Lecture 12: Analytical examples of Bayesian inference

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Predictive checking

Replicating the experiment using the model

- Assume that we have built model using data $x_{1:n}$.

$p(\vartheta | x_{1:n})$

- What would get it we ran the experiment again?

- The *replicated data* $x^{rep}_{1:n}$ are given by the following process:

$$\vartheta_s \mid x_{1:n} \sim p(\vartheta \mid x_{1:n})$$

$$x^{rep}_{1:n,s} \mid \vartheta = \vartheta_s \sim p(x^{rep}_{1:n} \mid \vartheta = \vartheta_s)$$

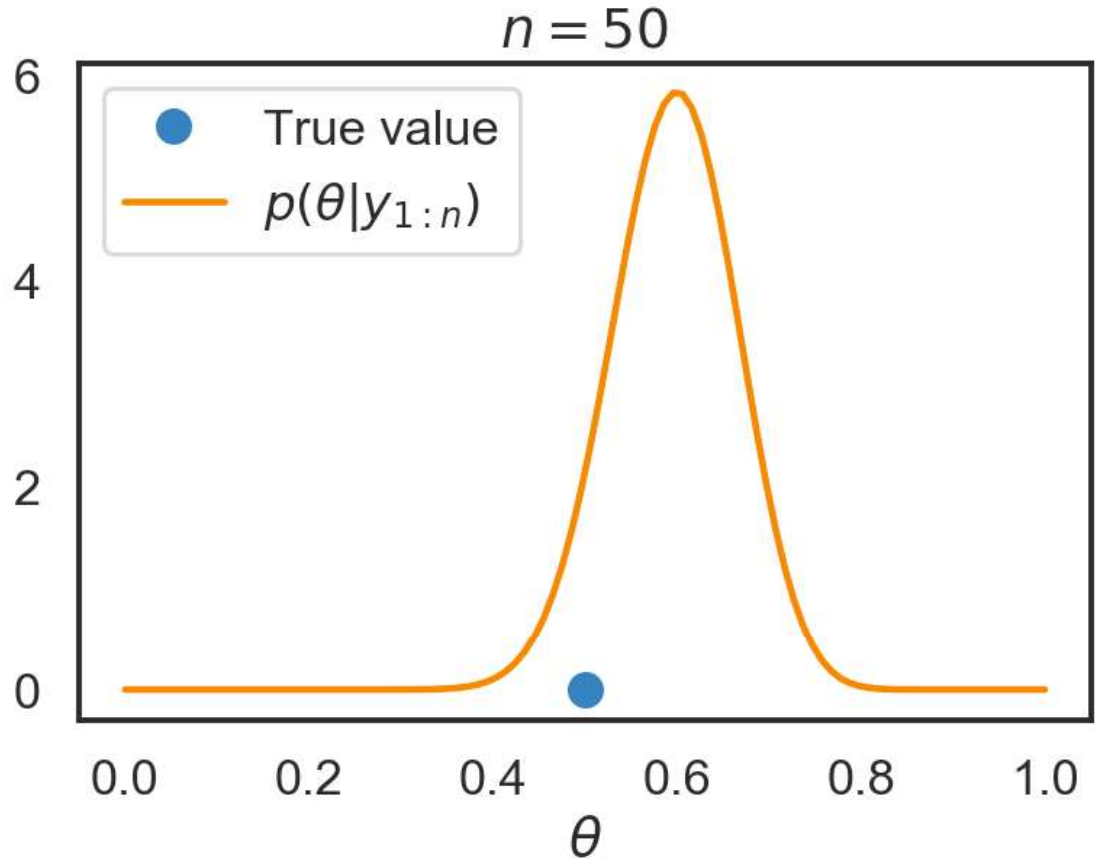
Posterior Predictive Checking

The idea is to sample $x^{\text{rep}}_{1:n}$ and compare their characteristics to the observed data $x_{1:n}$.

Example: Coin toss case studies

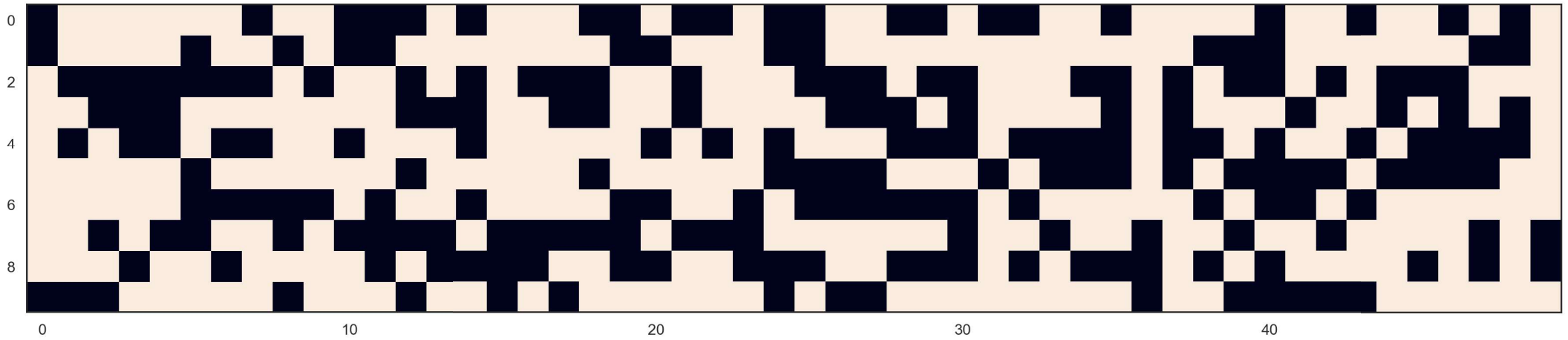
- Case study 1: I simply generate 50 coin tosses from a fair coin using Numpy.
- Case study 2: I just picked 50 coin tosses by hand trying to be as fair as possible.

Example: Inferring the probability of a coin toss



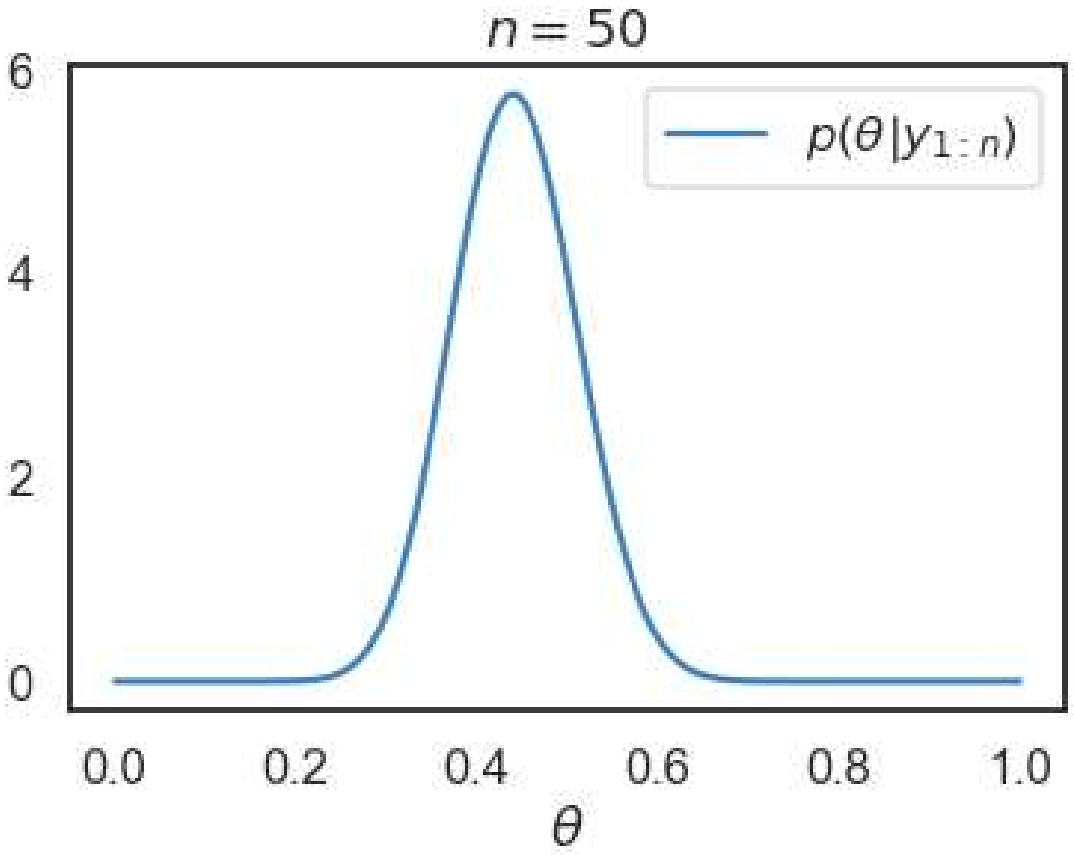
With data from fair coin.

Posterior Predictive Checking



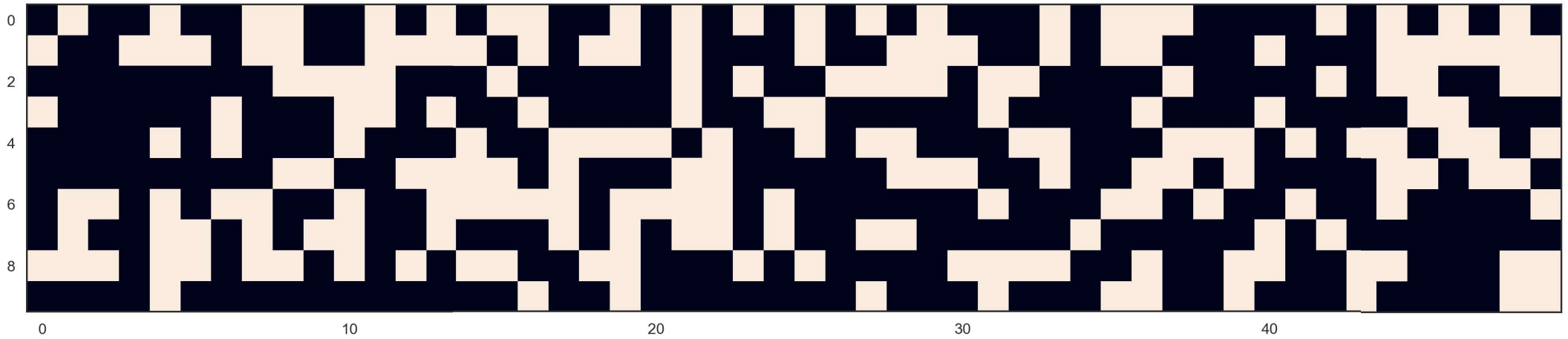
With data from fair coin.

Example: Inferring the probability of a coin toss



With made-up data.

Posterior Predictive Checking



With made-up data.