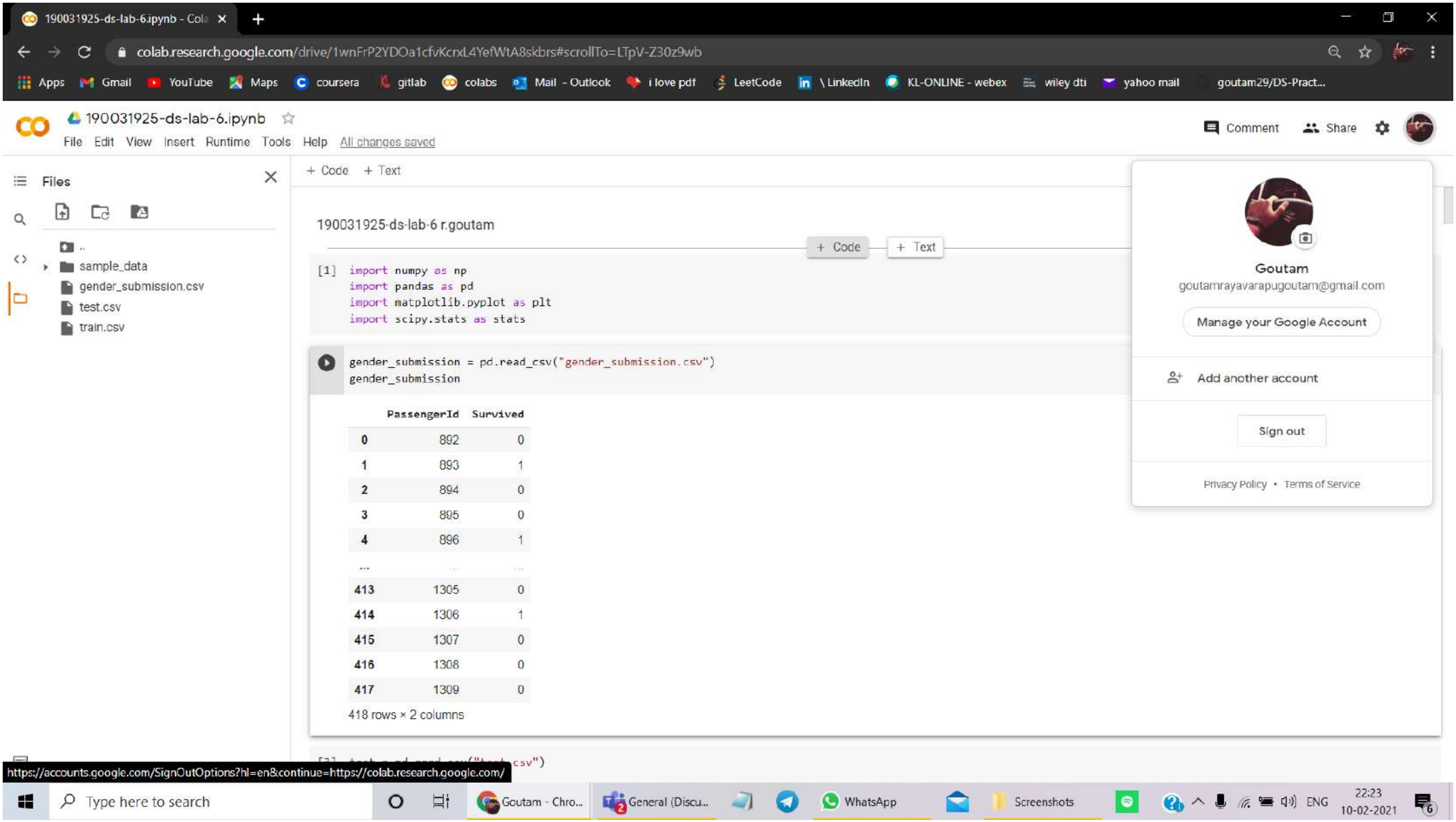
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[1] import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import scipy.stats as stats
gender_submission = pd.read_csv("gender_submission.csv")
gender_submission
PassengerId Survived
0 892 0
1 893 1
2 894 0
3 895 0
4 896 1
413 1305 0
414 1306 1
415 1307 0
416 1308 0
417 1309 0
418 rows × 2 columns
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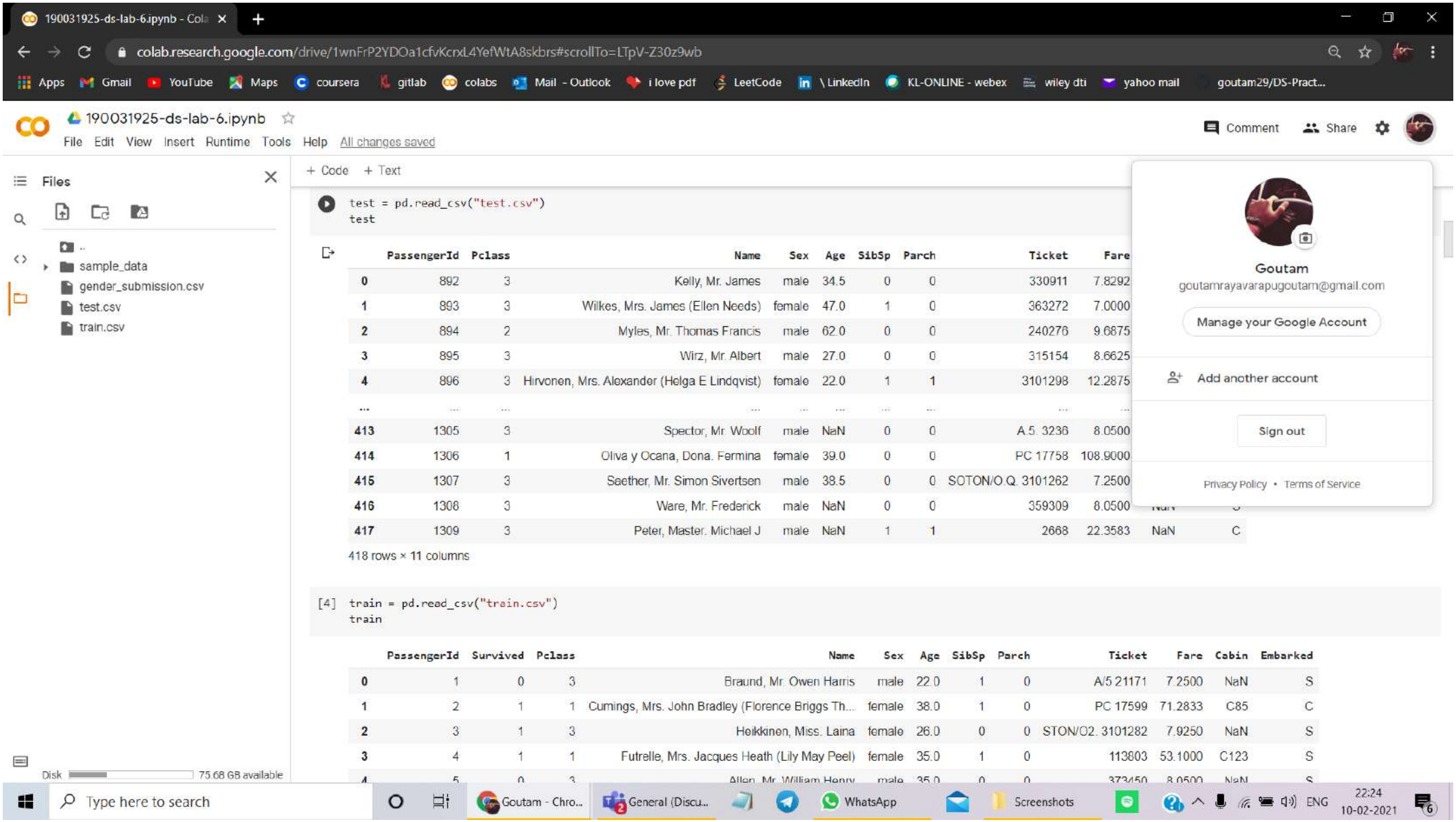
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test = pd.read_csv("test.csv")
test
PassengerId Pclass Name Sex Age SibSp Parch Ticket Fare
892 3 Kelly, Mr. James male 34.5 0 0 330911 7.8292
893 3 Wilkes, Mrs. James (Ellen Needs) female 47.0 1 0 363272 7.0000
894 2 Myles, Mr. Thomas Francis male 62.0 0 0 240276 9.6875
895 3 Wirz, Mr. Albert male 27.0 0 0 315154 8.6625
896 3 Hirvonen, Mrs. Alexander (Helga E Lindqvist) female 22.0 1 1 3101298 12.2875
1305 3 Spector, Mr. Woolf male NaN 0 0 A.5. 3236 8.0500
1306 1 Oliva y Ocana, Dona. Fermina female 39.0 0 0 PC 17758 108.9000
1307 3 Saether, Mr. Simon Sivertsen male 38.5 0 0 SOTON/O.Q. 3101262 7.2500
1308 3 Ware, Mr. Frederick male NaN 0 0 359309 8.0500
1309 3 Peter, Master. Michael J male NaN 1 1 2668 22.3583 NaN C
418 rows × 11 columns
[4] train = pd.read_csv("train.csv")
train
PassengerId Survived Pclass Name Sex Age SibSp Parch Ticket Fare Cabin Embarked
1 0 3 Braund, Mr. Owen Harris male 22.0 1 0 A/5 21171 7.2500 NaN S
2 1 1 Cumings, Mrs. John Bradley (Florence Briggs Th... female 38.0 1 0 PC 17599 71.2833 C85 C
3 1 3 Heikkinen, Miss. Laina female 26.0 0 0 STON/O2. 3101282 7.9250 NaN S
4 1 1 Futrelle, Mrs. Jacques Heath (Lily May Peel) female 35.0 1 0 113803 53.1000 C123 S
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```
[4] train = pd.read_csv("train.csv")
    train
```

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Tick			
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21			
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 175			
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 31012			
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113			
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373			
...	...	...	...	...	...	...	...	...				
886	887	0	2	Montvila, Rev. Juozas	male	27.0	0	0	211			
887	888	1	1	Graham, Miss. Margaret Edith	female	19.0	0	0	112			
888	889	0	3	Johnston, Miss. Catherine Helen "Carrie"	female	NaN	1	2	W./C. 6			
889	890	1	1	Behr, Mr. Karl Howell	male	26.0	0	0	111369	30.0000	C148	C
890	891	0	3	Dooley, Mr. Patrick	male	32.0	0	0	370376	7.7500	NaN	Q

891 rows × 12 columns

```
[5] uniform_data = stats.uniform.rvs(size=100000,  # Generate 100000 numbers
                                     loc = 0,      # From 0
                                     scale=10)     # To 10
```

```
[6] pd.DataFrame(uniform_data).plot(kind="density",  # Plot the distribution
                                    figsize=(9,9),
                                    xlim=(-1,11));
```

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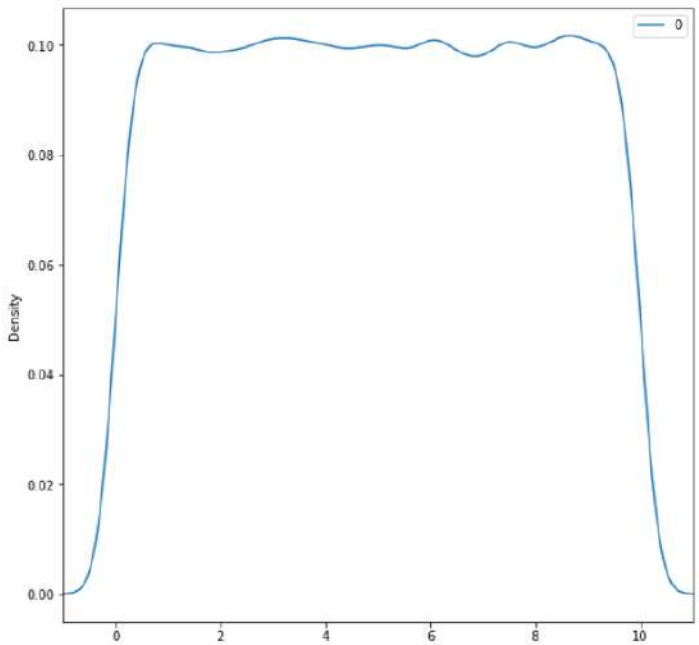
```
[5] uniform_data = stats.uniform.rvs(size=100000,  # Generate 100000 numbers
                                     loc = 0,      # From 0
                                     scale=10)     # To 10
```

```
pd.DataFrame(uniform_data).plot(kind="density",  # Plot the distribution
                                figsize=(9,9),
                                xlim=(-1,11));
```



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```
[7] stats.uniform.cdf(x=2.5,
                      loc=0,
                      scale=10)
```

```
0.25
```

```
[8] stats.uniform.ppf(q=0.4,
                      loc=0,
                      scale=10)
```

```
4.0
```

```
[9] for x in range(-1,12,3):
        print("Density at x value " + str(x))
        print( stats.uniform.pdf(x, loc=0, scale=10) )
```

```
Density at x value -1
0.0
Density at x value 2
0.1
Density at x value 5
0.1
Density at x value 8
0.1
Density at x value 11
0.0
```

```
[11] import random

     random.randint(0,10)
```

```
3
```

```
[12] random.choice([2,4,6,9]) # Get a random element from a sequence
```

```
2
```

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```
[11] import random

     random.randint(0,10)

     3
```

```
[12] random.choice([2,4,6,9]) # Get a random element from a sequence

     2
```

```
[13] random.random()          # Get a real number between 0 and 1

     0.986028408104114
```

```
[14] random.uniform(0,10)     # Get a real in the specified range

     8.31738112171565
```

```
[15] random.seed(12)  # Set the seed to an arbitrary value

     print([random.uniform(0,10) for x in range(4)])

     random.seed(12)  # Set the seed to the same value

     print([random.uniform(0,10) for x in range(4)])

     [4.7457067868854805, 6.574725026572553, 6.664104711248381, 1.4260035292536777]
     [4.7457067868854805, 6.574725026572553, 6.664104711248381, 1.4260035292536777]
```

normal distribution

```
[16] prob_under_minus1 = stats.norm.cdf(x= -1,
```

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normal distribution

```
[16] prob_under_minus1 = stats.norm.cdf(x= -1,
                                        loc = 0,
                                        scale= 1)

     prob_over_1 = 1 - stats.norm.cdf(x= 1,
                                      loc = 0,
                                      scale= 1)

     between_prob = 1-(prob_under_minus1+prob_over_1)

     print(prob_under_minus1, prob_over_1, between_prob)
```

```
0.15865525393145707 0.15865525393145707 0.6826894921370859
```

```
[17] # Plot normal distribution areas*

     plt.rcParams["figure.figsize"] = (9,9)

     plt.fill_between(x=np.arange(-4,-1,0.01),
                      y1= stats.norm.pdf(np.arange(-4,-1,0.01)) ,
                      facecolor='red',
                      alpha=0.35)

     plt.fill_between(x=np.arange(1,4,0.01),
                      y1= stats.norm.pdf(np.arange(1,4,0.01)) ,
                      facecolor='red',
                      alpha=0.35)

     plt.fill_between(x=np.arange(-1,1,0.01),
                      y1= stats.norm.pdf(np.arange(-1,1,0.01)) ,
                      facecolor='blue',
                      alpha=0.35)
```

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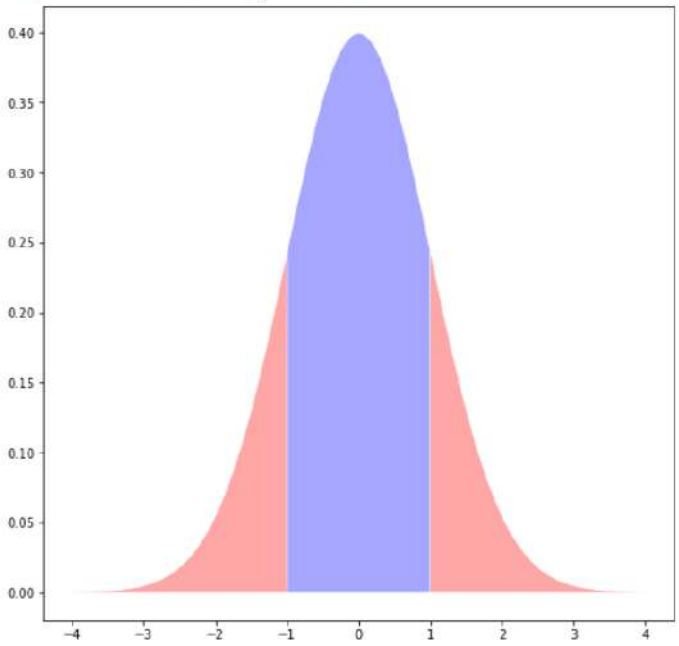
[17] <matplotlib.collections.PolyCollection at 0x7fe20e3ad940>




```
[18] print( stats.norm.ppf(q=0.025) ) # Find the quantile for the 2.5% cutoff

     print( stats.norm.ppf(q=0.975) ) # Find the quantile for the 97.5% cutoff
```

```
-1.9599639845400545
1.959963984540054
```

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```
[18] print( stats.norm.ppf(q=0.025) ) # Find the quantile for the 2.5% cutoff

     print( stats.norm.ppf(q=0.975) ) # Find the quantile for the 97.5% cutoff
```

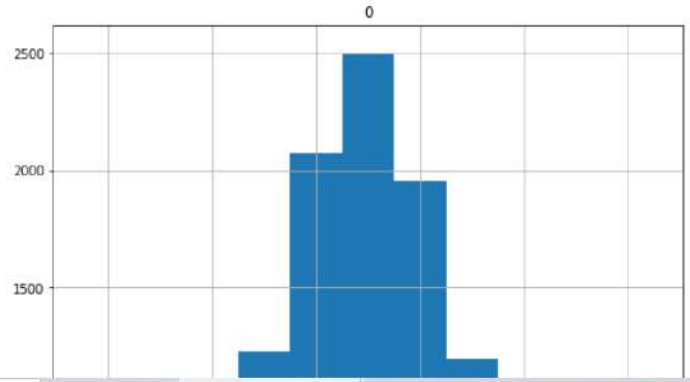
```
-1.9599639845400545
1.959963984540054
```

Binomial distribution

```
[20] fair_coin_flips = stats.binom.rvs(n=10,       # Number of flips per trial
                                       p=0.5,      # Success probability
                                       size=10000)  # Number of trials

     print( pd.crosstab(index="counts", columns= fair_coin_flips))
     pd.DataFrame(fair_coin_flips).hist(range=(-0.5,10.5), bins=11);
```

```
col_0     0    1    2     3     4     5     6     7    8    9   10
row_0
counts  14   99  407  1228  2076  2498  1957  1193  419  100   9
```



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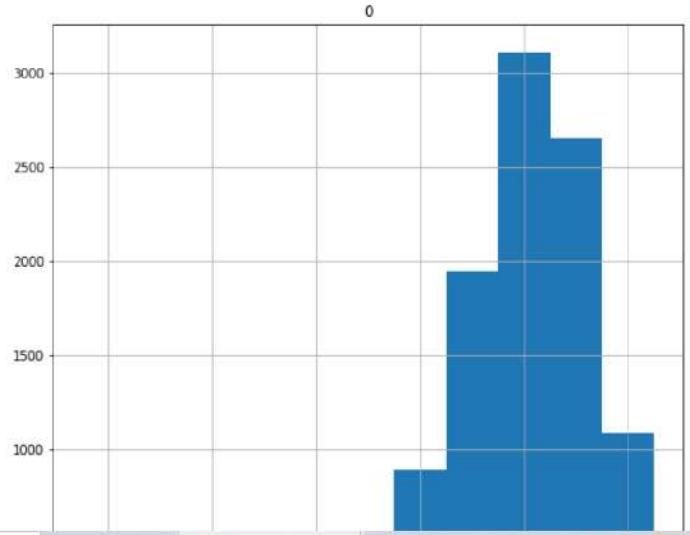
```
[21] biased_coin_flips = stats.binom.rvs(n=10,      # Number of flips per trial
                                         p=0.8,     # Success probability
                                         size=10000)  # Number of trials

     # Print table of counts
     print( pd.crosstab(index="counts", columns= biased_coin_flips))

     # Plot histogram
     pd.DataFrame(biased_coin_flips).hist(range=(-0.5,10.5), bins=11);
```

```
col_0     2   3   4    5    6     7     8     9     10
row_0
counts    1   4  47  269  893  1943  3105  2654  1084
```



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```
[22] stats.binom.cdf(k=5,       # Probability of k = 5 successes or less
                     n=10,      # With 10 flips
                     p=0.8)     # And success probability 0.8
```

```
0.032793497599999964
```

```
[23] 1 - stats.binom.cdf(k=8,       # Probability of k = 9 successes or more
                         n=10,      # With 10 flips
                         p=0.8)     # And success probability 0.8
```

```
0.37580963840000003
```

```
[24] stats.binom.pmf(k=5,       # Probability of k = 5 successes
                     n=10,      # With 10 flips
                     p=0.5)     # And success probability 0.5
```

```
0.24609375000000025
```

```
[25] stats.binom.pmf(k=8,       # Probability of k = 8 successes
                     n=10,      # With 10 flips
                     p=0.8)     # And success probability 0.8
```

```
0.301989888
```

Geometric and Exponential Distributions

```
[26] flips_till_heads = stats.geom.rvs(size=10000,  # Generate geometric data
                                       p=0.5)       # With success prob 0.5

     # Print table of counts
     print( pd.crosstab(index="counts", columns= flips_till_heads))
```

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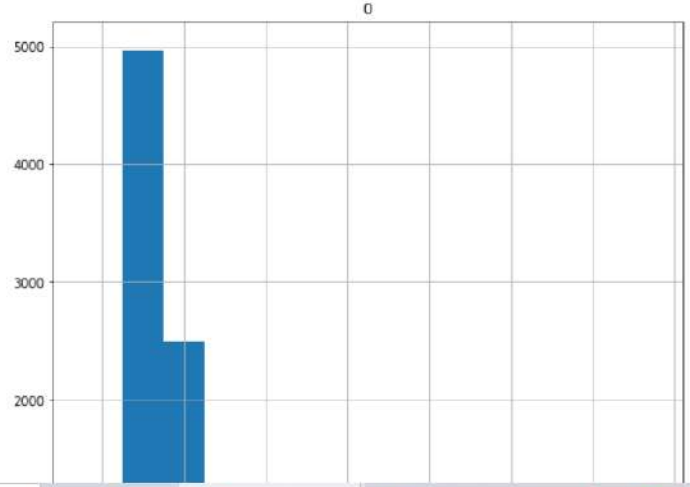
Geometric and Exponential Distributions

```
[26] flips_till_heads = stats.geom.rvs(size=10000,  # Generate geometric data
                                       p=0.5)       # With success prob 0.5

     # Print table of counts
     print( pd.crosstab(index="counts", columns= flips_till_heads))

     # Plot histogram
     pd.DataFrame(flips_till_heads).hist(range=(-0.5,max(flips_till_heads)+0.5)
                                         , bins=max(flips_till_heads)+1);
```

```
col_0     1     2     3    4    5    6   7   8   9   10  11  12  13
row_0
counts  4966  2489  1258  651  322  165  71  40  21   8   6   2   1
```



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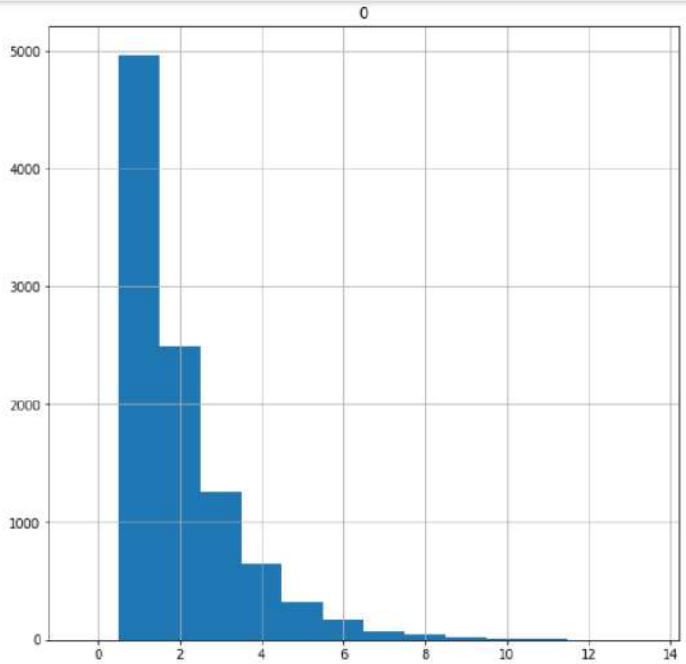
[26]




```
[27] first_five = stats.geom.cdf(k=5,   # Prob of success in first 5 flips
                                 p=0.5)

     1 - first_five
```

```
0.03125
```

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train.csv

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```
[27] first_five = stats.geom.cdf(k=5,   # Prob of success in first 5 flips
                                 p=0.5)

     1 - first_five
```

```
0.03125
```

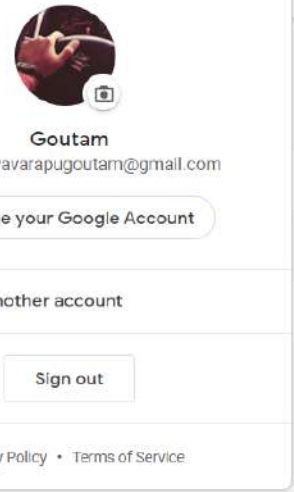
```
stats.geom.pmf(k=2,   # Prob of needing exactly 2 flips to get first success
               p=0.5)
```

```
0.25
```

```
[30]  # Get the probability of waiting more than 1 time unit before a success

     prob_1 = stats.expon.cdf(x=1,
                              scale=1)  # Arrival rate
     1 - prob_1
```

```
0.36787944117144233
```

```
[31] plt.fill_between(x=np.arange(0,1,0.01),
                      y1= stats.expon.pdf(np.arange(0,1,0.01)) ,
                      facecolor='blue',
                      alpha=0.35)

     plt.fill_between(x=np.arange(1,7,0.01),
                      y1= stats.expon.pdf(np.arange(1,7,0.01)) ,
                      facecolor='red',
                      alpha=0.35)


     plt.text(x=0.3, y=0.2, s= round(prob_1,3))
     plt.text(x=1.5, y=0.08, s= round(1 - prob_1,3));
```



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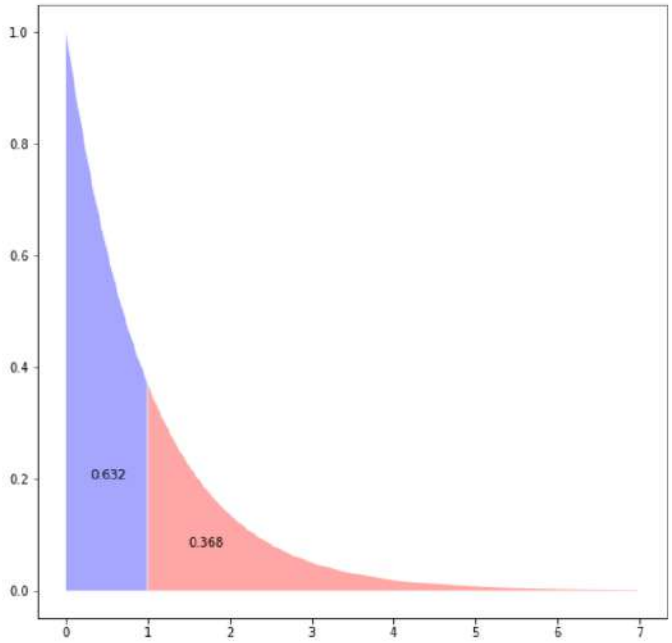
```
[31] plt.text(x=0.3, y=0.2, s= round(prob_1,3))
     plt.text(x=1.5, y=0.08, s= round(1 - prob_1,3));
```



Poisson Distribution

```
[32] random.seed(12)
```

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Poisson Distribution

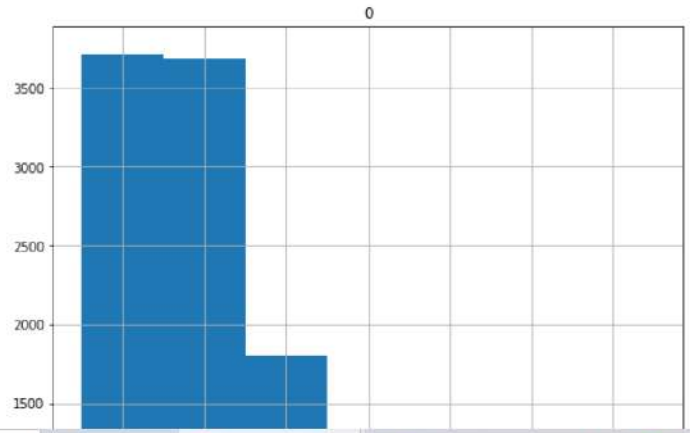
```
[32] random.seed(12)

     arrival_rate_1 = stats.poisson.rvs(size=10000,  # Generate Poisson data
                                        mu=1 )       # Average arrival time 1

     # Print table of counts
     print( pd.crosstab(index="counts", columns= arrival_rate_1))

     # Plot histogram
     pd.DataFrame(arrival_rate_1).hist(range=(-0.5,max(arrival_rate_1)+0.5)
                                       , bins=max(arrival_rate_1)+1);
```

```
col_0       0     1     2    3    4   5  6
row_0
counts   3712  3689  1799  593  182  23  2
```



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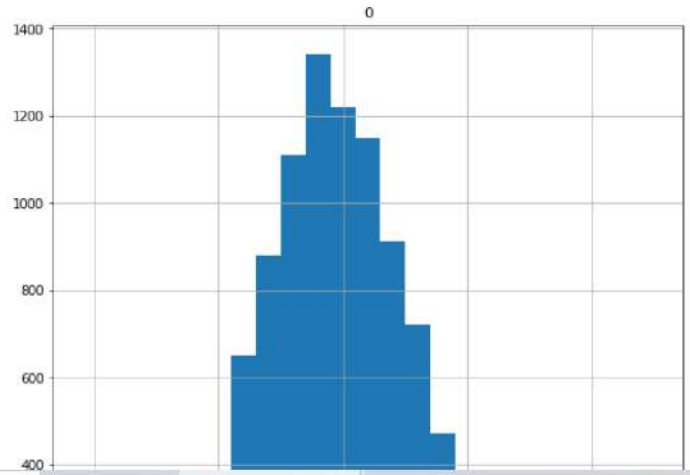
```
[33] random.seed(12)

     arrival_rate_10 = stats.poisson.rvs(size=10000,  # Generate Poisson data
                                         mu=10 )      # Average arrival time 10

     # Print table of counts
     print( pd.crosstab(index="counts", columns= arrival_rate_10))

     # Plot histogram
     pd.DataFrame(arrival_rate_10).hist(range=(-0.5,max(arrival_rate_10)+0.5)
                                        , bins=max(arrival_rate_10)+1);
```

```
col_0   0   1   2   3    4    5    6    7  ...   15   16   17  18  19  20  21  22
row_0                                      ...
counts   1   8  19  72  194  376  650  880  ...  349  240  136  80  37  26   8   5

[1 rows x 23 columns]
```



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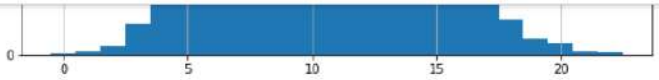
[33]




```
[34] stats.poisson.cdf(k=5,     # Check the probability of 5 arrivals or less
                       mu=10)   # With arrival rate 10
```

```
0.06708596287903189
```

```
[35] stats.poisson.pmf(k=10,     # Check the prob f exactly 10 arrivals
                       mu=10)    # With arrival rate 10
```

```
0.12511003572113372
```

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