Problem Wk.10.1.3: Joint distributions

Part 1: JDist example

If `Disease` is defined as follows

`Disease = DDist({'disease' : 0.0001, 'noDisease' : 0.9999})`

and the testing conditional distribution ($PTgD$) is as it was specified in the previous problem, namely, that:

- *P(posTest | disease) = 0.98*, and that
- *P(posTest | noDisease) = 0.05*.

then what is the joint distribution (also see Section 7.3 of the course notes) of `Disease` and `Test`, that is, *P(Disease, Test)*?

Enter the probabilities below; use 6 decimal digits of precision:

1. DDist({
   ('noDisease', 'posTest'): [_____] ,
   ('disease', 'posTest'): [_____] ,
   ('noDisease', 'negTest'): [_____] ,
   ('disease', 'negTest'): [_____] })

Part 2: JDist marginalization example

Having made a joint distribution, we sometimes want to get rid of one of the variables by *marginalizing it out*. For example, marginalizing *B* out of *P(A, B)* yields the distribution *P(A)*, where

$$P(A = a) = \sum_b P(A = a, B = b)$$

1. What is the result of marginalizing `Disease` out of the joint distribution *P(Disease, Test)*?

   Enter the probabilities below; use 6 decimal digits of precision.

   DDist({'posTest': [_____] , ' negTest': [_____] })

6.01SC Introduction to Electrical Engineering and Computer Science

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