**Homework 1**

**Problem 1:**

Test Sensitivity (SS) of Tinel’s sign, Phalen’s test, and nerve conduction velocity test are”

SSa = 0.97, SSb = 0.92, SSc =0.93

Test Specificity (SP) of Tinel’s sign, Phalen’s test, and nerve conduction velocity test are:

SPa = 0.91, SPb = 0.88, SPc = 0.87

1. In serial manner: **SSs = 0.97\*0.92\*0.93 = 0.83**

**SPs = 0.91\*0.88\*0.87 = 0.697**

1. In parallel manner (at least 1 test having positive result given patient has carpal tunnel syndrome):

SSp = 0.97\*0.92\*0.93 + 0.97\*(1-0.92)\*(1-0.93) + (1-0.97)\*0.92\*(1-0.93) + (1-0.97)\*(1-0.92)\*0.93+ 0.97\*0.92\*(1-0.93) +0.97\*(1-0.92)\*0.93+(1-0.97)\*0.92\*0.93

**SSp= 0.99983**

Similarly, **SPp = 0.9906**

1. Assuming 1000 people are tested with 3 combined test with 50 patient carrying carpal tunnel syndrome (prevalence = 50/1000)

Sensitivity = TP/(TP+FN)

Specificity = TN/(TN+FP)

-In serial manner: TP + FN =50 and Sensitivity = 0.83 => TP = 41.5 and FN = 8.5

TN +FP = 950 and specificity = 0.697 => TN = 662.15 and FP = 287.85

PPV in series manner = TP /(TP+FP) = 0.126

Similarly, PPV in parallel manner = 0.8484

**Problem 2:**

Pr (Went Beach =0) = 0.6, Pr(Midterm =0\Went Beach =0) = 0.55

Pr(Finances =0\Went Beach =0) = 0.583

Pr(Friends Go =0\Went Beach =0) = 0.883

Pr(Forecast =0\Went Beach =0) = 0.283

Pr(Gender = 0\ Went Beach =0)= 0.616

1. Probability that Michael will not go to the beach with given conditions:

Prn = 0.55 \* 0.583 \* (1-0.883)\*(1-0.283) \*(1-0.616)\*0.6 = 0.619%

Pr= 0.495%

Probability that Michael will go P = 0.495/(0.495+0.619) =44.4% => He wont go

1. Meliisa

Prn = (1-0.55)\*(1-0.583)\*(1-0.283)\*0.883\*0.616\*0.6 = 4.39%

Pr = 9.126%

Probablity that Melissa will go

P = 9.126/(9.126+4.39) = 67.5% => Melissa will go to the beach

**Problem 3:**

1. Probability that student knows both of the answers is 0.8\*0.8 =0.64

Probability that students knows the answer of 1 question and correctly guess the other is 2\*0.8\*0.2\*0.25 = 0.08

Probability that students guesses correctly both the answers is (0.2\*0.25)^2 = 0.0025

Probability that student answers correctly both questions is

Pr = 0.64 +0.08 +0.0025 = 0.7225

1. If answering correctly, probability that student knows both of the answer is

Pr = 0.64/0.7225 = 0.8858

1. Generalized formula in case of n questions

Probability that student answers correctly n questions

Pr = =

Probability that student knows the answers of n questions given answering correctly n questions

Pr =

**Proof: Induction Method**

Assuming that the equation holds true for n: Proving that the equationis true in case of (n+1)

Probability that student answer correctly n questions and knowing the answer of (n+1)th question

Pr = 0.85n\*0.8

Probability that student answer correctly n questions and guess correctly the answer of (n+1)question :

Pr = 0.85n \*0.2\*0.25

Therefore, probability that student answers correctly n+1 questions:

Pr = 0.85n\*0.8 + 0.85n\*0.2\*0.25 = 0.85n+1Probabilities in (a) and (b) approach 0 as n approaches infinity.