Artificial Bee Colony (ABC) algorithm and Clustering

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Outline

1 Artificial Bee Colony (ABC)

2 Clustering

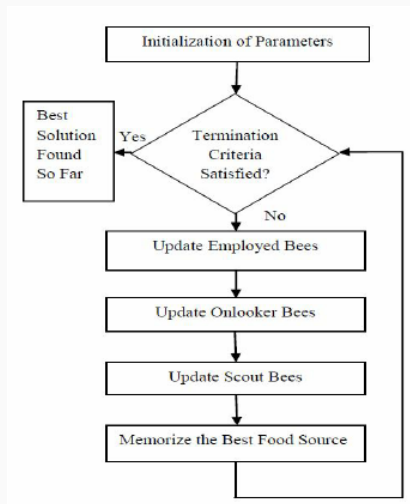# Outline

Phases

Figure 1: Phases of ABC algorithm Source: Kumar, S.,et al. (2014)

Initialization

```
1. Data
2. Generate the initial solution
3. Evaluate the nectar (fitness)
```

Parameters:

- The number of initial food sources *SN*

Simulation:

- Initial solution input
- Initial food sources

Employed bees

```
4. While (Condition not met){
5. For each employed bee{
     Produce new solution
     Greedy selection }
```

Finding neighbour

$$\nu_{ij} = z_{ij} + \phi_{ij}(z_{ij} - z_{kj})$$

Employed bees

```
4. While (Condition not met){
5. For each employed bee{
     Produce new solution
     Greedy selection }
```

Calculate fitness

$$fit_i = \frac{1}{1/f_i}$$

Onlooker bees

```
6. Calculate the probabilities of solution
7. For each onlooker bee{
    Select a solution using probabilities
    Produce new solution
    Greedy selection }
```

Calculate probabilities

$$p_i = \frac{fit_i}{\sum_{i=1}^{SN} fit_i}$$

Scout bees

```
8. Abandon non-improving solution
9. Replace it with new solution
```

Parameter:

- The limit

Scout bees

```
8. Abandon non-improving solution
9. Replace it with new solution
```

Parameter:

- The limit

Finding new solution

$$z_i^j = z_{min}^j + \delta_i^j(z_{max}^j - z_{min}^j)$$

```
10. Record the best solution }
11. End
```

Parameters:

- Maximum number of iterations
- Maximum number of unimproved global minimum

Outline

Adjustment

Solution representation:

$k \times D$ matrix

Adjustment

Solution representation:

$k \times D$ matrix $\Rightarrow$ vector

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Standardization

$z_{ij}^* = \frac{z_{ij}}{\max_j |z_{ij}|}$

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Initialize different foods sources

- Evenly assigned across the solution space $\times$
- Randomly sample between bounds $\times$

Adjustment

Solution representation:

$k \times D$ matrix $\Rightarrow$ vector

Standardization

$z_{ij}^* = \frac{z_{ij}}{\max_j |z_{ij}|}$

Initialize different foods sources

- Evenly assigned across the solution space $\times$
- Randomly sample between bounds $\times$
- Sample from the existing data points

Kumar, S., Sharma, V. K., & Kumari, R. (2014).
Randomized memetic artificial bee colony algorithm.
arXiv preprint arXiv:1408.0102.