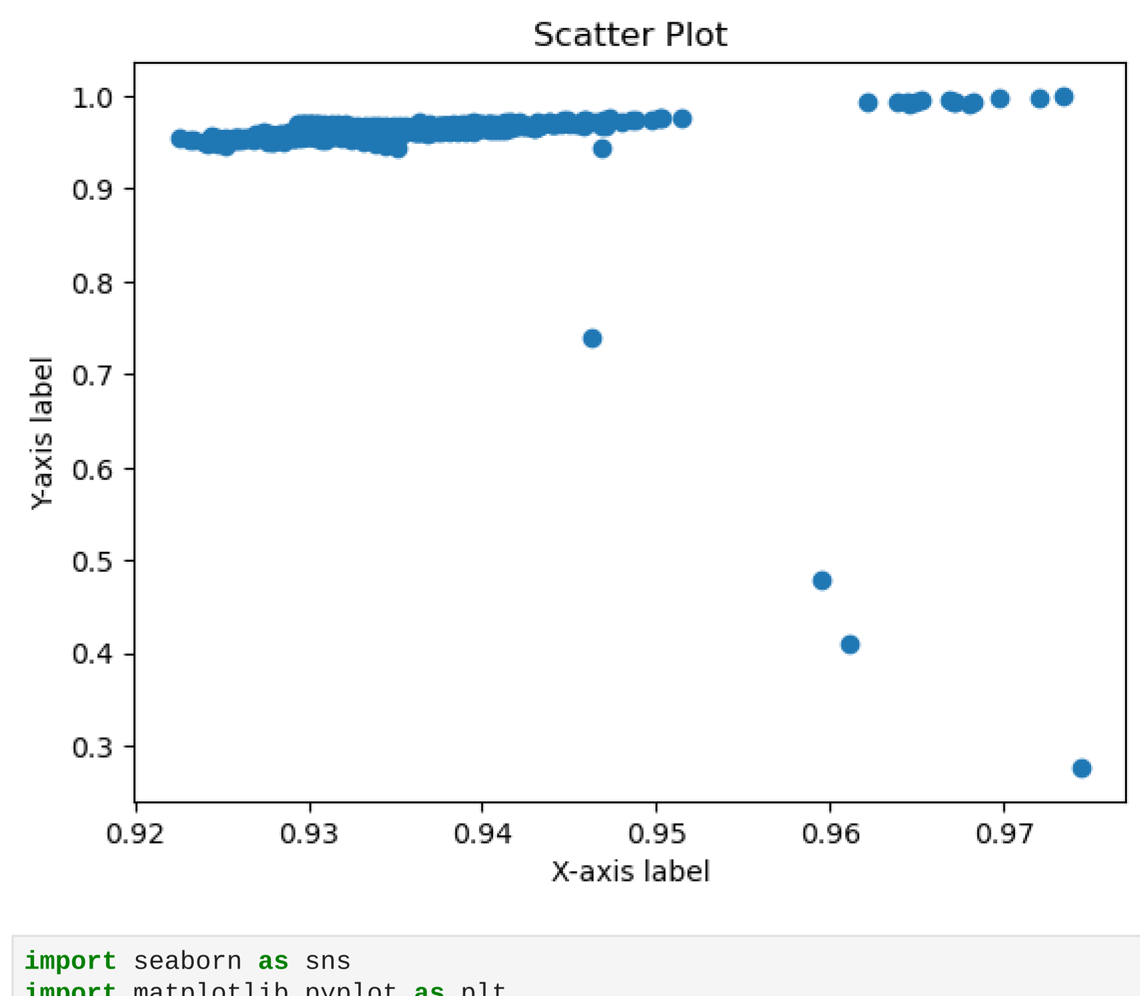

In [19]:
```python
df['PE1'].value_counts()
```

Out[19]:
```
PE1
0.934070    4
0.936128    4
0.934230    3
0.936534    3
0.931383    3
           ..
0.927218    1
0.931112    1
0.930940    1
0.932726    1
0.924763    1
Name: count, Length: 609, dtype: int64
```

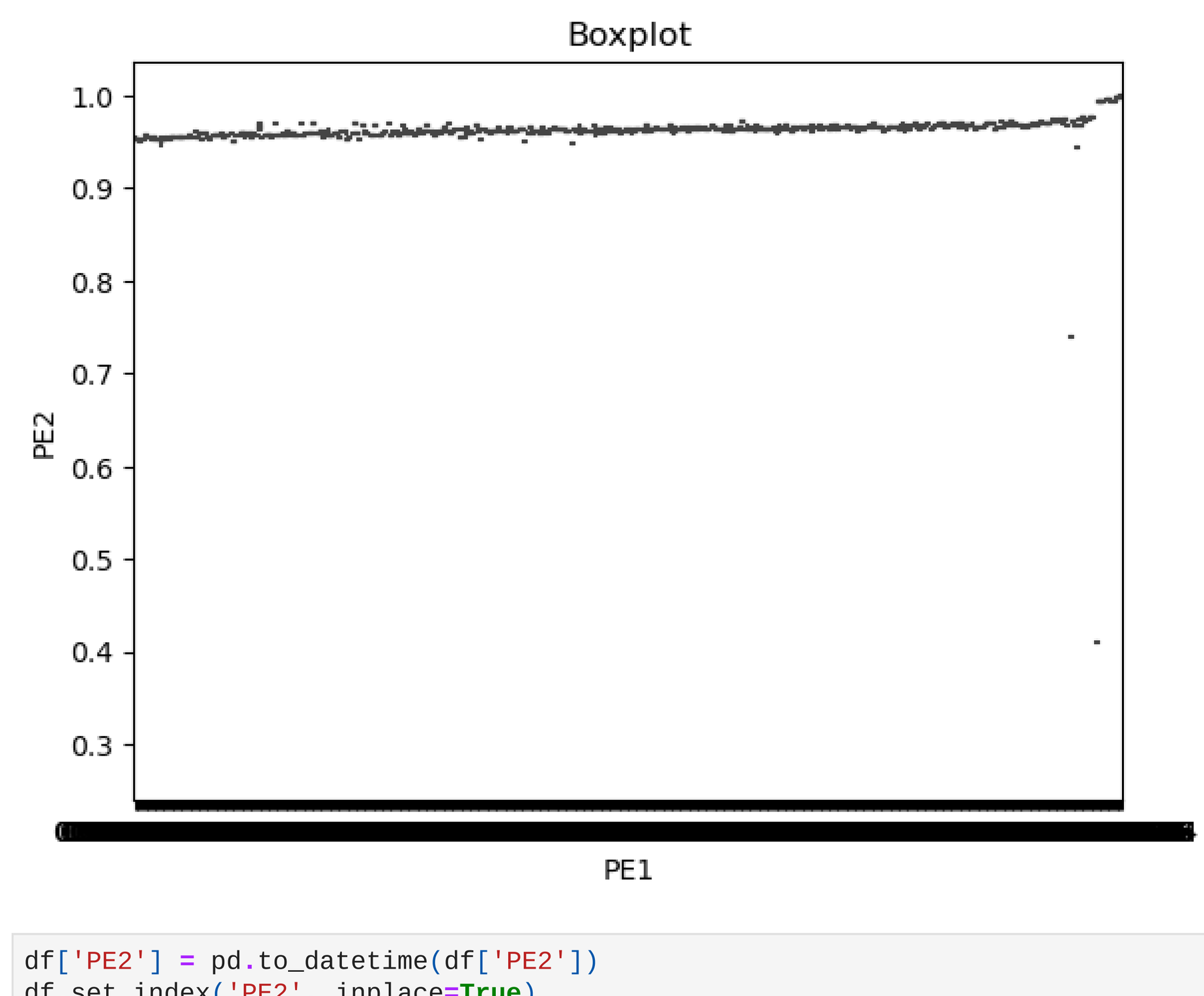
In [29]:
```python
import matplotlib.pyplot as plt
df['PE2'].hist(bins=20)
plt.title('Histogram of Length')
plt.xlabel('X- Count')
plt.ylabel('Y- Length')
plt.show()
```



In [30]:
```python
plt.scatter(df['PE1'], df['PE2'])
plt.title('Scatter Plot')
plt.xlabel('X-axis label')
plt.ylabel('Y-axis label')
plt.show()
```



In [38]:
```python
import seaborn as sns
import matplotlib.pyplot as plt
sns.boxplot(x='PE1', y='PE2', data=df)
plt.title('Boxplot')
plt.show()
```



In [39]:
```python
df['PE2'] = pd.to_datetime(df['PE2'])
df.set_index('PE2', inplace=True)
```

In [ ]:

In [ ]: