**National University of Computer & Emerging Sciences, Karachi Computer Science Department**

**Summer 2023, Lab Manual – 08**

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| **Course Code: AI-2002** | **Course: Artificial Intelligence Lab** |
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**Lab Tasks**

**Write Python Program for each task, create sample space and calculate the probability and show the output.**

1. A die is loaded in such a way that an even number is twice as likely to occur as an odd number. If E is the event that a number less than 4 occurs on a single toss of the die, find P (E).
2. An insurance company insured 2000 scooter drivers, 4000 car drivers, and 6000 truck drivers. The probability of an accident involving a scooter driver, car driver, and a truck is 0.01, 0.03, and 0.015 respectively. One of the insured persons meets with an accident. What is the probability that he is a scooter driver?
3. A bag contains 10 red marbles and 20 blue marbles. If you draw a marble at random, what is the probability that it is red given that it is blue? This is an example of conditional probability because we are given that the marble is blue, and we want to find the probability that it is red.
4. Write Python Program for each task, create sample space and calculate the probability and show the output.

*A manufacturing firm employs three analytical plans for the design and development of a particular product. For cost reasons, all three are used at varying times. In fact, plans 1, 2, and 3 are used for 30%, 20%, and 50% of the products, respectively. The defect rate is different for the three procedures as follows: P(D|P1)=0.01, P(D|P2)=0.03, P(D|P3)=0.02, where P(D|Pj ) is the probability of a defective product, given plan j. If a random product was observed and found to be defective, which plan was most likely used and thus responsible?*

1. Develop a **Dynamic Bayesian network** with the following structure and conditional probability distributions using pgmpy library. Perform inference to find the probability of C at time step 2 given evidence of A=1 at time step 1 and B=0 at time step 2 using VariableElimination algorithm.

* P(A) = [0.6, 0.4]
* P(B|A) = [[0.8, 0.2], [0.3, 0.7]]
* P(C|B) = [[0.9, 0.1], [0.2, 0.8]]
* P(D|B) = [[0.7, 0.3], [0.4, 0.6]