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:

$P(A) = 0.50 \rightarrow$ Probability that a student regularly attends football games

$P(F) = 0.30 \rightarrow$ Probability that a student is a first-year student

$P(U \cap A') = 0.40 \rightarrow$ 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):

$P(F)+P(U)=1$

$0.30+P(U)=1$

$\Rightarrow P(U)=0.70$

Find $P(U \cap A')$

$P(U \cap A)+P(U \cap A')=P(U)$

$P(U \cap A)+0.40=0.70$

$P(U \cap A)=0.30$

1. Find $P(F \cap A)$

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

$P(A)=P(F \cap A)+P(U \cap A)$

$0.50=P(F \cap A)+0.30$

$P(F \cap A)=0.20$

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:

$f(x)=x^2+10\sin(x)$ 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