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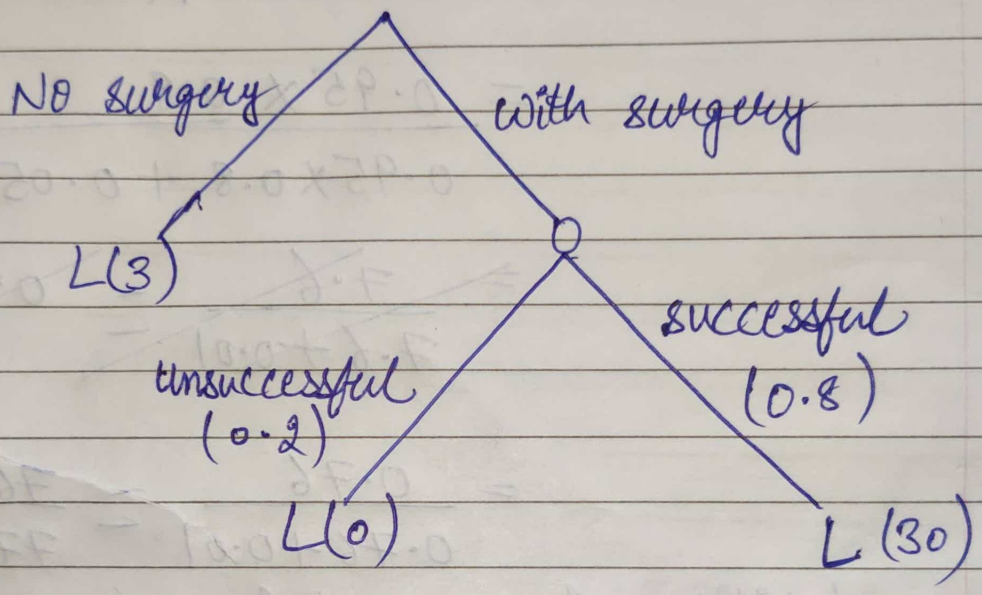
2020125

Machine Learning
Assignment-2
Section-A

Ans- (a) $L(x)$ denotes patient's living function where x represents number of days he will survive.

Decision Tree:



(b) Expected value of surgery:

$$E[\text{surgery}] = 0.8 \times L(30) + 0.2 \times L(0)$$

$L(30) = 1$ and $L(0) = 0$

So, $E[\text{surgery}] = 0.8$

This implies that if $L(3) < 0.8$, then surgery have to be performed.

Date

(c) We have to find P(Survive / test is +ve)
we can use Bayes's theorem here.

$$P(\text{Survive} / \text{test } +ve) = \frac{P(\text{test } +ve / \text{survive}) \times P(\text{Survive})}{P(\text{test } +ve / \text{survive}) \times P(\text{survive}) + P(\text{test } +ve / \text{Not Sur.}) \times P(\text{Not Sur.})}$$

$$= \frac{0.95 \times 0.8}{0.95 \times 0.8 + 0.05 \times 0.2}$$

$$= \frac{7.6}{7.6 + 0.01} = 0.998$$

$$= \frac{0.76}{0.76 + 0.01} = \frac{76}{77} = 0.987$$

Probability of successful surgery if test is +ve is 0.987.

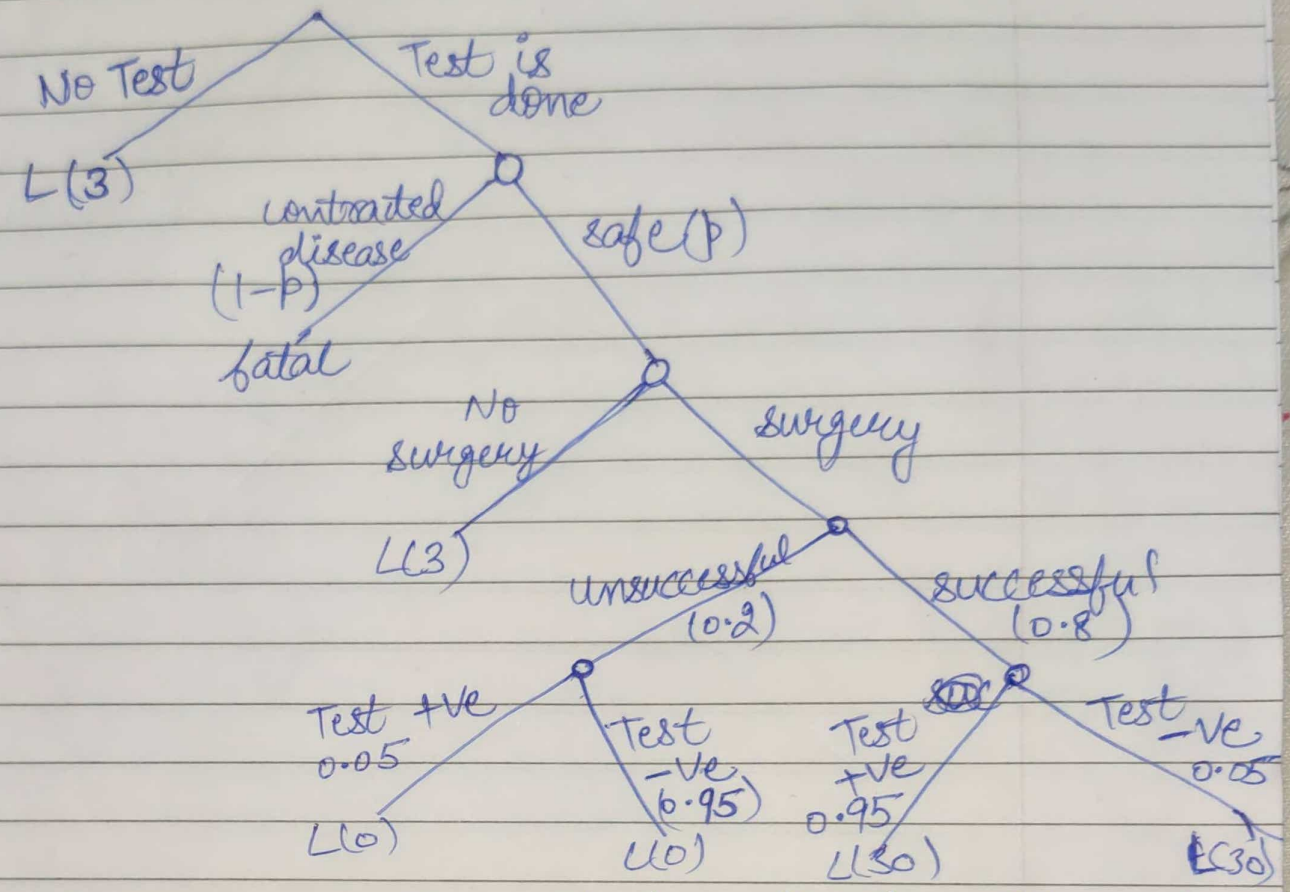
(d) If the person doesn't have surgery, then

$L(3) = 0.8$
and expected value is $0.8 \times 1 = 0.8$

Sive the result of test is positive and then probability that the person survives the surgery $= 0.987$.
Taking $L(30) = 1$,
expected value is $0.987 \times 1 = 0.987$

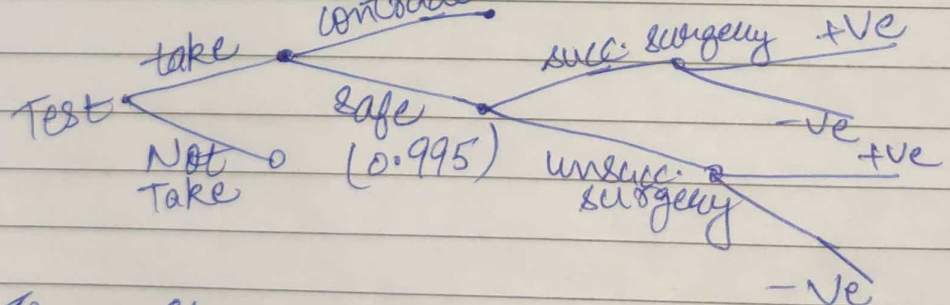
Since there are high chances of surviving, given test is positive, so surgery should be performed.

(e)



Here, I am assuming that patient will not have surgery without having test.

(f)



Since if a person take test and it turn out to be +ve, there is a very high prob. of his survival (0.987). Since contracting a disease prob. is very very low, compared to previous. So it is still recommended to conduct test before operation.