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KDDM - MidTerm

Q1. Given points:

i. A = (0,0,0), B=(0,1,0)
ii. A = (0,1,0), B=(0,0,0)

The distance formula = $d(A,B) = ((x_2-x_1)^2+ (y_2-y_1)^2+ (z_2-z_1)^2)^{1/3}$

i. $d(A,B) = ((0-0)^2+ (0-1)^2+ (0-0)^2)^{1/3}$
   $= -1$
ii. $d(A,B) = ((0-0)^2+ (1-0)^2+ (0-0)^2)^{1/3}$

   $= 1$

Since the distance function must be non negative (d(x,y) >= 0), but here we get the distance as **-1** which violates the non negative property. Hence this is not a valid distance function.

Q2. Probability of travelling to England = P(E) = 0.5

Probability of travelling to Italy = P(I)=0.2

Probability of travelling to Spain = P(S)=1−P(E)−P(I)=0.3

Probability of contracting COVID in each country is proportional to prevalence:

P(C|E) = 1200/1000000 = 0.0012

P(C|I) = 1500/1000000 = 0.0015

P(C|S) = 1600/1000000 = 0.0016

Probability of contracting COVID while traveling:

Using the law of total probability:

P(C) = P(C|E) P(E) + P(C|I) P(I) + P(C|S) P(S)

= 0.0012 x 5 + 0.0015 x 0.2 + 0.0012 x 0.3

= 0.00138

So the probability that the employee contracts covid while travelling is **%0.138**

Given that the employee contracted COVID, what is the probability that they traveled to England

Using Bayes theorem

P(E|C) = P(C|E) x P(E) / P(C)

= 0.0012 x 0.5 / 0.00138

= 0.4348

So, given that the employee contracted COVID, the probability that they traveled to England is **43.48%**.