Assignment 2

AI1110 : Probability and Random Variables
Indian Institute of Technology Hyderabad

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Problem 11.16.4.6 : Three letters are dictated to three persons and an envelope is addressed to each of them, the letters are inserted into the envelopes at random so that each envelope contains exactly one letter. Find the probability that at least one letter is in its proper envelope.

Solution: Let L_1,L_2,L_3 be three letters and E_1,E_2,E_3be their corresponding envelops respectively. There are 6 ways of inserting 3 letters in 3 envelops. These are as follows:

$$L_1E_1, L_2E_3, L_3E_2 \tag{1}$$
$$L_2E_2, L_1E_3, L_3E_1 \tag{2}$$
$$L_3E_3, L_1E_2, L_2E_1 \tag{3}$$
$$L_1E_1, L_2E_2, L_3E_3 \tag{4}$$
$$L_1E_2, L_2E_3, L_3E_1 \tag{5}$$
$$L_1E_3, L_2E_1, L_3E_2 \tag{6}$$

There are 4 ways in which at least one letter is inserted in a proper envelope.
Thus the required probability is $\frac{4}{6} = \frac{2}{3}$.

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