

Monte Carlo Simulations (MA323) Lab 4

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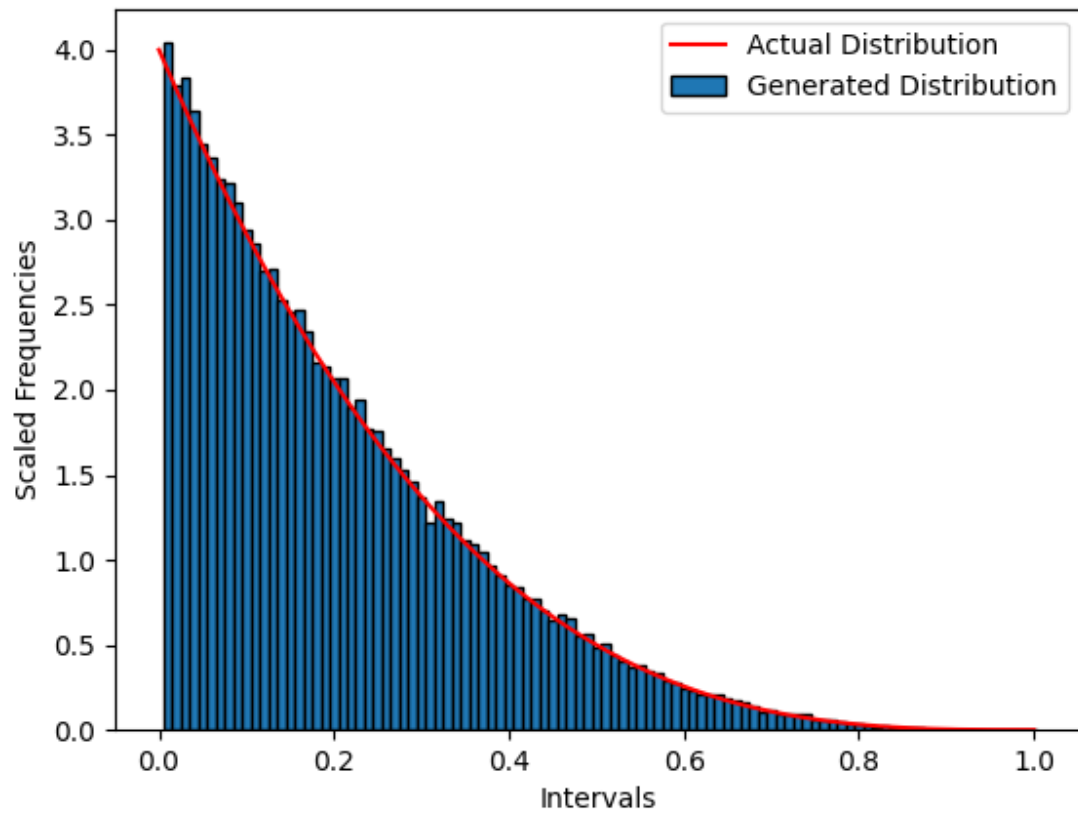
Roll no - 180123021

Beta Distribution :

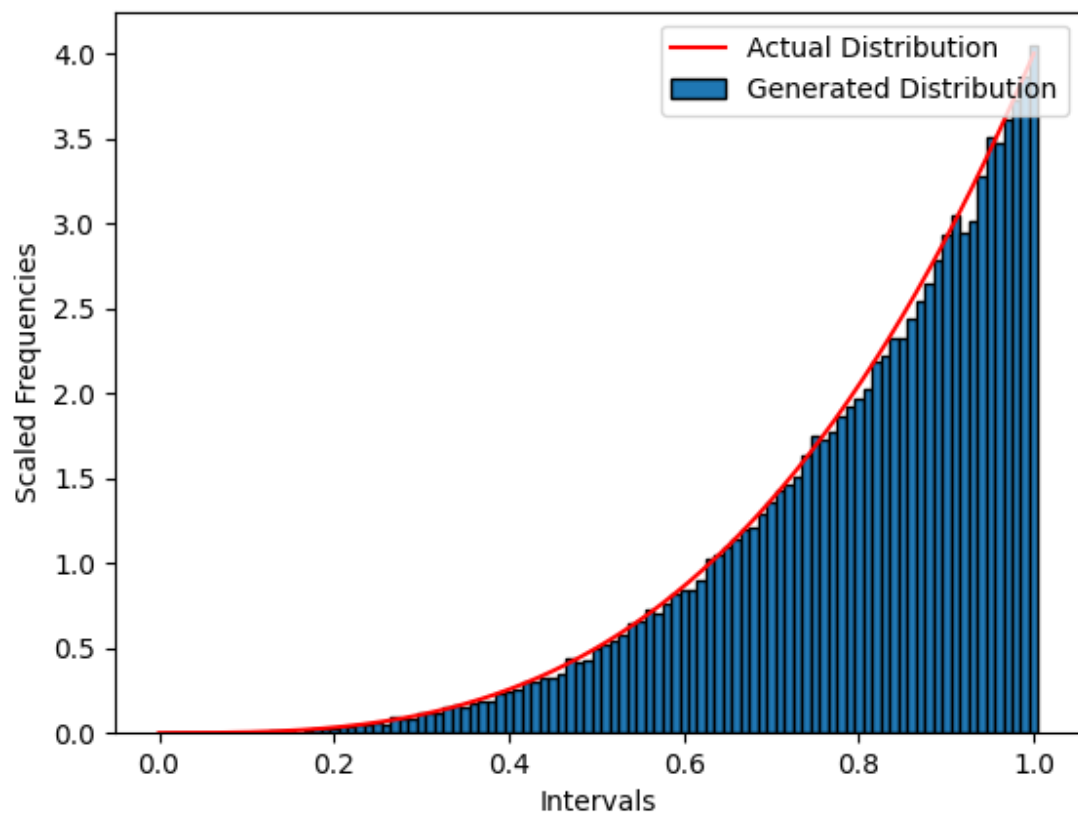
$$f(x) = (1/B(\alpha_1, \alpha_2)) * (x^{\alpha_1-1}) * ((1-x)^{\alpha_2-1})$$

- 1) 5 sets of values of (α_1, α_2) chosen are:
 - a) (1, 4)
 - b) (4, 1)
 - c) (3, 3)
 - d) (2, 4)
 - e) (4, 2)
- 2) The values of x^* for these pairs are calculated using $x^* = (\alpha_1 - 1)/(\alpha_1 + \alpha_2 - 2)$. The calculated values are -
 - a) $x^* = 0$ for (1, 4)
 - b) $x^* = 1$ for (4, 1)
 - c) $x^* = 0.5$ for (3, 3)
 - d) $x^* = 0.25$ for (2, 4)
 - e) $x^* = 0.75$ for (4, 2)
- 3) The values of c are calculated using $c = f(x^*)$. The calculated values are
 - a) $c = 4$ for (1, 4)
 - b) $c = 4$ for (4, 1)
 - c) $c = 1.875$ for (3, 3)
 - d) $c = 2.109375$ for (2, 4)
 - e) $c = 2.109375$ for (4, 2)
- 4) The Beta Distribution is generated using the acceptance-rejection method for these pairs, keeping $f(x)$ to be the Beta Distribution and $g(x)$ to be the Uniform Distribution. The implementation could be found in 180123021_Kartikeya_Singh.py
- 5) The histograms generated are given below -

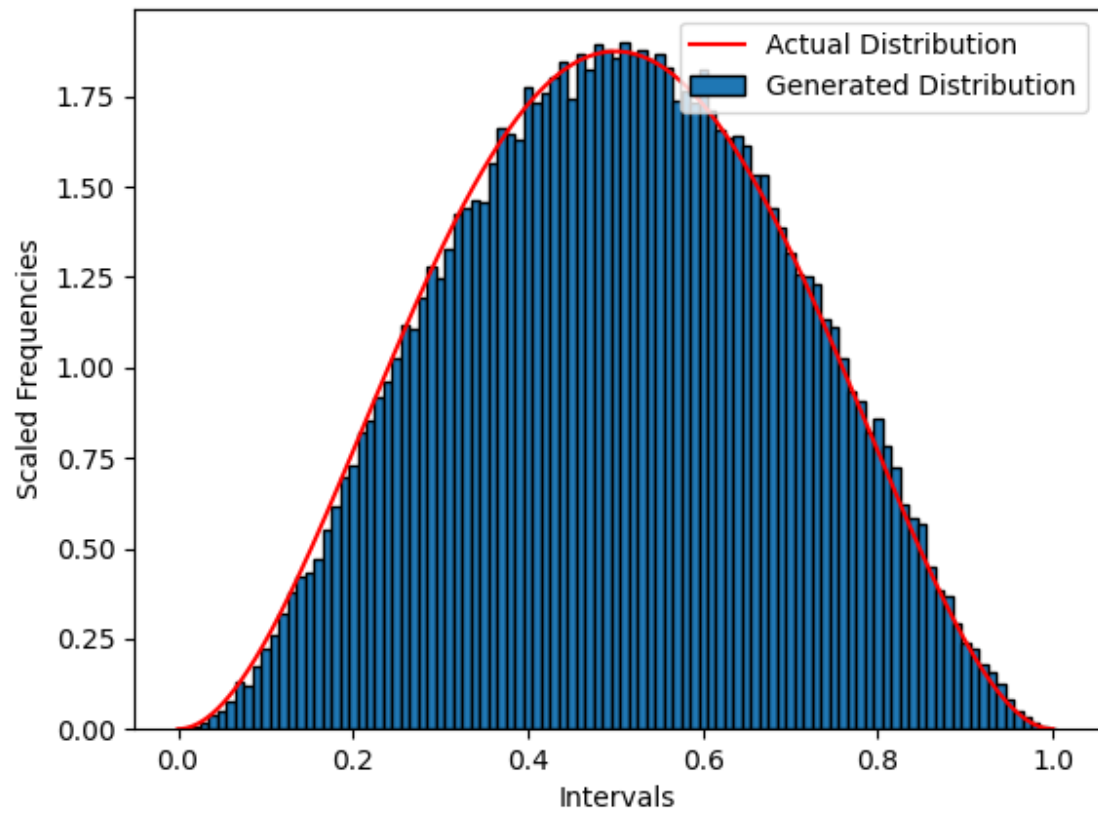
Beta Distribution for $a_1 = 1, a_2 = 4$



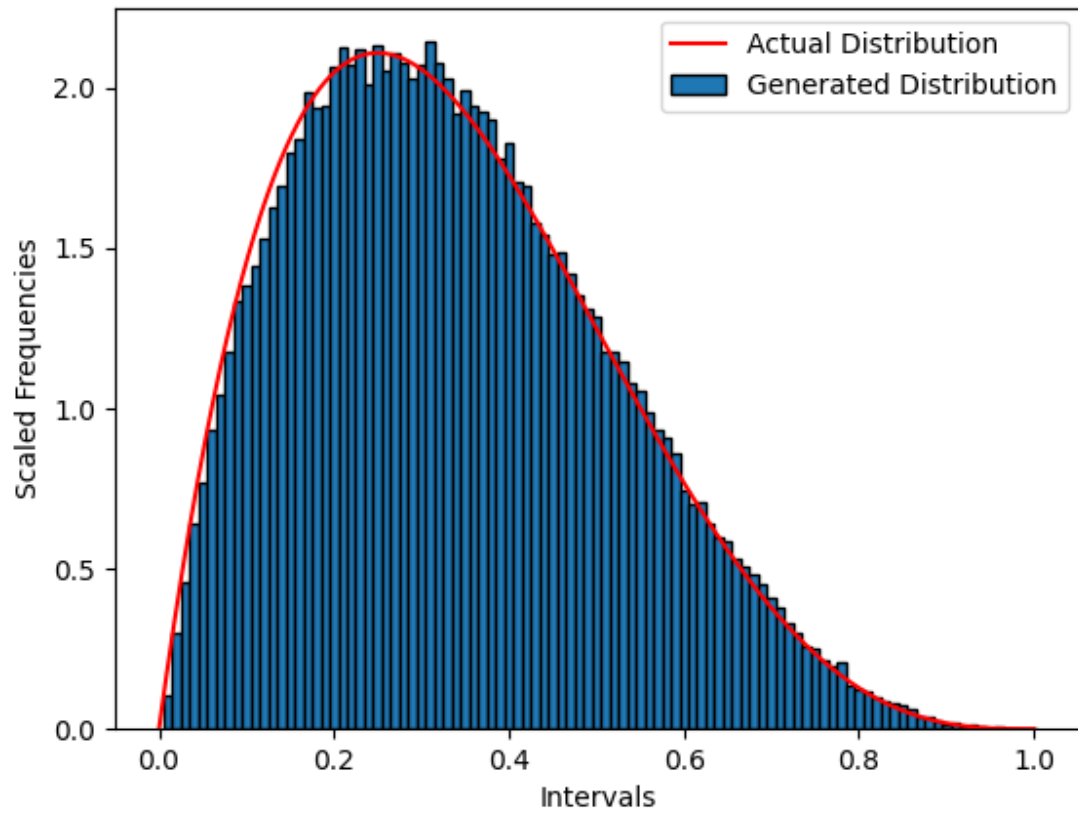
Beta Distribution for $a_1 = 4, a_2 = 1$



Beta Distribution for $a_1 = 3$, $a_2 = 3$



Beta Distribution for $a_1 = 2$, $a_2 = 4$



Beta Distribution for $a_1 = 4$, $a_2 = 2$

