AI5002 - Assignment 5

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Download code and LaTeX from below hyperlinks
1. Codes/MiscellaneousDistributions_5_31.py
2. LaTeX

***Problem* 5.31**

Two cards are drawn simultaneously (or successively without replacement) from a well shuffled pack of 52 cards. Find the mean, variance and standard deviation of the number of kings.

Solution

Let X be a random variable.
X = Number of kings present in the two cards drawn from a well shuffled pack of 52 cards.

The values that X can have are = $\{ 0, 1, 2 \}$.
The probability of X taking each of the above values are -

$$P(X=0) = \frac{\binom{48}{2}}{\binom{52}{2}} = \frac{188}{221} \approx 0.851 \tag{0.0.1}$$

$$P(X=1) = \frac{\binom{4}{1} * \binom{48}{1}}{\binom{52}{2}} = \frac{32}{221} \approx 0.145 \tag{0.0.2}$$

$$P(X=2) = \frac{\binom{4}{2}}{\binom{52}{2}} = \frac{1}{221} \approx 0.004 \tag{0.0.3}$$

The Mean calculated as E(X) is given by,

$$E(X) = \sum X.P(X) \tag{0.0.4}$$

$$= 0 * \frac{188}{221} + 1 * \frac{32}{221} + 2 * \frac{1}{221}$$

$$= \frac{34}{221} \approx 0.154$$

$$E(X^2) = \sum X^2 .P(X)$$

$$= 0^2 * \frac{188}{221} + 1^2 * \frac{32}{221} + 2^2 * \frac{1}{221} = \frac{36}{221}$$

The Variance calculated as Var(X)is given by,

$$Var(X) = E(X^2) - [E(X)]^2 \tag{0.0.5}$$

$$= \frac{36}{221} - \left[\frac{34}{221}\right]^2 = \frac{6800}{48841} \approx 0.139$$

The Standard-Deviation calculated as SD(X) is given by,

$$SD(X) = \sqrt{Var(X)} = \sqrt{0.139} \approx 0.373 \tag{0.0.6}$$

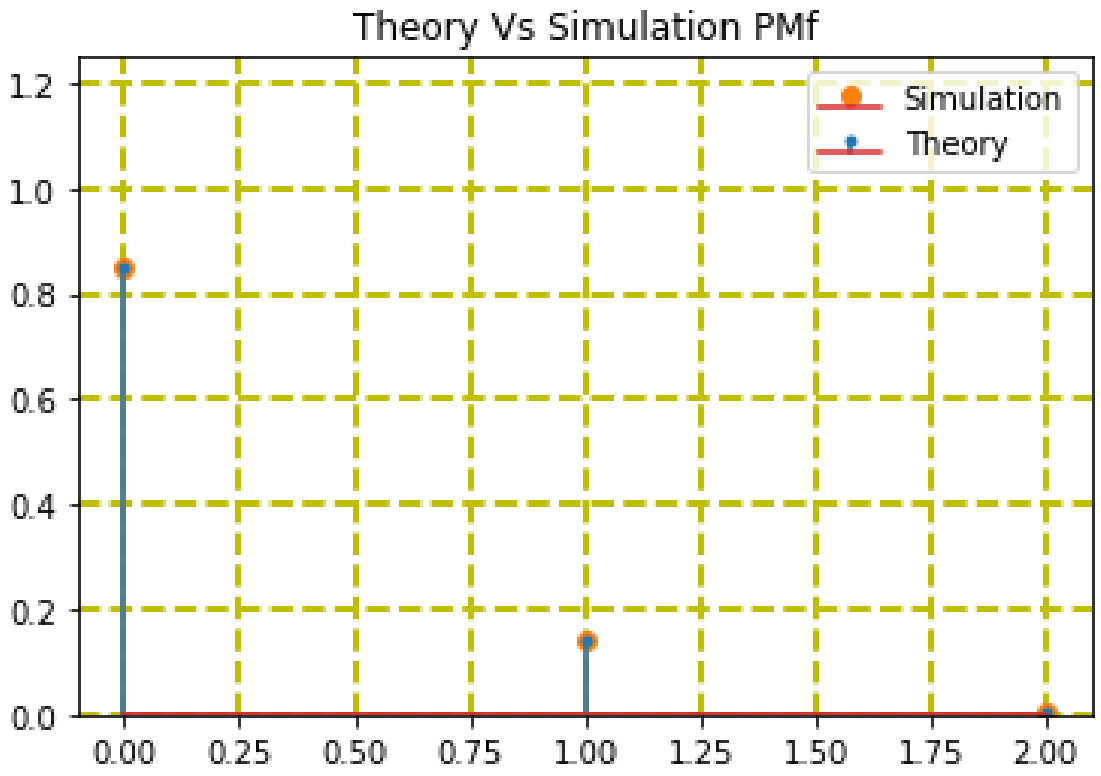

Fig 1.1: Theory Vs Simulation of PMf

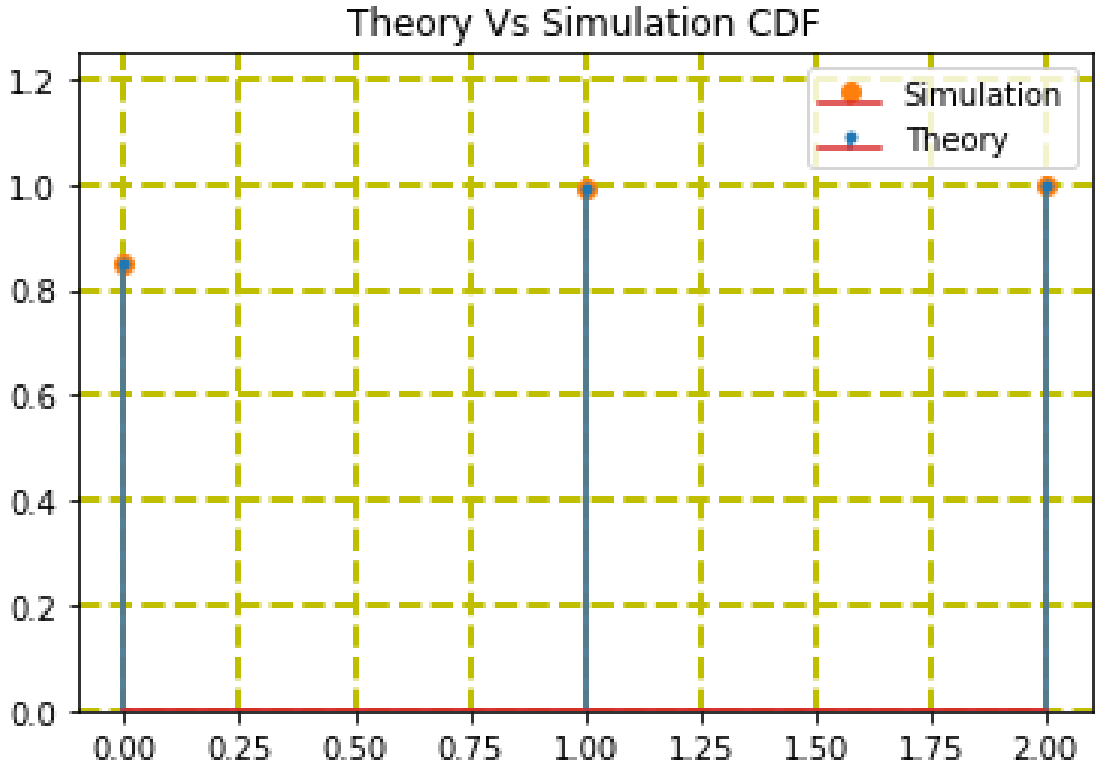

Fig 1.2: Theory Vs Simulation CDF