

Challenging problems

Annu-EE21RESCH01010

Download latex code from here-

[https://github.com/annu100/AI5002-Probability-and-Random-variables/tree/main.tex/challenging problems](https://github.com/annu100/AI5002-Probability-and-Random-variables/tree/main.tex/challenging%20problems)

I. CHALLENGING PROBLEM 9

Two points are chosen on a line of unit length. Find probability that each of 3 line segments have length greater than $1/4$ is.....

II. SOLUTIONS

Imagine choosing one point P_1 , and then a second point P_2 . We assume that "at random" means here that the distributions of X and Y are uniform on $[0,1]$ and that P_1 and P_2 are independent.

We want the probability that $1/4 \geq P_1 \leq 3/4$ and $1/4 \geq P_2 \leq 3/4$ and subtraction of P_1 and $P_2 \geq 1/4$.

Draw the usual square. Draw the line $x=1/4$, $x=3/4$, $y=1/4$, $y=3/4$. By Looking at the K square bounded by these lines.

Drawing the two lines subtraction of P_1 and P_2 is $\pm 1/4$.

We want to find the probability that (P_1, P_2) lands in the part of K that is not between these two lines. That consists of two isosceles right-angled triangles.

Each of these triangles has legs $1/4$, so their combined area is

$$\frac{1}{16}$$