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Course: CS 513

Exam: Midterm

#1 (10 Points)

Question 1

Is the following function a proper distance function? Why? Explain your answer. Measure the distance between (0, 0, 0) and (0, 1, 0)

𝒅(𝒙,𝒚) = Ʃ ((𝒙𝒊― 𝒀𝒊) 𝟐)

Answer:

A function should satisfy three conditions to be a proper distance function:

1. The distance should always be non-negative
2. The distance from A to B should be the same as the distance from B to A, Commutative
3. The distance from A to C must be less than or equal to the distance from A to B to C, Triangle Inequality

To test the given function 𝒅(𝒙,𝒚) = Ʃ ((𝒙𝒊― 𝒀𝒊) 𝟐)

Let us for example assume X is (3,4) and Y is (4,7) and Z is (5,4)

Condition 1: Distance of X Y = (( 3 - 4 )2 + (4-7)2) => 10

Therefore, it passes the first condition

Condition 2: Distance of Y X = (( 4- 3 )2 + (7-4)2) => 10

Therefore, it passes the Second condition

Condition 3: Since point Z is (5,4) , Distance of X Z = (( 3 - 5 )2 + (4-4)2) => 4

Distance of Y Z = (( 4- 5 )2 + (7-4)2) = 10

Therefore since X Z = 4 which is less than X Y + Y Z = 20

Therefore the given function is proper distance function

Distance between A(0,0,0) and B(0.1.0)

(( 0- 0 )2 + (0-1)2 + (0-0)2) => 0+1+0 => 1

#2 (15 Points)

Question 2

What are the chances that the employee will contract COVID while travelling?

Assume that the employee has traveled to Europe and contracted COVID, what   
is the probability that he/she traveled to England?

Answer:

Chance of employee going to a country

P(E) = 50% = 0.5

P(I) = 20% = 0.2

P(S) = 30% = 0.3

Chance of contracting covid in a country

P(C/E) = 1200/1,000,000 = 0.0012

P(C/I) = 1400/1,000,000 = 0.0014

P(C/S) = 1800/1,000,000 = 0.0018

Chances of Contracting Covid while employee travels

P(C) = P(C/E) \* P(E) + P(C/E) \* P(I) + P(C/S) \* P(S)

=> 0.0012 \* 0.5 + 0.0014 \* 0.2 + 0.0018 \* 0.3

**=> 0.00142**

**=> 0.142%**

Employee has traveled to Europe and contracted COVID Probability that he/she traveled to England

P(E/C) = ( P(C/E) \* P(E) ) / P(C)

=> ( (0.0012 \* 0.5) / **0.00142**)

**=> 0.4225**

**=> 42.25%**