**Practice Problem SET-2**

1. Of the students at a certain college, 50% regularly attend the football games, 30% are first-year students and 40% are upper-class students (i.e., non-first years) who do not regularly attend football games.

a. What is the probability that a student selected at random is both is a first-year student and regularly attends football games?

b. What is the conditional probability that the person chosen attends football games, given that he/she is a first year student?

c. What is the conditional probability that the person is a first year student given that he/she regularly attends football games?

Answer:

P(A) = 0.50 → Probability that a student regularly attends football games

P(F) = 0.30 → Probability that a student is a first-year student

P(U∩A’) = 0.40 → Probability that a student is an upper-class student who does not attend football games

Since a student is either a first-year student (F) or an upper-class student (U):

P(F)+P(U)=1

0.30+P(U)=1

⇒P(U)=0.70

Find P(U∩A’)

P(U∩A)+P(U∩A’)=P(U)

P(U∩A)+0.40=0.70

P(U∩A)=0.30

1. Find P(F∩A)

Since the total probability of attending football games is **50%**, we use:

P(A)=P(F∩A)+P(U∩A)

0.50=P(F∩A)+0.30

P(F∩A)=0.20

1. P(A/F)
2. P(F/A)

2. Using Genetic algorithm find the minimum distance route.

1. **Initialize a Population**
   * Generate random six routes (permutations of cities).
2. **Evaluate Fitness**
   * Calculate the total distance of each route (shorter distances = better fitness).
3. **Selection (Survival of the Fittest)**
   * Choose the best routes for crossover.
4. **Crossover (Recombination)**
   * Create new routes by combining parts of two parents.
5. **Mutation**
   * Randomly swap two cities in a route to introduce diversity.
6. **Repeat Until Stopping Condition** (4 iterations)
   * The algorithm runs for a fixed number of generations or until convergence.

Distance Matrix: (A, B, C, D, E) are five cities.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | A | B | C | D | E |
| A | 0 | 2 | 9 | 10 | 7 |
| B | 2 | 0 | 6 | 4 | 3 |
| C | 9 | 6 | 0 | 8 | 5 |
| D | 10 | 4 | 8 | 0 | 6 |
| E | 7 | 3 | 5 | 6 | 0 |

3. Using Simulated Annealing find the minimum value of the function:

f(x)=x2+10 sin(x) for x in the range [−10,10].

Consider initial temperature as 100.

Cooling factor is 10%.

Initial x value is 1.

For every iteration varied the x value in the accuracy of +or-2