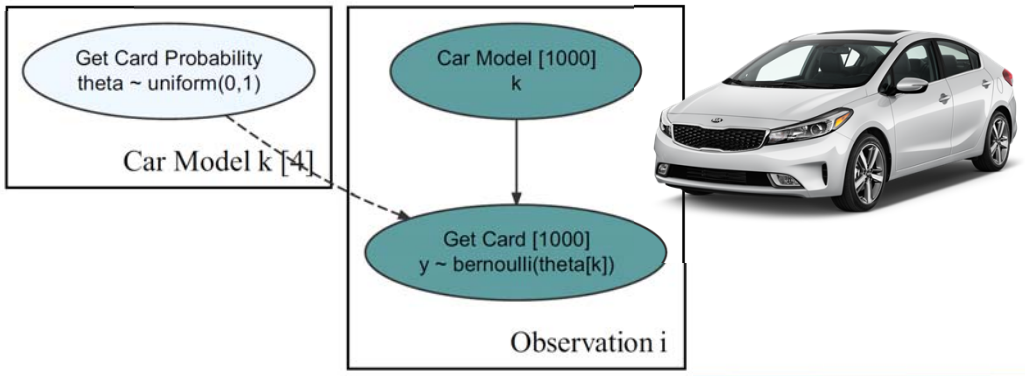
Parameter & Model Estimation

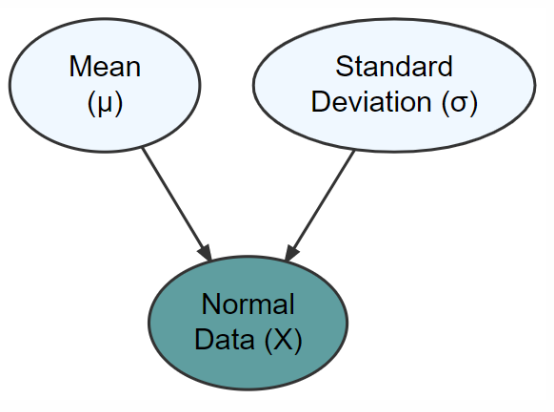
Finding the plausible data generating stories

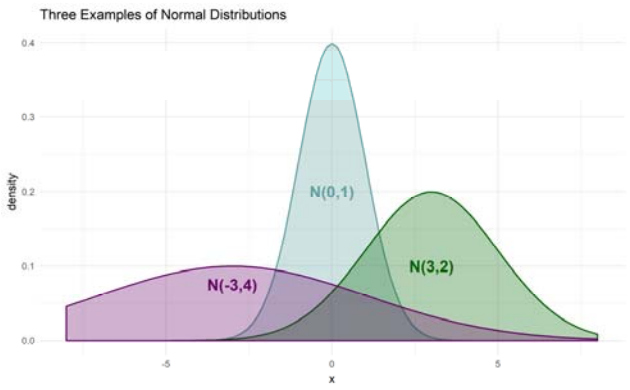
Walkthrough

`creditCard.R`



Normal Distribution





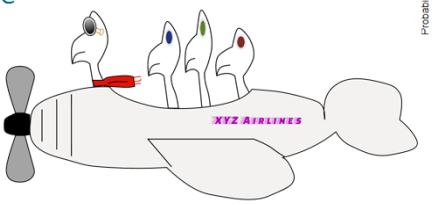
Normal Distribution Stories

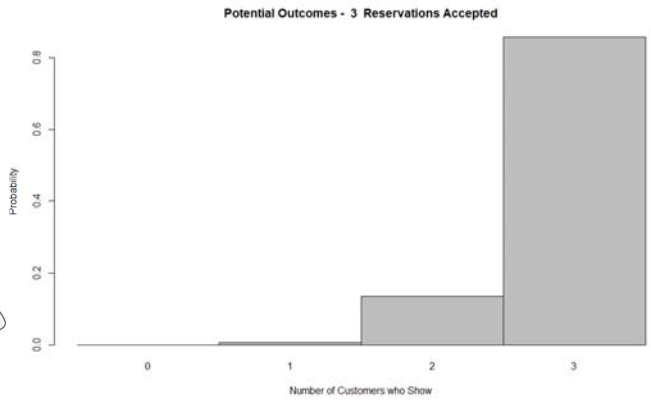
Example Uses

- Finance: Changes in the logarithm of exchange rates, price indices, and stock market indices are assumed normal
- Testing: Standardized test scores (e.g. IQ, SAT Scores)
- Biology: Heights of males in the united states
- Physics: Density of an electron cloud is 1s state.
- Manufacturing: Height of a scooter's steering support
- Inventory Control: Demand for chicken noodle soup from a distribution center

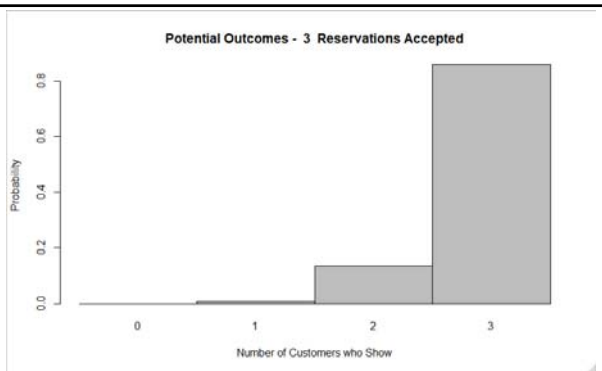
Normal Distribution Stories

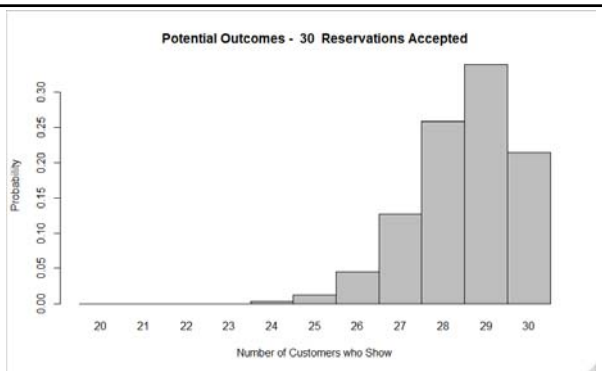
- Generative story
  - The sum of *n* independent random variables becomes approximately normal as *n* grows large

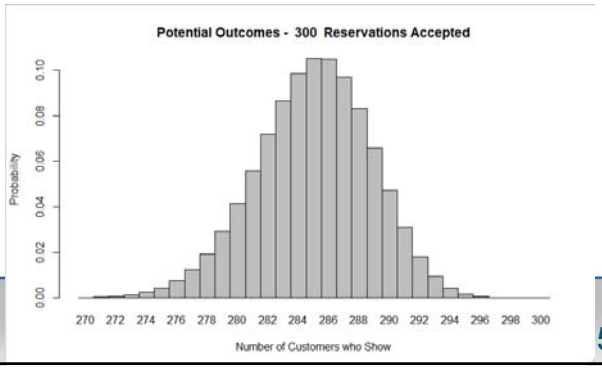


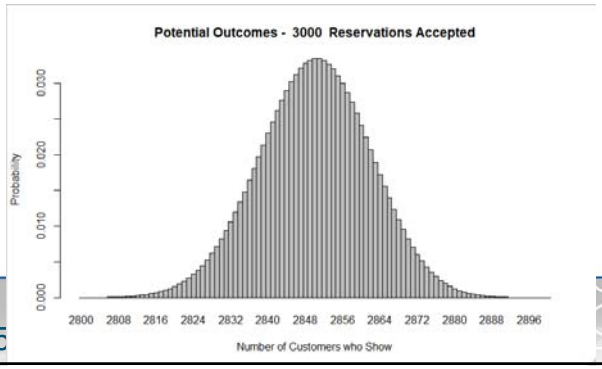


Assume 95% of Passengers Show

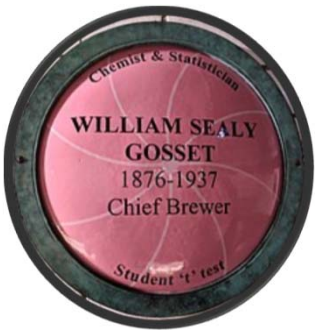




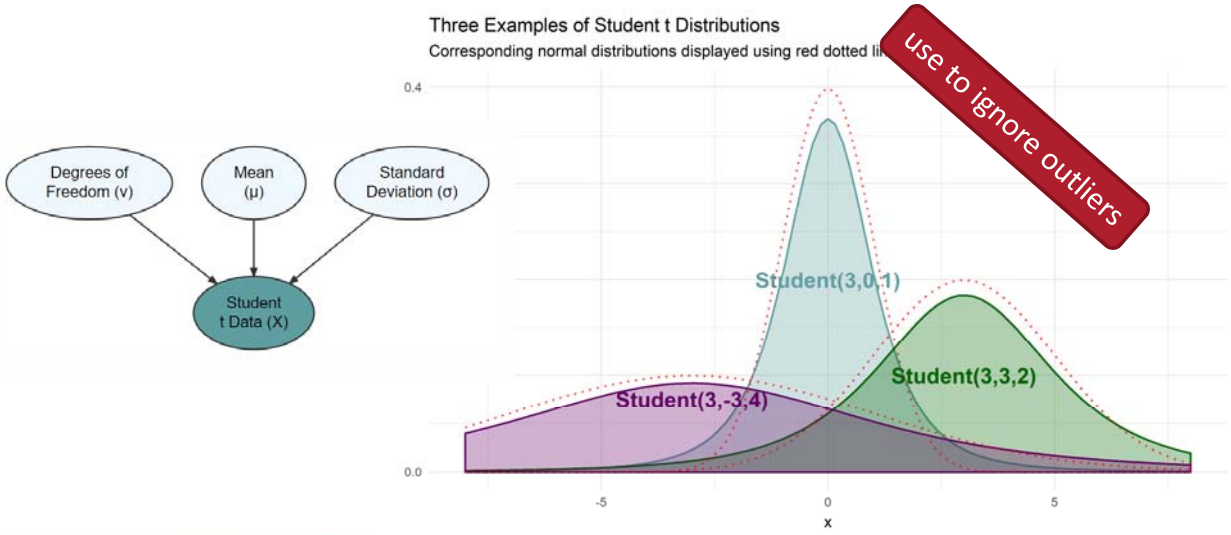




t-dist: A Story About Beer



T-Distribution: A Wider Tailed Normal Dist



Gamma Distribution Stories

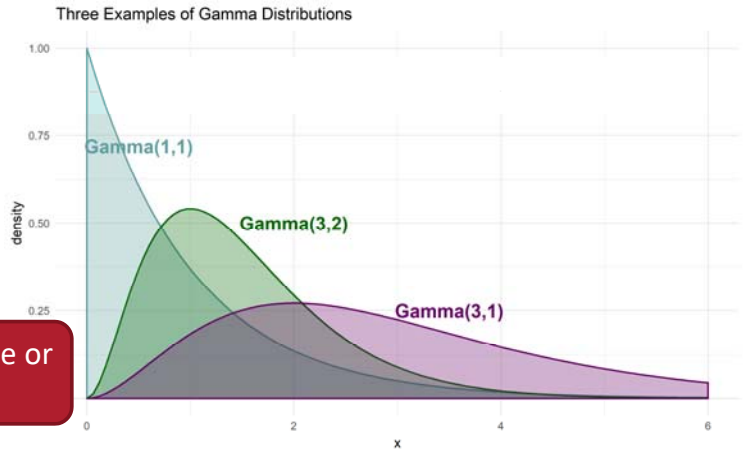
Example Uses

- Insurance: Size of Claims
- Meterology: Rainfall Amounts
- Telecom: Decay of signal power

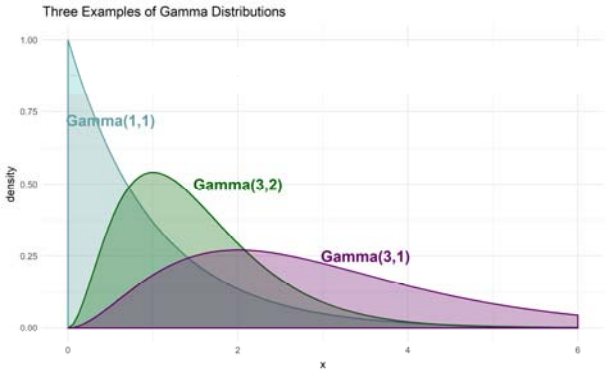
Notable Property

- Support: 0 to ∞

QUESTION: Is the gamma a discrete or Continuous distribution?



Gamma Distribution Stories

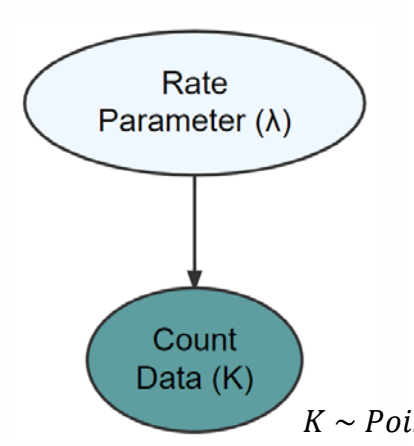


$X \sim gamma(\alpha, \beta)$

$E[X] = \frac{\alpha}{\beta}$: The mean of a Gamma distributed rv is the ratio of α over β

$\mathrm{Var}[X] = \frac{\alpha}{\beta^2}$: The variance, a popular measure of spread or dispersion, can also be expressed as a ratio of the two parameters.

Poisson Distribution

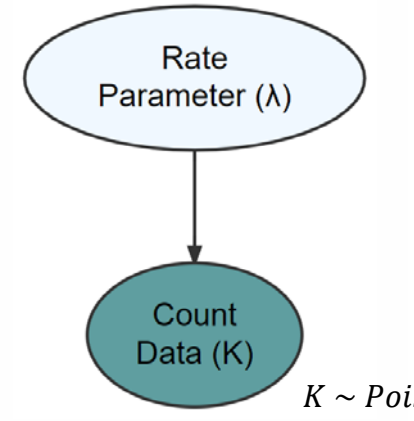


$K \sim Poisson(\lambda)$

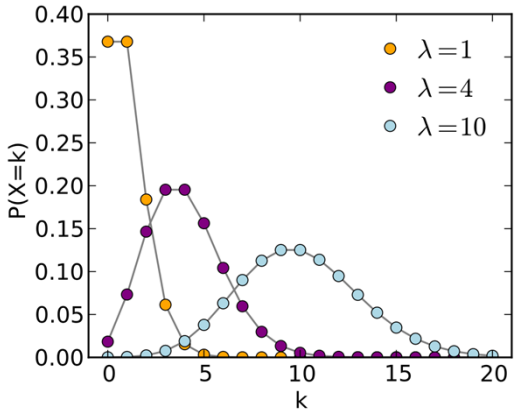
- Generative story
  - K represents the number of events that occur in a fixed interval of time
  - Assumptions:
    - Constant arrival rate
    - Arrivals are independent
- Examples
  - Patient arrival for specific time periods at a emergency room

istribution

QUESTION: Is rate parameter λ discrete or continuous?

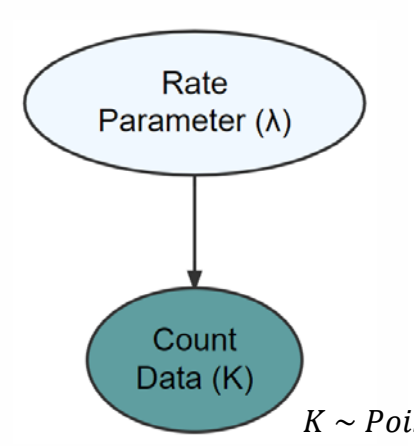


$K \sim Poisson(\lambda)$

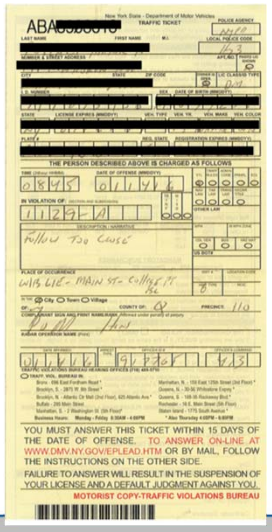


QUESTION: Is the Poisson a discrete or continuous distribution?

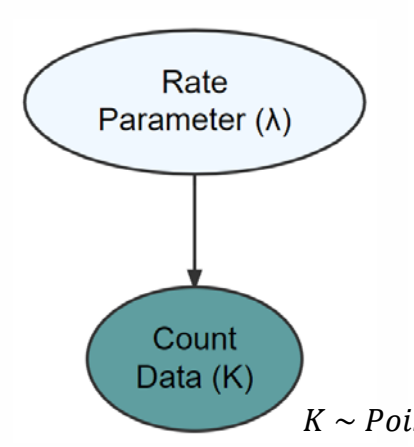
Poisson Distribution: Posterior Predictive



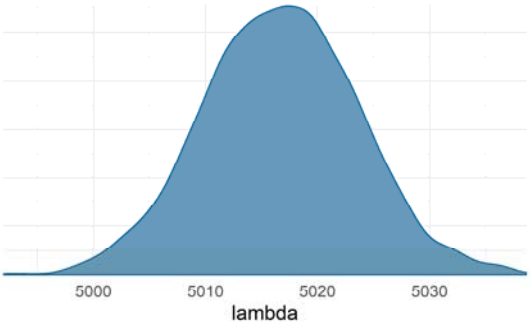
$K \sim Poisson(\lambda)$



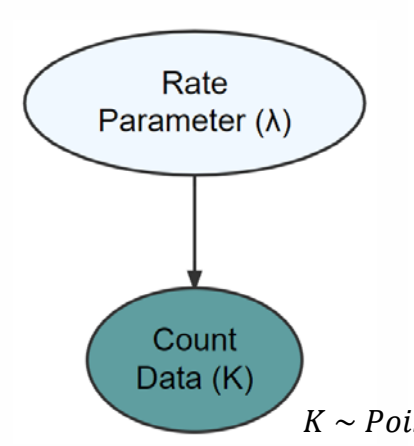
Poisson Distribution: Posterior Predictive

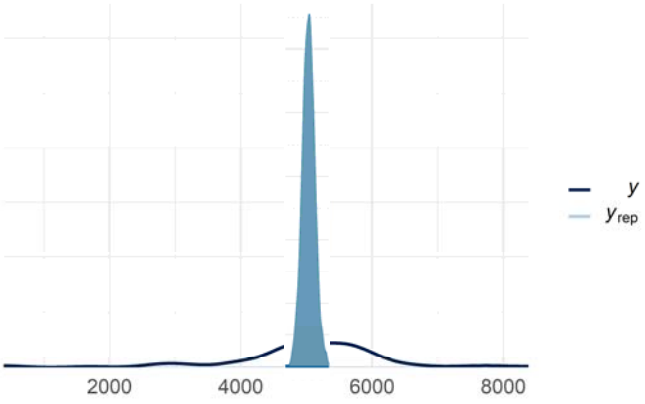


$K \sim Poisson(\lambda)$



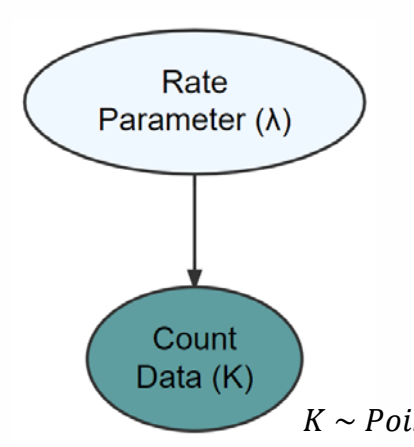
Poisson Distribution: Posterior Predictive

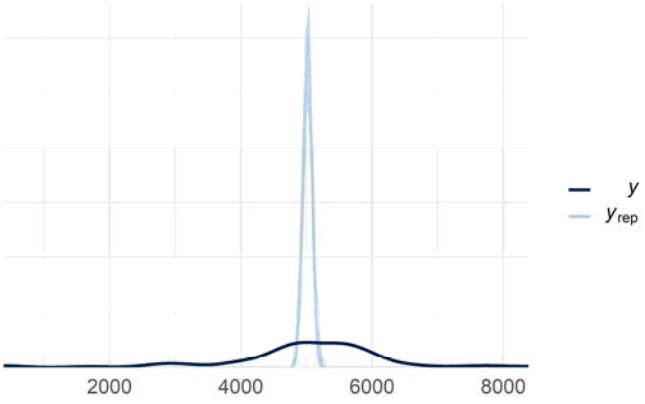




$$K \sim Poisson(\lambda)$$

Poisson Distribution: Posterior Predictive





$$K \sim Poisson(\lambda)$$

Walkthroughs

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normalDistributin.R
postPredictive.R
linModelWalkthrough.R
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