



# POISSON-GAMMA BAYESIAN ANALYSIS

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TEAM-5



# OBJECTIVE

To ascertain the number of people who take part in an expedition to the Himalayan mountain ranges by performing a Poisson-Gamma Bayesian Analysis

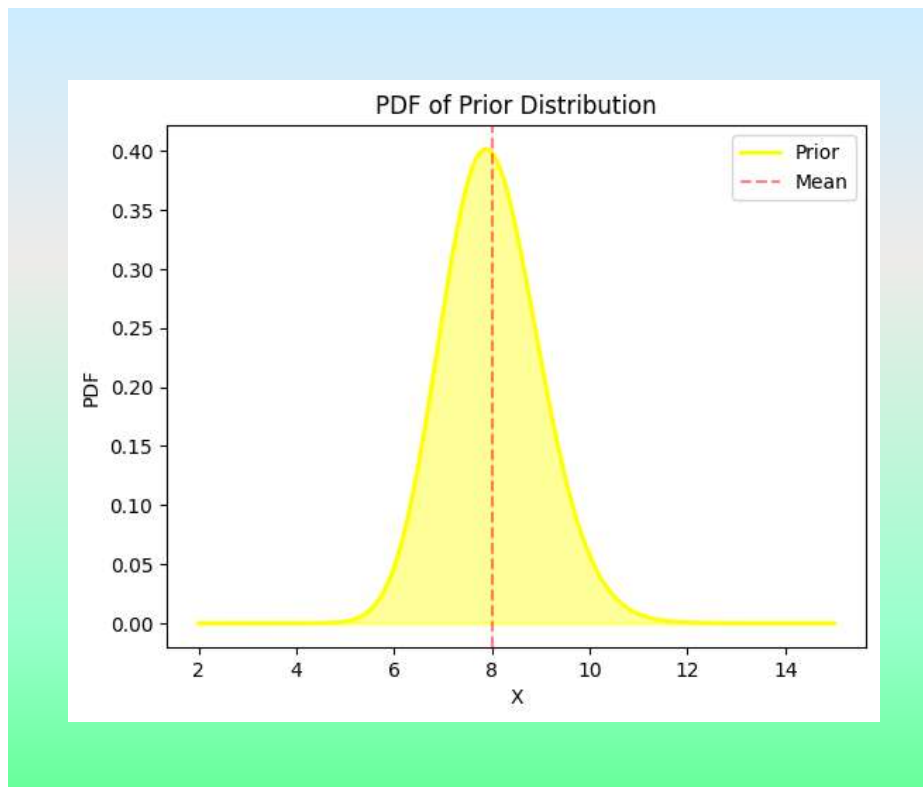




## **PRIOR DATA**

Based on internet searches on various Mount-Everest related expeditions, We guessed that number of people in an expedition were around 8, but can range between 5 to 10

Our Gamma Prior needs to have similar patterns to our guess, and we discovered that a suitable prior can be:



$$\lambda \sim \text{Gamma}(64, 8)$$
$$\text{mean} = 8$$
$$\text{var} = 1$$



# DATASET

The Himalayan Climber Data is a sub-sample of the Himalayan Database distributed through the R for Data Science TidyTuesday project





This dataset includes information on the results and conditions for various Himalayan climbing expeditions.

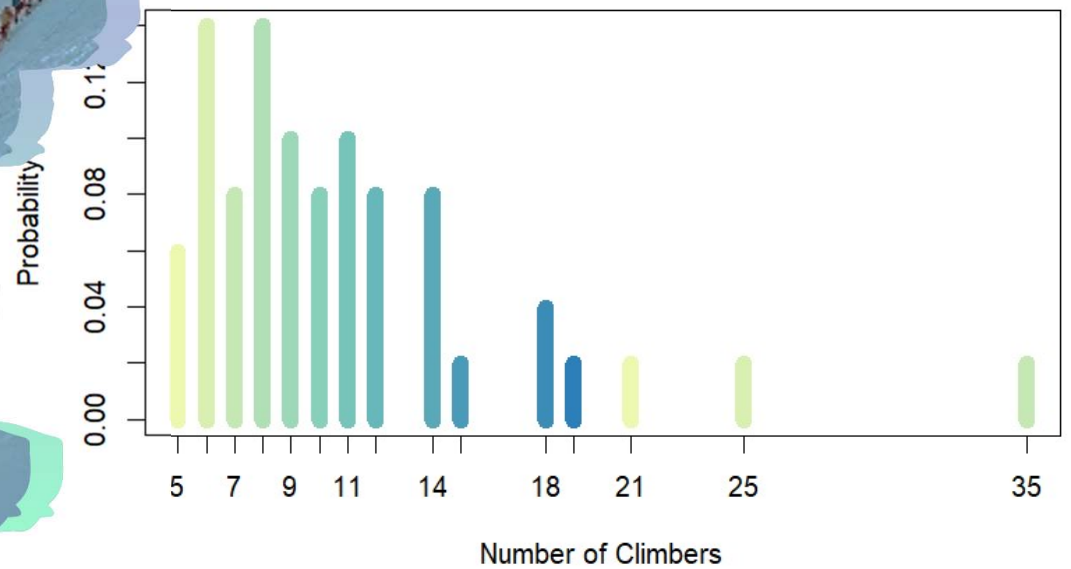
A photograph of a mountain expedition. A long line of people, some carrying large yellow and red backpacks, are ascending a steep, snow-covered mountain slope. The word "DATASET" is overlaid in large, white, bold, sans-serif capital letters on the left side of the image. The background shows a rugged mountain peak under a clear blue sky.

# DATASET

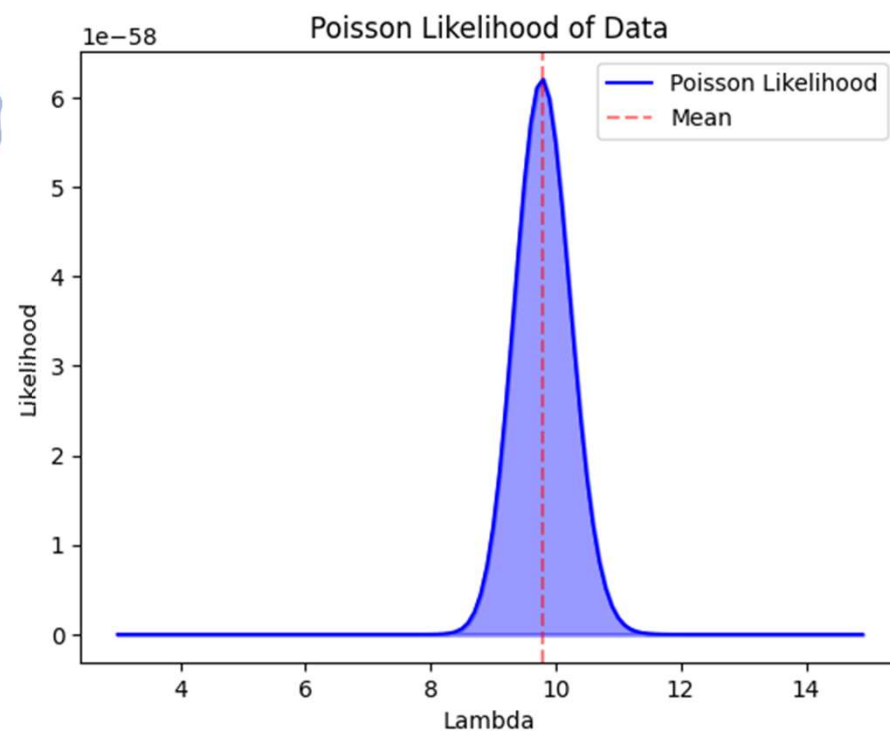
Our Dataset includes 50 randomly sampled expeditions and the number of people that participated in the expedition.

# DATASET

PMF of Climbers Data







# POSTERIOR DISTRIBUTION

$$n = 50$$

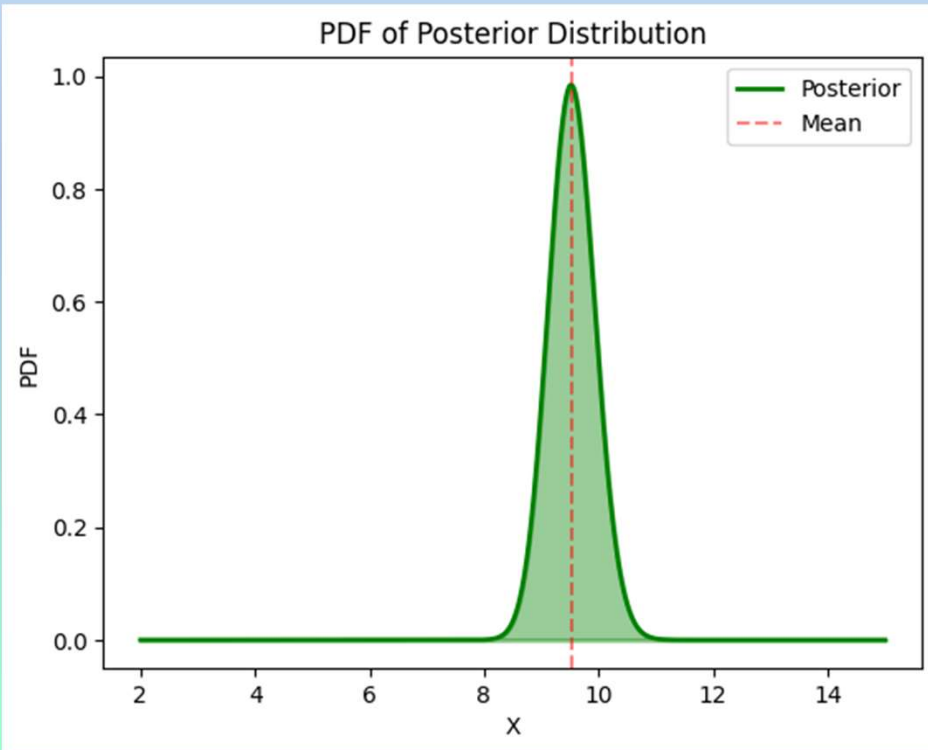
$$\sum y_i = 489$$

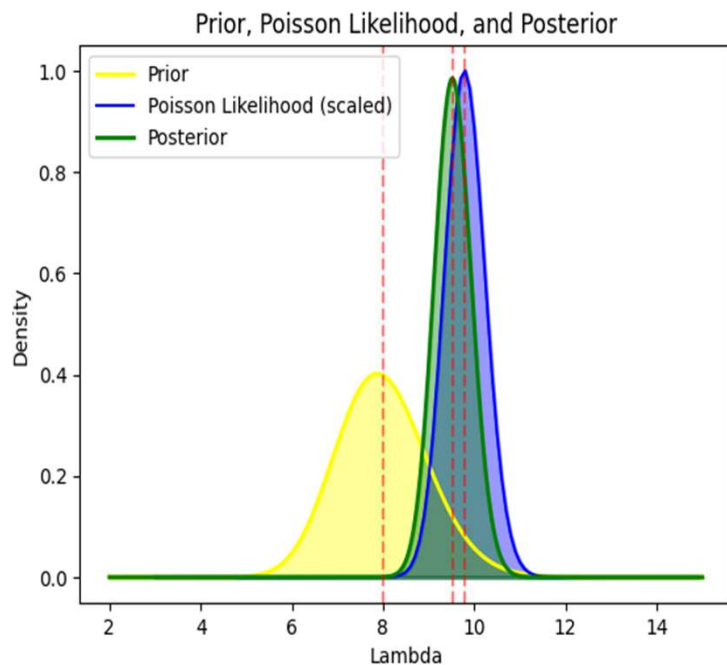
$$\alpha = 64$$

$$\beta = 8$$

Therefore, The posterior distribution is

$$\text{Posterior} \sim \text{Gamma}(553, 58)$$





```
> summarize_gamma_poisson(64, 8, 489, 50)
  model shape rate mean mode var
1 prior   64    8 8.000000 7.875000 1.0000000
2 posterior 553  58 9.534483 9.517241 0.1643876
```

## CONCLUSION

As our prior was a guess, the posterior model of  $\lambda$  more in sync with our collected data. Based on the posterior distribution, the expected number of people to participate in an expedition increased from 8 to 9.53

There is also a big decrease in the variability of  $\lambda$ , from 1 to 0.16



# THANK YOU

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