We know:
- \( P(B) = 0.01 \)
- \( P(\Theta | G) = 0.97 \)
- \( P(\Theta | B) = 0.98 \)

Solution:

**Method 1:**

2x2 table

Bayes's Theorem in odds form:

\[
\frac{P(B | \Theta)}{P(\Theta | B)} = \left( \frac{P(B)}{P(\Theta | B)} \right) \cdot \left( \frac{P(\Theta | B)}{P(\Theta | B)} \right) \cdot \left( \frac{P(\Theta | B)}{P(\Theta | B)} \right)
\]

(\text{posterior odds in favor of } B) \rightarrow (\text{prior odds in favor of } B) \cdot (\text{Bayes factor})

We want \( P(B | \Theta) \)

Only 7 system days (unknown) (data)

2 possible truth states \((B, G)\)

**Method 2:**

Earlier we showed that:

(likelihood ratio)
excellent, we know all the probability. So let's compute:

$$P(B) = 0.01$$

$$P(\neg B) = P(G) = 0.99$$

$$P(\Theta | B) = 0.98$$

$$P(\Theta | \neg B) = 1 - P(\Theta | B) = 1 - 0.97 = 0.03$$

From which

$$P = \frac{0}{140} = \frac{98}{297}$$

So the odds in favor of $B$ are $\frac{98}{98+297} = 0.25$ before.
Bayes' Theorem is probability.

\[ p(\theta | Y) = \frac{p(Y | \theta) p(\theta)}{p(Y)} \]

When we have a prior model, we can use Bayes' Theorem to compute the posterior model. The posterior is proportional to the product of the likelihood and the prior.

Bayesian inference is a search for the posterior over the unknown parameter \( \theta \).
\[ P(\Theta) = \frac{\mathbb{P}(G) \cdot P(\Theta|G) + \mathbb{P}(B) \cdot P(\Theta|B)}{\mathbb{P}(\Theta)} \]

\[ = (0.99) \left[ 1 - P(\Theta|G) \right] (0.01) (0.98) \]

\[ = (0.99)(0.03) + (0.01)(0.98) \]

\[ = (0.0297) + (0.0098) = 0.0395 \]

So

\[ P(B|\Theta) = \frac{P(B) \cdot P(\Theta|B)}{P(\Theta)} \]

Finally

\[ DG \]

ch. 3

Random variables

\[ P(I = y) \]

\[ \uparrow \text{ random variable} \]

\[ \text{(process)} \]

\[ \uparrow \text{ possible value of } I \]

\[ \text{(outcome)} \]

\[ (potential) \]

\[ (kinetic) \]
Graph theory

- 4 nodes
- 6 edges
- $\mathbb{E}$: dependent

5 nodes
- 4 edges

$n$ nodes $\rightarrow$ # data points

\[
\binom{n}{2} \text{ edges} = \frac{n(n-1)}{2}
\]

$= O(n^2)$

This is of order $n^2$

$= \text{Big oh of } n^2$

in this model, the past and the future are conditionally independent given $\theta$

$O(n^2)$