

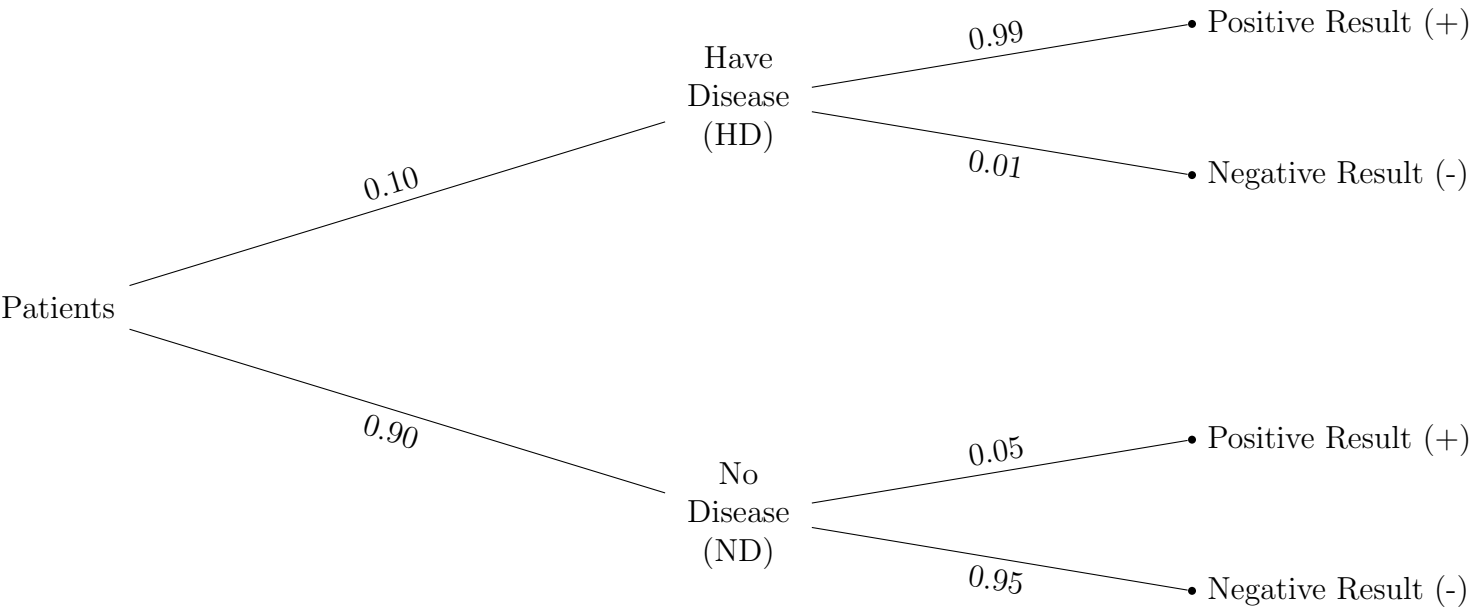
# Conditional Probability Tree Diagram and Questions

## 0.1 Initial Setup:

**Description:** A hospital is testing patients for a certain disease. If a patient has the disease, the test is designed to return a “positive” result. If a patient does not have the disease, the test should return a “negative” result.

- 99% of patients who have the disease test positive.
- 5% of patients who don’t have the disease also test positive.
- 10% of the population in question has the disease.

## 0.2 Probability Tree:



## 0.3 Questions:

Find the probability that a randomly selected patient has the disease and  $(\cap)$  tests positive:

$$P(HD \cap (+)) = 0.10 * 0.99 = 0.099 \approx 9.9\% \text{ probability} \tag{1}$$

Find the probability that a random patient tests positive:

$$P((+)) = P(HD \cap (+)) + P(ND \cap (+)) = 0.099 + (0.90 * 0.05) = 0.144 \approx 14.4\% \text{ probability} \tag{2}$$

Given  $(|)$  a random patient tests positive, what is the probability that they have the disease:

$$P(HD | (+)) = \frac{P(HD \cap (+))}{P((+) )} = \frac{0.099}{0.1444} = 0.6875 \approx 68.8\% \text{ probability} \tag{3}$$