EE18BTECH11026_ASST02

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2 EE18BTECH11026

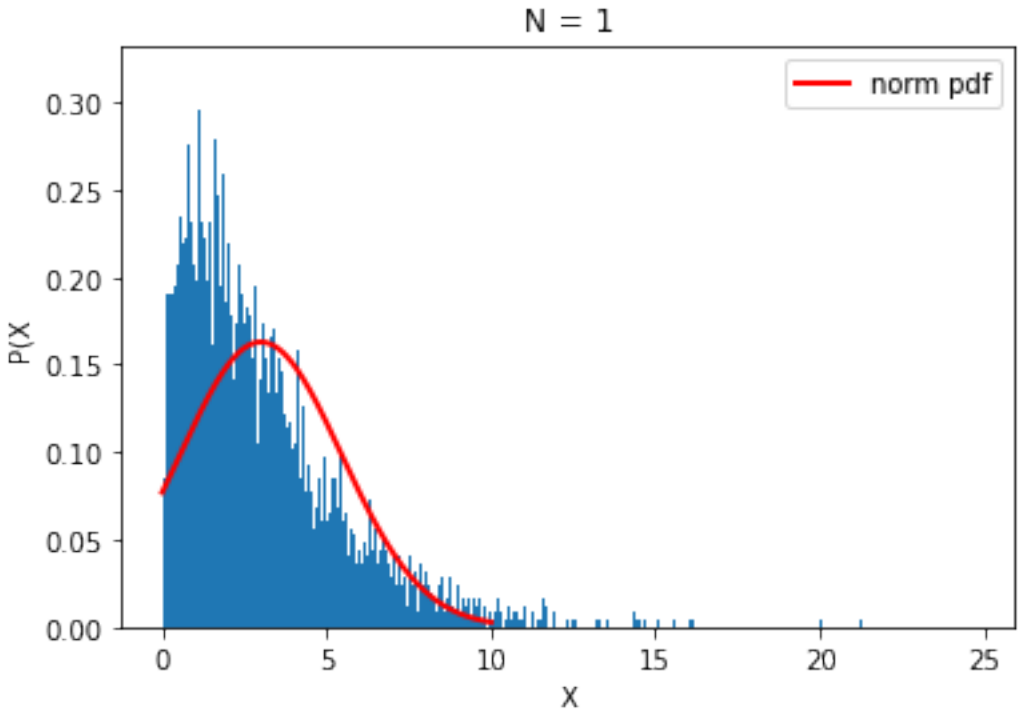
3 ASSIGNMENT 02

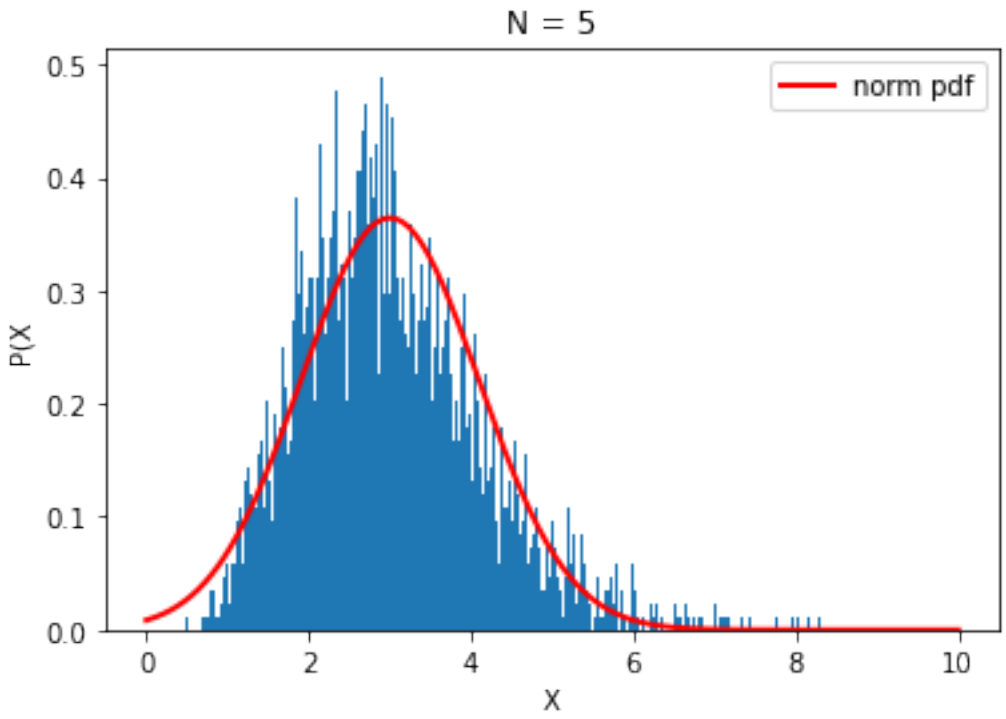
[30]:
```
## IMPORTS

import scipy.stats as sp
import numpy as np
import math
import matplotlib.pyplot as plt
```

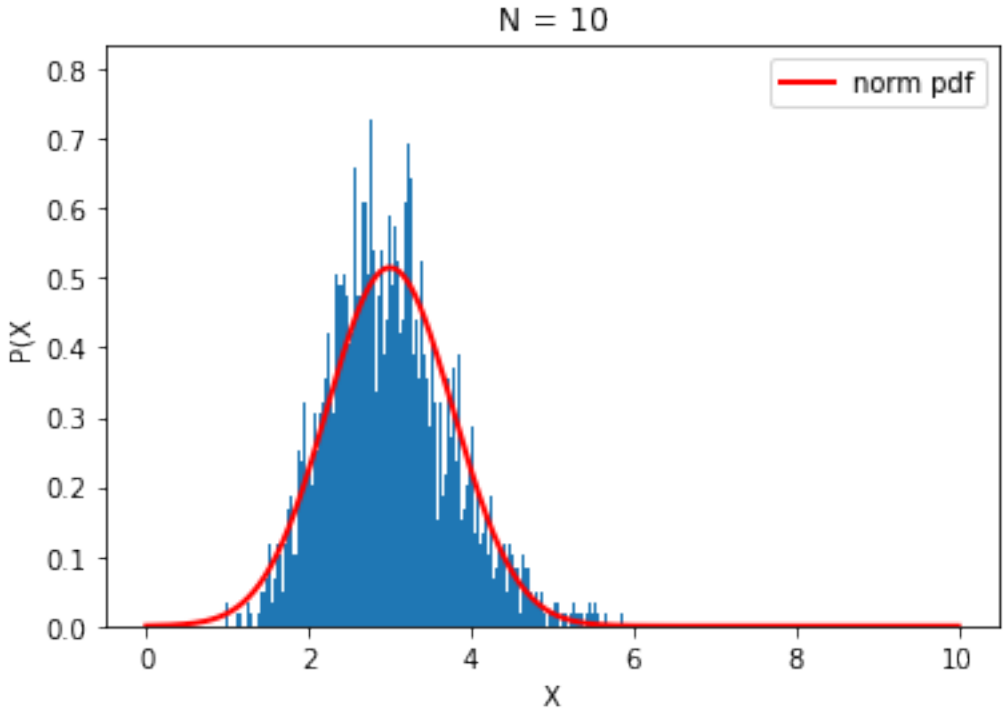
4 Q1

[58]:
```
## for a degree of freedom 3
def gen_chisq_means(N,times_drawn):
    means = [ np.random.chisquare(3,N).sum()/N for e in range(times_drawn)]
    return means

x = np.linspace(0,10,1000)

N=1
plt.hist(gen_chisq_means(N,10000),bins=1000,density=True)
plt.plot(x,sp.norm.pdf(x,loc=3,scale = math.sqrt(6/N)), 'r-', lw=2, label="norm␣
 ↪pdf")
plt.xlabel('X')
plt.ylabel('P(X')
plt.legend()
plt.title('N = {}'.format(N))
plt.show()

N=5
plt.hist(gen_chisq_means(N,10000),bins=1000,density=True)
```

```
plt.plot(x,sp.norm.pdf(x,loc=3,scale = math.sqrt(6/N)), 'r-', lw=2, label="norm␣
↪pdf")
plt.xlabel('X')
plt.ylabel('P(X')
plt.title('N = {}'.format(N))
plt.legend()
plt.show()

N=10
plt.hist(gen_chisq_means(N,10000),bins=1000,density=True)
plt.plot(x,sp.norm.pdf(x,loc=3,scale = math.sqrt(6/N)), 'r-', lw=2, label="norm␣
↪pdf")
plt.xlabel('X')
plt.ylabel('P(X')
plt.title('N = {}'.format(N))
plt.legend()
plt.show()
```

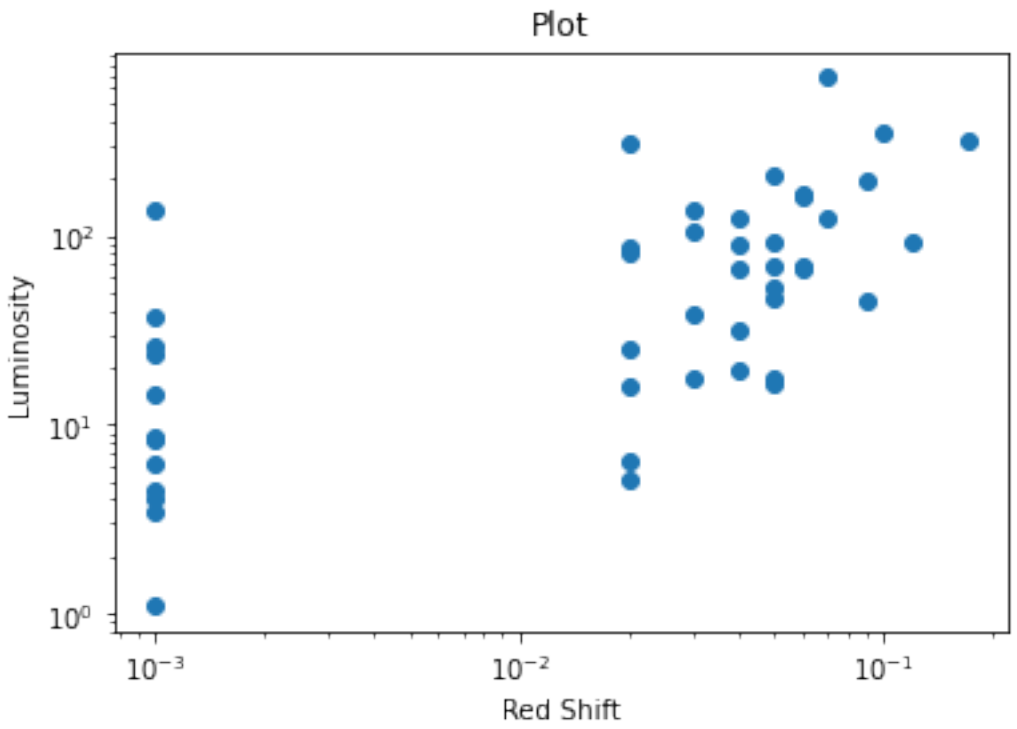



N = 5
norm pdf
P(X
X
0.0
0.1
0.2
0.3
0.4
0.5
0
2
4
6
8
10


N = 10
norm pdf
P(X
X
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0
2
4
6
8
10

5 Q2

[59]:
```
data = np.genfromtxt('DATA_Q2.dat', skip_header=0, skip_footer=0, names=True,␣
 ↪dtype=None, delimiter=' ')

lum_list,reds_list = [],[]
for (lum_val,red_val) in data:
    lum_list.append(lum_val)
    reds_list.append(red_val)

### Plotting
plt.loglog(reds_list, lum_list,'o')
plt.xlabel('Red Shift')
plt.ylabel('Luminosity')
plt.title("Plot")
plt.show()

## Correlation ceffs
k,pk = sp.kendalltau(reds_list, lum_list)
s,ps = sp.spearmanr(reds_list,lum_list)
p,pp = sp.pearsonr(reds_list, lum_list)


print("Spearman correlation : {} , its P-val {} ".format(s,ps) )
print("Pearson correlation : {} , its P-val {}".format(p,pp) )
print("Kendall-Tau correlation : {} , its P-val {} ".format(k,pk) )

print("Its shows positive correlation")
```



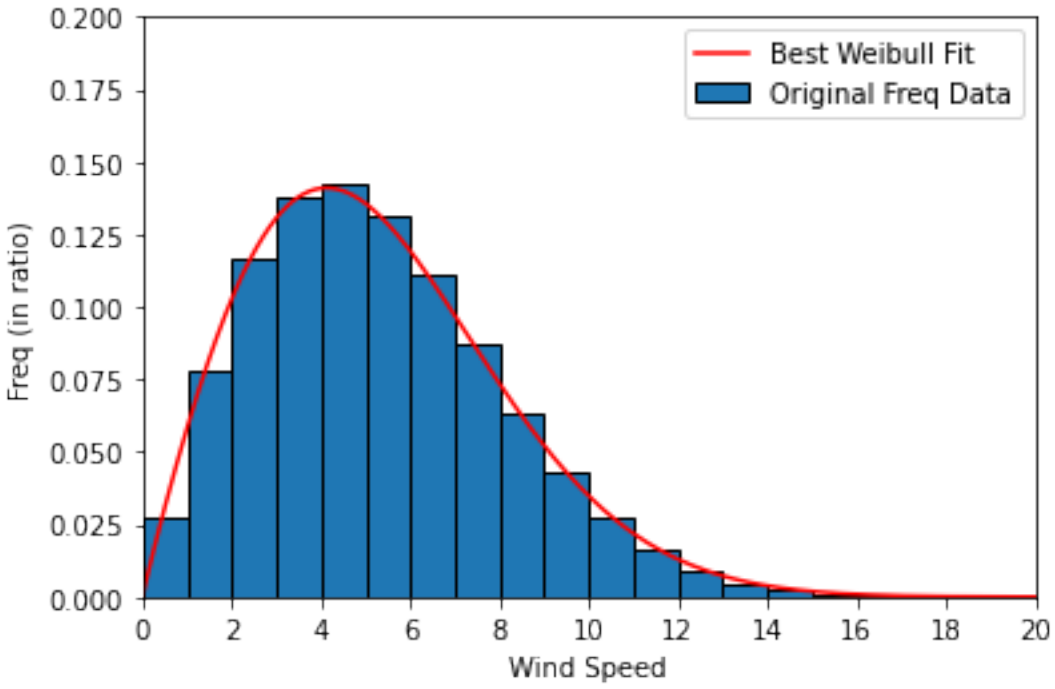

```
Spearman correlation : 0.6596325957535454 , its P-val 6.166489759081011e-07
Pearson correlation : 0.5144497852670243 , its P-val 0.00025464716576124137
Kendall-Tau correlation : 0.5029584682704178 , its P-val 2.969686227473415e-06
Its shows positive correlation
```

6 Q3

[60]:
```
data = np.genfromtxt('DATA_Q3.dat', skip_header=0, skip_footer=0, names=True,␣
 ↪dtype=None, delimiter=' ')
f_list = []

speed_bins = np.arange(21)
for s,f in data:
    f_list.append(f*1e5)

f_arr,speed_arr = np.array(f_list),np.array(speed_bins)
hist_dist = sp.rv_histogram((f_arr,speed_arr))

### Drawing samples from the hist_dist distribution
sim_data = hist_dist.rvs(size = 100000)

### Finding param
```

```
f0,k,loc,lam = sp.exponweib.fit(sim_data, floc=0, f0 = 1)
print('The Estimates of the Weitbull param are : \n k = {} \n lambda = {}'.
 ↪format(k,lam) )

### Plots
x = np.linspace(0,20,1000)
plt.plot(x, sp.exponweib.pdf(x, f0, k, loc, lam), color = 'r', label = "Best␣
 ↪Weibull Fit")
plt.bar(speed_bins[:-1], f_arr/10000000, width=np.diff(speed_bins),␣
 ↪edgecolor="black", align="edge", label = "Original Freq Data")
plt.xlim([0,20])
plt.ylim([0,0.2])
plt.xlabel("Wind Speed")
plt.ylabel("Freq (in ratio)")
plt.xticks(np.arange(0,22,2))
plt.legend()
plt.show()
```

```
The Estimates of the Weitbull param are :
 k = 1.9441004938149316
 lambda = 5.974669169382235
```



7 Q4

[25]:
```
mu, sigma = 0, 1 # mean and standard deviation
g_list_1 = np.random.normal(mu, sigma, 1000)
g_list_2 = np.random.normal(mu, sigma, 1000)


'''
Pearson correlation coeff
'''

pcc,p_val_p = sp.pearsonr(g_list_1,g_list_2)
a,p_val_t = sp.ttest_ind(g_list_1,g_list_2)


print('Pearson correlation coeff is {}'.format(pcc))
print('p-val using pearson : {}'.format(p_val_p))
print('p-val using student-t : {}'.format(p_val_t))

print("Both p-vals does not match ")
```

```
Pearson correlation coeff is -0.045251564070178066
p-val using pearson : 0.15273916008236166
p-val using student-t : 0.7635740684803143
Both p-vals does not match
```

8 THE END

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