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Course: DATA.STAT.720

1.a)

Here Prior distribution for θ is Gamma distribution with mean 3.0 & S.D 2.0.

mean of a Gamma dist^n is given by

$\mu = \alpha/\beta = 3.0$

1.b) For Gamma distribution

$$\sigma = \sqrt{\alpha/\beta^2}$$

$$\frac{\sigma}{\beta^2} = 4.0 \quad \& \quad \frac{\alpha}{\beta} = 3$$

$\therefore \alpha = 1$

$$\beta = \frac{1}{3}$$

1.c

$$L(\theta) = \exp\left(\frac{-n/\theta}{1000}\right) \times \left(\frac{n/\theta}{10000}\right)^{x_i} / x_i!$$

Likelihood is the product of the individual of each district.

d) $\text{Posterior}(\theta) \propto \text{Prior}(\theta) \times \text{likelihood}$

$$\text{Prior}(\theta) = \frac{\beta^{\alpha}}{\Gamma\alpha} \cdot \theta^{\alpha-1} e^{(-\beta\theta)}$$

$$\text{Likelihood}(\theta) = \left(\frac{x_i \theta}{10000}\right)^{x_i} \exp\left(\frac{-x_i/\theta}{10000}\right) \frac{}{x_i!}$$

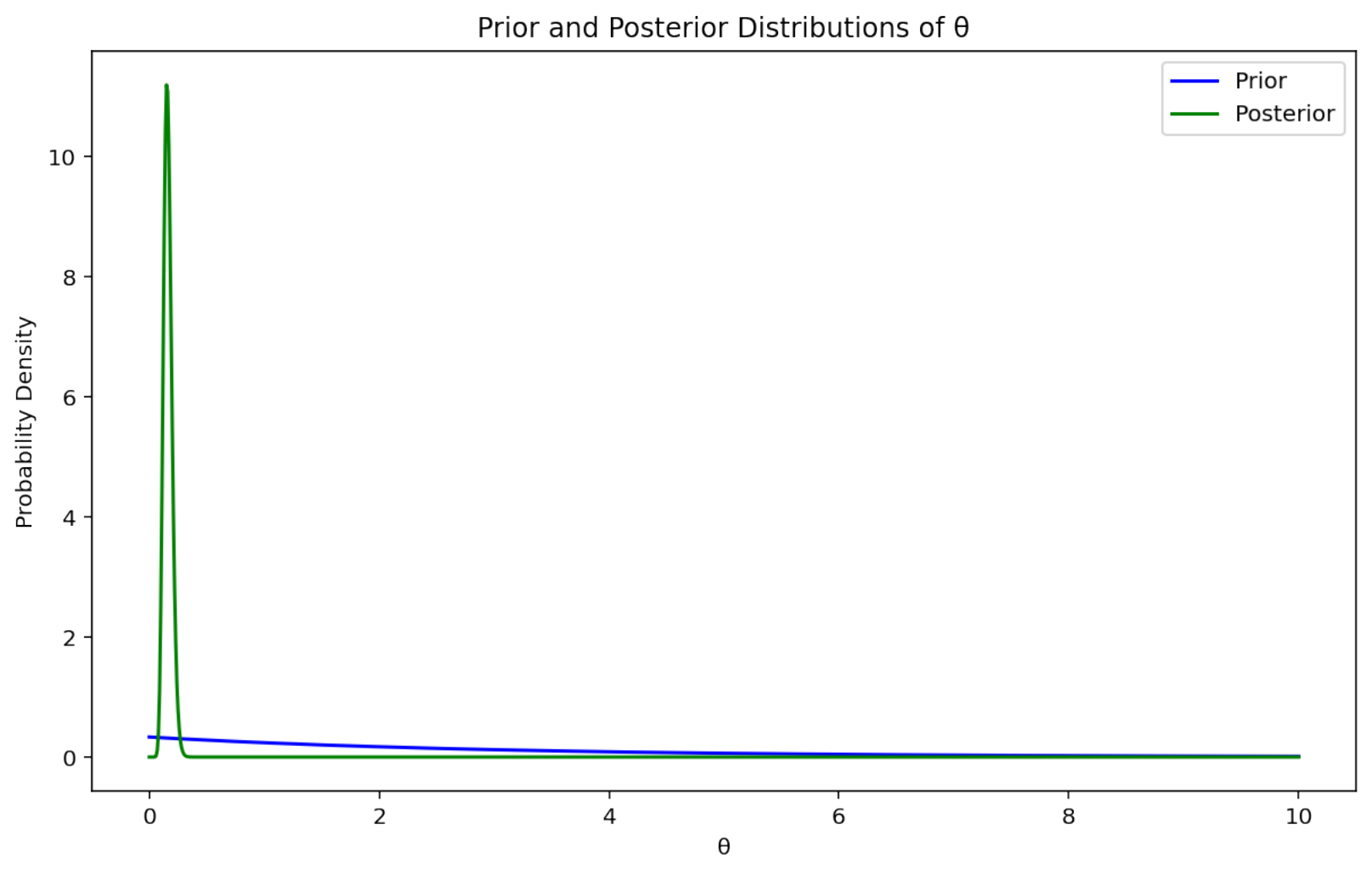
e) Posterior mean of θ is given by α'/β' &

$$S.D = \sqrt{\frac{\alpha'}{\beta'^2}}$$

f)

g) $P(\theta < 2) = CDF(\theta = 2.0)$

Posterior prob that $\theta < 2.0$ is


Prior and Posterior Distributions of θ
Prior
Posterior
Probability Density
θ
0
2
4
6
8
10