1 Chapter 7 Discrimination and Detection

Problem 7.2 ***Suppose the prior distribution and the posterior distribution are as in figure 7.2.***

(a) Calculate the likelihood ratio.
(b) Does the sensory evidence alone (without the prior) indicate that the stimulus was s+ or s-?
(c) Do the prior and the likelihood favor the same alternative?

(a)
Using Bayes' rule:

$$\frac{p(s_-|x)}{p(s_+|x)} = \frac{p(x|s_-)p(s_-)}{p(x|s_+)p(s_+)} \Rightarrow \frac{p(x|s_-)}{p(x|s_+)} = \frac{p(s_-|x)}{p(s_+|x)} \cdot \frac{p(s_+)}{p(s_-)}$$

And after plugging in the values:

$$Likelihoodratio = \frac{0.55}{0.45} \cdot \frac{0.3}{0.7} = \frac{11}{21} \approx 0.524$$

(b)
Since the likelihood ratio is less than 1, the sensory evidence alone (without the prior) favors s_+.

(c)
The prior favors s_- (0.7 being bigger than 0.3), while the likelihood favors s_+. Therefore, the prior and likelihood **do not** favor the same alternative.