My boyfriend has flirtatious tendencies...he cheated me before. He said that he would never have affairs with other girls.

But....recently he very often (>3 per week) comes home so late. He says that he doesn’t cheat me...actually, he is very nice and talkative when he is at home. I still suspect that he is cheating me again...but no evidence.

Ok. I will read your fortune based on “Bayesian rule”...
According to the male behavior's data (refer the file male_behavior.dat*), the fact that the usual men who cheated their partner before come home late night shows:

\[
\begin{align*}
P(\text{cheating}) &= 0.6 \\
P(\text{not cheating}) &= 0.4
\end{align*}
\]

From the data above, the probability for cheating is not so high… And your boyfriend is very nice and talkative… from my abundant experience as a fortune-teller (n>300), most men are nice and talkative when they have the secrets… therefore:

\[
\begin{align*}
P(\text{nice and talkative} \mid \text{cheating}) &= 0.8 \\
P(\text{not nice and not talkative} \mid \text{cheating}) &= 0.2 \\
P(\text{nice and talkative} \mid \text{not cheating}) &= 0.3 \\
P(\text{not nice and not talkative} \mid \text{not cheating}) &= 0.7
\end{align*}
\]

Based on Bayes’ rule,

\[
\begin{align*}
P(\text{cheating} \mid \text{nice and talkative}) &= \frac{P(\text{nice and talkative} \mid \text{cheating}) \cdot P(\text{cheating})}{P(\text{nice and talkative} \mid \text{cheating}) \cdot P(\text{cheating}) + P(\text{nice and talkative} \mid \text{not cheating}) \cdot P(\text{not cheating})} \\
&= \frac{0.8 \cdot 0.6}{0.8 \cdot 0.6 + 0.3 \cdot 0.4} \\
&= 0.80
\end{align*}
\]

Hmm… 0.8… but it is up to you whether 0.8 is high or not…

(*It is fictional data!)
Fortune-teller Madam Bayes’ Advice

By Aki Shiozawa