Virus test

- Let us say that we have a test for a virus that is 99% accurate. Specifically, this means:
  - If someone is positive for the virus, then the test shows positive with probability 99%;
  - If someone is negative for the virus, then the test shows negative with probability 99%;
- Ok, now assume that someone has tested positive. What's the probability that they actually have the virus?

Some notation

- Let V and T be the random variables as to whether the person has the virus, and whether the test is positive, respectively.
- i.e., $\{V = 1\}$ means the subject has the virus, $\{V = 0\}$ means they do not, $\{T = 1\}$ means test is positive, and $\{T = 0\}$ means the test is negative.
- By the assumptions in the problem, we have

$$\mathbb{P}(T = 1|V = 1) = 0.99, \quad \mathbb{P}(T = 0|V = 1) = 0.01,$$
$$\mathbb{P}(T = 1|V = 0) = 0.01, \quad \mathbb{P}(T = 0|V = 0) = 0.99.$$

- And we are asking: what is $\mathbb{P}(V = 1|T = 1)$. Is it 99%???