**D1**

The fission–fusion society is one in which the size and composition of the social group change as time passes and animals move throughout the environment; animals merge into a group (fusion)—e.g. sleeping in one place—or split (fission)—e.g. foraging in small groups during the day. For species that live in fission–fusion societies, group composition is a dynamic property. The change in composition, subgroup size, and dispersion of different groups are 3 main elements of a fission-fusion society.

**D2**

The competition for food among the group members of parent group when there is a shortage of food due to seasonal changes lead to fission into many groups and then fusion into a single group. When there is high availability of food then the group is largest whereas, in case of the smallest group, the food scarcity is at its peak. Fission part shows the food foraging behavior of spider monkeys and fusion represents combining of smaller groups to become a larger one.

**D3 Foraging Behavior of Spider Monkeys:**

Spider monkeys live in the tropical rain forests of Central and South America and exist as far north as Mexico. Spider monkeys are among the most intelligent New World monkeys. They are called spider monkeys because they look like spiders when they are suspended by their tails. Spider monkeys always prefer to live in a unit group called ‘parent group’. Based on the food scarcity or availability they split themselves or combine. Communication among them depends on their gestures, positions and whooping. Group composition is a dynamic property in this structure.

**D4**

The social organization and behavior of spider monkeys can be understood through the following facts:

1. Spider monkeys live in a group of about 40-50 individuals.
2. All individuals in this community forage in small groups by going off in different directions during the day and everybody share the foraging experience in the night at their habitat.
3. The lead female spider monkey decides the forage route.
4. If the leader does not find sufficient food then she divides the group into smaller groups and these groups forage, separately.
5. Individuals of the society might not be noticed closer at one place because of their mutual tolerance among each other. When they come into contact their gestures reflect that they are actually part of a large group.

**D5**

**Diagrama

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**D6 Spider Monkey Optimization Process:**

SMO is a meta-heuristic technique inspired by the intelligent foraging behavior of spider monkeys. The foraging behavior of spider monkeys is based on the fission-fusion social structure. Features of this algorithm depend on social organization of a group where a female leader takes decision whether to split or combine.

**D7**

The leader of the entire group is named here as the global leader while the leaders of the small groups are named as local leaders. With reference to the SMO algorithm, the phenomenon of food scarcity is defined by no improvement in the solution. Since SMO is a swarm intelligence based algorithm, each small group should have a minimum number of monkeys. Therefore, at any time if a further fission creating at least one group with less than the minimum number of monkeys, we define it as the time for fusion. In SMO algorithm, a Spider Monkey (SM) represents a potential solution.

**D8**

SMO consists of six phases: Local Leader phase, Global Leader phase, Local Leader Learning Phase, Global Leader Learning phase, Local Leader Decision phase and Global Leader Decision phase. All these phases of SMO are explained next:

**D9 Initialization**

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**D10 Local Leader Phase (LLP):**

Here, all spider monkeys get chance to update themselves. Modification in the position of spider monkey is based on its local leader and local group members’ experiences. The fitness value of each spider monkey is calculated at its new position and if fitness is higher than that of its old one, it gets updated otherwise not. Here, position update equation is:

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