

UNIVERSITY OF KOBLENZ - AG SOFTLANG

DATA SCIENCE

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# Assignment 5: Statistic Modeling

TO BE SUBMITTED UNTIL THE 15.12.2021 (2 P.M)

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December 1, 2021

## Question 5.1: Grid Approximation Poisson

We have the data  $Y$  with 0, 0, 1, 2, 0, 2, 2, 1 and 1. It follows a Poisson distribution. We can define a simple model for estimating the lambda parameter of the Poisson distribution as:

$$\begin{array}{ll} Y \sim \text{Poisson}(\text{lambda}) & [\text{likelihood}] \\ \text{lambda} \sim \text{Uniform}(0, 4) & [\text{prior}] \end{array}$$

Use a grid approximation to compute the posterior for the model with the data  $Y$ . Produce a plot to visualize the posterior. Submit the plot and the code.

## Question 5.2: Grid Approximation Normal

We have the data  $Y$  with 0.3120639, 0.5550930, 0.2493114 and 0.9785842. It follows a normal distribution. We can define a simple model for estimating the mu (mean) and sigma (sd) parameter of the normal distribution as:

$$\begin{array}{ll} Y \sim \text{Normal}(\mu, \sigma) & [\text{likelihood}] \\ \mu \sim \text{Uniform}(0, 1) & [\text{prior}] \\ \sigma \sim \text{Uniform}(0, 1) & [\text{prior}] \end{array}$$

Use grid approximation to compute the posterior for the model with the data  $Y$ . Produce a plot of the posterior. Submit the plot and the code.

Hint: Since you are approximating a two-dimensional parameter space, the grid approximation algorithm and the plot changes. Find a way to depict the posterior with respect to both parameters in a single plot.