

# Likepois\_random.R

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```
# Likepois_random.R
# Plot likelihood for Poisson data vs. lambda

# Load necessary libraries
library(ggplot2)

# Define likelihood function
likefn <- function(x,y){
  return(prod(dpois(y,x)))
}

# Generate n random Poisson observations
n <- 3
lambda_true <- 6
y <- rpois(n,lambda_true)

# Minimum, maximum, and step values of lambda
lmin <- 0.1
lmax <- 15
lstep <- 0.1

# Find x (lambda) values for the plot
lambda <- seq(lmin,lmax,lstep)

# Find likelihood as a function of x (lambda)
likelihood <- sapply(lambda,likefn,y)

# Make data frame for ggplot2
likedata <- as.data.frame(cbind(lambda,likelihood))

# Print y data
y
```

```
## [1] 4 4 3
```

```
# Print likelihood data
likedata
```

```
##      lambda    likelihood
## 1      0.1 2.143571e-15
## 2      0.2 3.252217e-12
## 3      0.3 2.083987e-10
## 4      0.4 3.655382e-09
## 5      0.5 3.152496e-08
## 6      0.6 1.735242e-07
## 7      0.7 7.006261e-07
## 8      0.8 2.254807e-06
## 9      0.9 6.102373e-06
```

## 10	1.0	1.440598e-05
## 11	1.1	3.044907e-05
## 12	1.2	5.874350e-05
## 13	1.3	1.049675e-04
## 14	1.4	1.757105e-04
## 15	1.5	2.780385e-04
## 16	1.6	4.189214e-04
## 17	1.7	6.045922e-04
## 18	1.8	8.399117e-04
## 19	1.9	1.127814e-03
## 20	2.0	1.468890e-03
## 21	2.1	1.861158e-03
## 22	2.2	2.300023e-03
## 23	2.3	2.778437e-03
## 24	2.4	3.287227e-03
## 25	2.5	3.815555e-03
## 26	2.6	4.351471e-03
## 27	2.7	4.882501e-03
## 28	2.8	5.396236e-03
## 29	2.9	5.880879e-03
## 30	3.0	6.325717e-03
## 31	3.1	6.721500e-03
## 32	3.2	7.060720e-03
## 33	3.3	7.337772e-03
## 34	3.4	7.549021e-03
## 35	3.5	7.692769e-03
## 36	3.6	7.769148e-03
## 37	3.7	7.779944e-03
## 38	3.8	7.728385e-03
## 39	3.9	7.618887e-03
## 40	4.0	7.456798e-03
## 41	4.1	7.248140e-03
## 42	4.2	6.999354e-03
## 43	4.3	6.717079e-03
## 44	4.4	6.407942e-03
## 45	4.5	6.078388e-03
## 46	4.6	5.734540e-03
## 47	4.7	5.382084e-03
## 48	4.8	5.026195e-03
## 49	4.9	4.671478e-03
## 50	5.0	4.321944e-03
## 51	5.1	3.981004e-03
## 52	5.2	3.651482e-03
## 53	5.3	3.335635e-03
## 54	5.4	3.035198e-03
## 55	5.5	2.751420e-03
## 56	5.6	2.485119e-03
## 57	5.7	2.236732e-03
## 58	5.8	2.006366e-03
## 59	5.9	1.793850e-03
## 60	6.0	1.598782e-03
## 61	6.1	1.420579e-03
## 62	6.2	1.258512e-03
## 63	6.3	1.111749e-03

## 64	6.4	9.793816e-04
## 65	6.5	8.604602e-04
## 66	6.6	7.540130e-04
## 67	6.7	6.590677e-04
## 68	6.8	5.746678e-04
## 69	6.9	4.998854e-04
## 70	7.0	4.338310e-04
## 71	7.1	3.756606e-04
## 72	7.2	3.245809e-04
## 73	7.3	2.798521e-04
## 74	7.4	2.407896e-04
## 75	7.5	2.067637e-04
## 76	7.6	1.771991e-04
## 77	7.7	1.515730e-04
## 78	7.8	1.294124e-04
## 79	7.9	1.102923e-04
## 80	8.0	9.383148e-05
## 81	8.1	7.969032e-05
## 82	8.2	6.756696e-05
## 83	8.3	5.719429e-05
## 84	8.4	4.833675e-05
## 85	8.5	4.078732e-05
## 86	8.6	3.436462e-05
## 87	8.7	2.891026e-05
## 88	8.8	2.428630e-05
## 89	8.9	2.037294e-05
## 90	9.0	1.706644e-05
## 91	9.1	1.427717e-05
## 92	9.2	1.192792e-05
## 93	9.3	9.952282e-06
## 94	9.4	8.293317e-06
## 95	9.5	6.902290e-06
## 96	9.6	5.737580e-06
## 97	9.7	4.763717e-06
## 98	9.8	3.950530e-06
## 99	9.9	3.272407e-06
## 100	10.0	2.707646e-06
## 101	10.1	2.237889e-06
## 102	10.2	1.847639e-06
## 103	10.3	1.523829e-06
## 104	10.4	1.255467e-06
## 105	10.5	1.033314e-06
## 106	10.6	8.496230e-07
## 107	10.7	6.979028e-07
## 108	10.8	5.727253e-07
## 109	10.9	4.695569e-07
## 110	11.0	3.846165e-07
## 111	11.1	3.147551e-07
## 112	11.2	2.573534e-07
## 113	11.3	2.102356e-07
## 114	11.4	1.715965e-07
## 115	11.5	1.399403e-07
## 116	11.6	1.140292e-07
## 117	11.7	9.283985e-08

```
## 118 11.8 7.552725e-08
## 119 11.9 6.139455e-08
## 120 12.0 4.986762e-08
## 121 12.1 4.047396e-08
## 122 12.2 3.282512e-08
## 123 12.3 2.660211e-08
## 124 12.4 2.154319e-08
## 125 12.5 1.743385e-08
## 126 12.6 1.409843e-08
## 127 12.7 1.139324e-08
## 128 12.8 9.200847e-09
## 129 12.9 7.425345e-09
## 130 13.0 5.988504e-09
## 131 13.1 4.826556e-09
## 132 13.2 3.887568e-09
## 133 13.3 3.129280e-09
## 134 13.4 2.517334e-09
## 135 13.5 2.023817e-09
## 136 13.6 1.626071e-09
## 137 13.7 1.305718e-09
## 138 13.8 1.047863e-09
## 139 13.9 8.404448e-10
## 140 14.0 6.736998e-10
## 141 14.1 5.397342e-10
## 142 14.2 4.321685e-10
## 143 14.3 3.458513e-10
## 144 14.4 2.766254e-10
## 145 14.5 2.211385e-10
## 146 14.6 1.766889e-10
## 147 14.7 1.411011e-10
## 148 14.8 1.126238e-10
## 149 14.9 8.984872e-11
## 150 15.0 7.164377e-11
```

```
# Plot the values
ggplot(likedata,aes(lambda,likelihood))+
  geom_line(color="red",size=1)+
  ggtitle("Poisson likelihood function")
```

