8.4-Probability Trees and Bayes Formula

Thursday, November 16, 2017 9:14 AM

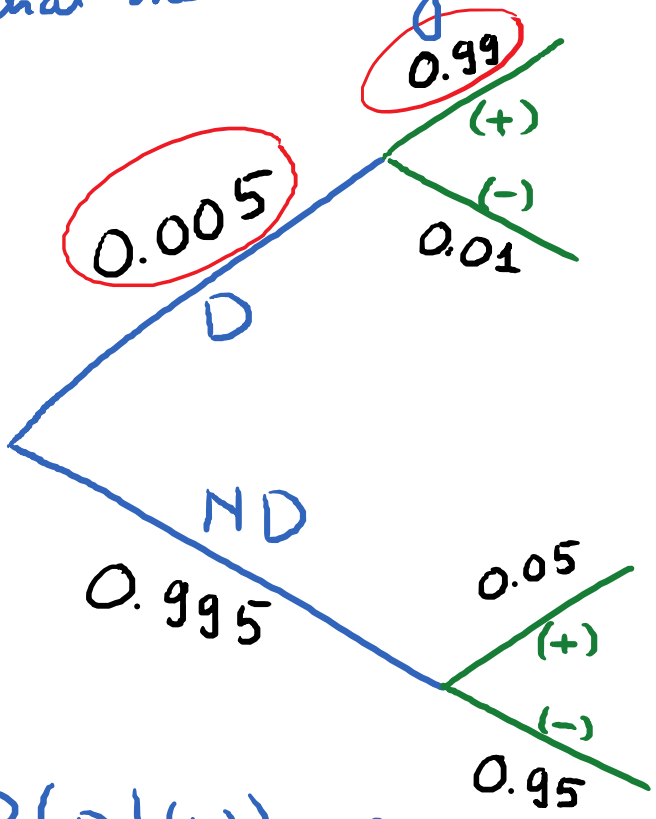
Goal: Solve application problems using the method of probability tree.

E.g. Rare disease: found in 0.5% of the population

Blood Test for this disease.

* The test is 99% accurate if the disease is present
* The test has a 5% false positive rate.

Q: If one get a positive result, find the probability that one actually has the disease.



Goal: Find $P(D|(+))$

$$P(D|(+)) = \frac{P(D \cap (+))}{P((+))}$$

$$P(D \cap (+)) = (0.005)\cdot(0.99)$$

$$P((+)) = (0.005)\cdot(0.99) + (0.995)\cdot(0.05)$$

$$\rightarrow P(D|(+)) = 0.0905 \rightarrow 9.05\%$$

Ex. Find $P(ND|(-))$

$$P(ND|(-)) = \frac{P(ND \cap (-))}{P((-))}$$

$$= \frac{(0.995)\cdot(0.95)}{(0.995)\cdot(0.95) + (0.005)\cdot(0.01)}$$

$$= 0.9999471 \longrightarrow 99.9471\%$$

Ex. Doctor is called to see a sick child.

In the neighborhood:

90% of all sick children have the flu

10% _____ have measles.

95% of children who have measles have a rash

5% of children who have the flu have a rash.

Q: If the doctor finds a rash, what is the chance that the child has measles.