nb

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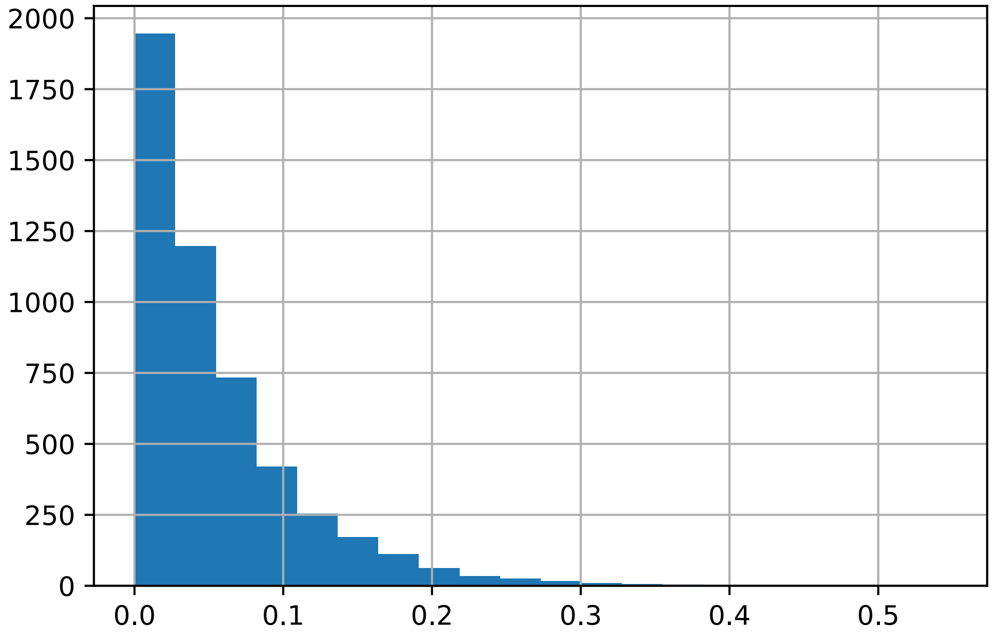
0.2 Entry Number: 2018MT10742

[29]:
```
import pandas as pd
import seaborn as sns
import numpy as np
import matplotlib.pyplot as plt
import scipy
```

[4]:
```
data = pd.read_csv("2018MT10742.csv")["x"]
```

[5]:
```
data.hist(bins=20)
```

[5]:
```
<AxesSubplot:>
```

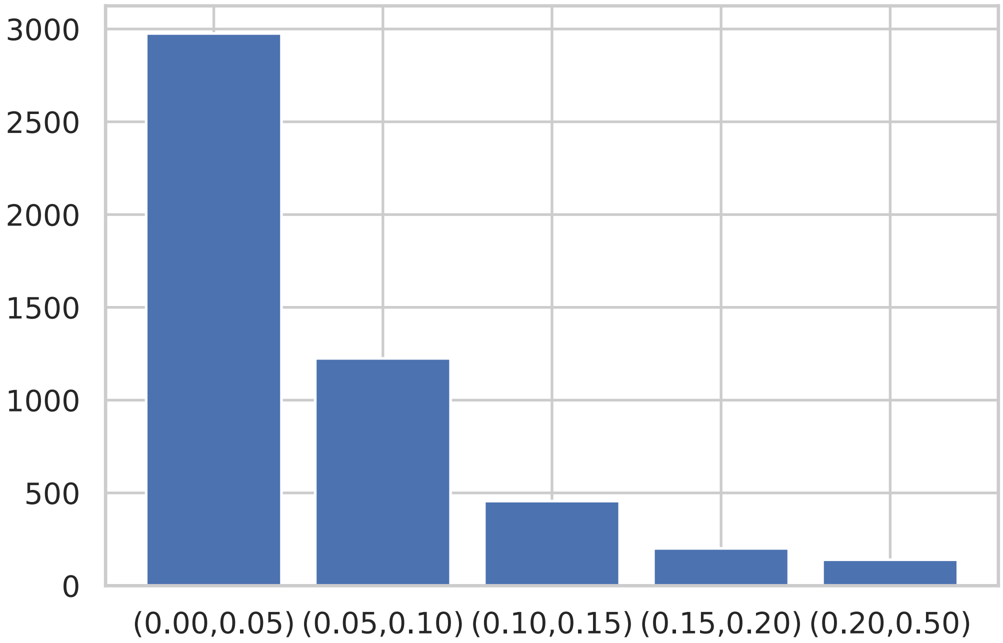


[26]:

```
# Divide data into bins
vals, bin_ends = np.histogram(data.to_numpy(),bins=[0, 0.05, 0.1, 0.15, 0.2, 0.
 ↪5])
bins = [f"({bin_ends[i]:.2f},{bin_ends[i+1]:.2f})" for i in range(len(bin_ends)␣
 ↪- 1)]
plt.bar(bins, vals)
```

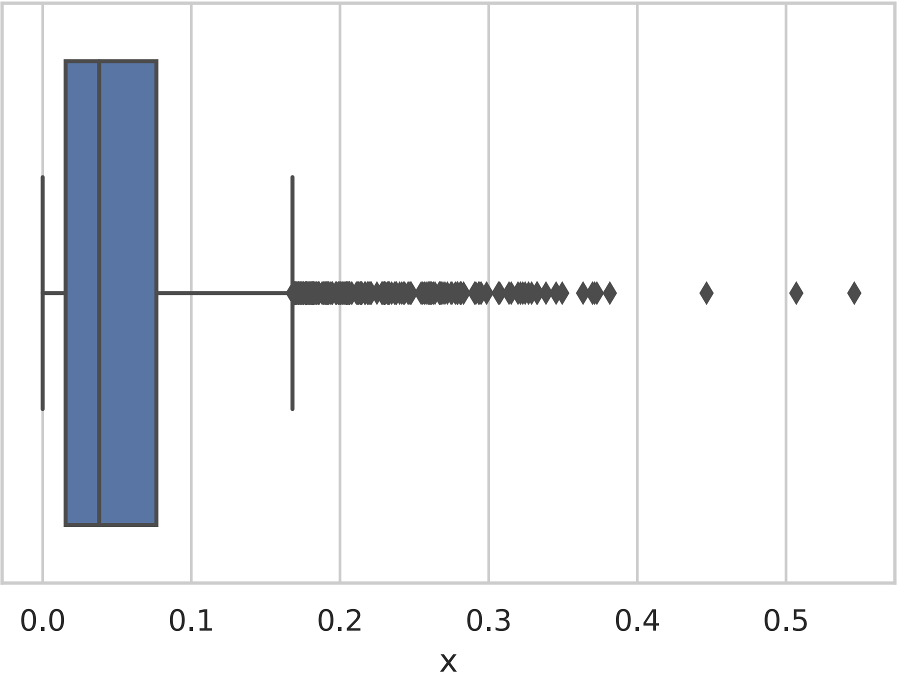
[26]:

```
<BarContainer object of 5 artists>
```



[7]:

```
sns.set_theme(style="whitegrid")
ax = sns.boxplot(x=data)
```



[31]:

```
scipy.stats.binned_statistic(data, data, bins=10, )
```

[31]:

```
BinnedStatisticResult(statistic=array([0.05542199]),
bin_edges=array([2.13650573e-05, 5.45918198e-01]), binnumber=array([1, 1, 1,
…, 1, 1, 1]))
```

[8]:

```
print(f"Mean = {data.mean()}")
print(f"Median = {data.median()}")
#print(f"Mode = {data.mode()}") Mode how?
print(f"Coefficient of variation = {np.sqrt(data.var()) / data.mean()}")
print(f"Skewness = {data.skew()}")
print(f"Kurtosis = {data.kurtosis()}")
```

```
Mean = 0.05542199485096252
Median = 0.037988257982457 65
Coefficient of variation = 1.014388462069229
Skewness = 2.054355085588827
Kurtosis = 6.356203008806815
```

[38]:

```
from scipy.stats import expon

_, l_inv = expon.fit(data)
lmbda = 1 / l_inv
print(f"Lambda = {lmbda}")
```

```
Lambda = 18.0503363179046
```

[37]:

```
lmbda
```

[37]:

```
18.0503363179046
```

[44]:

```
def estimator_1(d):
    return len(d) / d.sum()
def estimator_2(d):
    return (len(d) - 1) / d.sum()
def estimator_3(d):
    return np.sqrt(1 / d.var())
```

[45]:

```
print(f"Estimator 1 = {estimator_1(data)}")
print(f"Estimator 2 = {estimator_2(data)}")
print(f"Estimator 3 = {estimator_3(data)}")
```

```
Estimator 1 = 18.043377952907317
Estimator 2 = 18.039769277316736
Estimator 3 = 17.787443989752234
```

[72]:

```
def get_interval(data, confidence):
    t_stat = scipy.stats.t.ppf(1 - confidence/2, len(data) - 1)
    mean = data.mean()
    var = data.var()
    n = len(data)
    diff = t_stat * np.sqrt(var) / np.sqrt(n)
    return 1 / np.array([mean + diff, mean - diff])
```

[73]:

```
print(f"Confidence interval for 0.01 confidence: {get_interval(data, 0.01)}")
print(f"Confidence interval for 0.05 confidence: {get_interval(data, 0.05)}")
print(f"Confidence interval for 0.1 confidence: {get_interval(data, 0.1)}")
```

```
Confidence interval for 0.01 confidence: [17.40016384 18.73597151]
Confidence interval for 0.05 confidence: [17.54981219 18.56550887]
Confidence interval for 0.1 confidence: [17.6273579  18.47950948]
```