



Department of Computer Science and Engineering (Data Science)

B.Tech. Sem: III Subject: Statistics for Data Science

Experiment 4

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Date:	Experiment Title: Probability Distribution
Aim	To implement Probability Distribution using Python.
Software	Google Colab
Implementation	<p>Using Python solve the following questions given below :</p> <p>1. Out of 800 families with 4 pets(dog or cat) each, how many families would be expected to have</p> <p>(i) 2 dogs and 2 cats, (ii) at least 1 dog,</p> <p>(iii) at most 2 cats and (iv) both dog and cat.</p> <p>Code:</p> <pre> print(binom.pmf(2,4,0.5)*800) print((binom.pmf(1,4,0.5)+binom.pmf(2,4,0.5)+binom.pmf(3,4,0.5)+binom.pmf(4,4,0.5))*(800)) print((binom.pmf(2,4,0.5)+binom.pmf(3,4,0.5)+binom.pmf(4,4,0.5))*(800)) print((binom.pmf(1,4,0.5)+binom.pmf(2,4,0.5)+binom.pmf(3,4,0.5))*800) </pre> <p>[21]</p> <pre> ... 300.0 750.0 550.0 700.0 </pre> <p>2. The number of monthly breakdowns of a computer is a RV having Poisson distribution with mean equal to 1.8 . Find the probability that this computer will function for a month</p> <p>(i) without a breakdown, (ii) with only one break down and</p> <p>(iii) with atleast two breakdown.</p> <p>Code:</p> <pre> print(poisson.pmf(0,1.8)) print(poisson.pmf(1,1.8)) print(1-(poisson.pmf(0,1.8)+poisson.pmf(1,1.8))) </pre> <p>[22]</p> <pre> ... 0.16529888822158653 0.2975379987988558 0.5371631129795577 </pre>

3. A taxi cab company has 12 Ambassadors and 8 Fiats. If 5 of these taxi cabs are in workshop for repairs and an Ambassador is as likely to be in for repairs as a Fiat, what is the probability that

(i) 3 of them are Ambassadors and 2 are Fiats,

(ii) at least 3 of them are Ambassadors and

(iii) all the 5 are of the same make.

Code:

```
[57] print(hypergeom.pmf(3,20,5,12))
      print(hypergeom.pmf(3,20,5,12)+hypergeom.pmf(4,20,5,12)+hypergeom.pmf(5,20,5,12))
      print(hypergeom.pmf(5,20,5,12)+hypergeom.pmf(5,20,5,8))

... 0.3973168214654289
     0.7038183694530455
     0.05469556243550056
```

4. Buses arrive at a specified stop at 15 min intervals starting at 7 a.m., that is, they arrive at 7, 7:15, 7:30, 7:45 and so on. If a passenger arrives at the stop at a random time that is uniformly distributed between 7 a.m. and 7:30 a.m., find the probability that he waits

(i) less than 5 min for a bus and

(ii) at least 12 min for a bus.

Code:

```
[78] print(uniform.cdf(1,0,30)+uniform.cdf(2,0,30)+uniform.cdf(3,0,30)+uniform.cdf(4,0,30))
      print(1-uniform.cdf(12,0,30))

... 0.3333333333333337
     0.6
```

5. The mileage which car owners get with a certain kind of radial tire is a RV having an exponential distribution with mean 40,000 km. Find the probabilities that one of these tires will last

(i) at least 20,000 km and

(ii) at most 30,000 km.

Code:

```
[72] print(expon.cdf(20000,scale=40000))
      print(expon.cdf(30000,scale=40000))

... 0.3934693402873666
     0.5276334472589853
```



	<p>6. In a certain city, the daily consumption of electric power in millions of kWh can be treated as a RV having an Erlang distribution with parameters $\lambda = 1/2$ and $k = 3$. If the power plant of this city has a daily capacity of 12 millions kWh, what is the probability that this power supply will be inadequate on any given day.</p> <p>Code:</p> <pre>[74] print(1-gamma.cdf(12,3)) ... 0.0005222580500329199</pre> <p>7. Suppose, if in a basket there are balls which are defective with a Beta distribution of $\alpha = 2$ and $\beta = 5$. Compute the probability of defective balls in the basket from 20% to 30%.</p> <p>Code:</p> <pre>from scipy.stats import beta #Q7 Beta Distribution m=beta.cdf(0.2,2,3)+beta.cdf(0.3,2,3) print(m) 0.5291</pre> <p>8. The marks obtained by a number of students in a certain subject are approximately normally distributed with mean 65 and standard deviation 5. If 3 students are selected at random from this group, what is the probability that at least 1 of them would have scored above 75?</p> <p>Code:</p> <pre>[77] print(3*(1-norm.cdf(75,65,5))) ... 0.06825039584453763</pre>
Conclusion	

Signature of Faculty