**ARTIFICIAL BEE COLONY ALGORIHTM**

The Artificial Bee Colony (ABC) algorithm is a swarm-based meta-heuristic algorithm for optimizing numerical problems and was inspired by the intelligent foraging behavior of honey bees.

The model consists of four essential components:

**Food Sources** are representative of solutions to the problem being solved. Each food source produces nectar proportional to the fit of the solution to the problem.

**Employed bees** search for new food sources that have more nectar than previous food sources within the neighborhood of the previous food source. This search is random but leverages the known information from other food sources.

**Onlooker bees** watch the waggle dance of the employed bees and learn the food source locations. In practice, this is achieved using a Roulette Wheel Selection Algorithm, which results in the selection of food locations that have higher nectar with greater probability.

**Scout bees** choose their food sources randomly to replace abandoned food sources that cannot be improved any further over a predetermined number of trails.

**Initialization Phase**

In the initialization phase, we generate enough food sources for each of the employed bees.The bees are distributed in the solution space, having been generated randomly.

**Employed Bee Phase**

The employed bee phase consists of each of the bees going out exploring a food source. In the process, the bees explore the neighborhood and, if they find a food source with more nectar, their food source gets replaced by the newer, better food source.

**Onlooker Bee phase**

The employed bees then return home and begin their waggle dance. Each onlooker bee perceives, with some error, the amount of nectar that each bee got from its food source. So, each onlooker bee, according to their perception of the nectar produced by the food source, will pick that food source. The higher the nectar, the more probable it is that the onlooker bee will pick it.

The onlooker bees can be thought of as providing extra exploration around the most promising food sources. Essentially, they do the same thing as the employed bees but are more concentrated around promising food sources. So, while the employed bees ensure that we do not abandon solutions too soon, the onlooker bee phase facilitates the rapid development of the best food sources. This way, we can converge faster as well as keep our avenues open.

**Scout Bee Phase**

When the neighborhood of the food source has been explored enough, it is abandoned. Every time a food source is explored, we increment the trial counter. When the trial count exceeds the maximum configured value, we delete it from the array of food sources, as shown in the image below, and find a new, random food source.

**FLOWCHART:**

