Incorrect acceptance and rejection ratio numbers are more common in the usual form of the membership function because of the membership function's continuous weight. Here,  ABC method is used to determine the layout of the membership subdomain plane by optimization of the membership function weight value. Artificial bee colony (ABC) algorithm was proposed in 2005 by Karboga [31] to find a solution to optimization problems and is an algorithm focused on swarm intelligence influenced by the collective action of social insect’s communities. Here, ABC is divided into two groups, which consists of workers and non-worker bees. Non worker bees again are divided into onlooker and scout bees. The first half of ABC's colony is made up of worker bees, while the second half is made up of onlookers. The amount of worker bees or onlooker bees is proportional to the amount of population solutions, and the food supply locations indicate a possible solution to the optimization issue.

Based on the social behaviour of creatures in swarms like birds and fish, PSO is a strong optimization approach that may be applied to a wide range of problems. Unintelligent people may have the ability to form large global organisations, according to the theory. This approach of optimization relies on the cooperation of individuals. The swarm's individual members are only aware of their immediate surroundings in terms of location and speed. To solve a problem, each particle alters its own behaviour and the behaviour of its neighbours in order to develop a solution. Particles may progressively converge on the solution of the issue by following basic shifting rules in the solution space.

Eventually, at each given point in time t, each particle i has a location xi(t) in the space of potential solutions, which changes by a velocity at time t+1. Particle velocity vi(t) is determined by the best position yi(t) it has ever been to, as well as the best location all particles have ever been to (we called it global best). The locations are assessed using a fitness function that relies on the optimization issue and K the space dimension.



 is constantly updated based on this formula:



The optimimum position visited by all the particles till the time t, z(t) will be found at time t with the below equation



where  indicates number of particles.

The velocity  of the particle i at the time t updated using the below equation.

Ant colony optimization (ACO) was initially proposed in 1997 by Dorigo and Gambardell [11] to solve optimization issues like the travelling salesman problem. The method was derived from real-world research and observations of ant colonies. An ant colony's survival is more important than the survival of a single individual or a subgroup of the colony, according to the research. It is the way ants look for food that sets them apart from other insects. To choose the most efficient route, they look for the most direct route between the food source and their nest. To some extent, this behaviour may be traced back to an ant population's use of random behaviour as part of a larger collective intelligence. There is no direct connection between them, but simply indirect communication. However, even though the material is swiftly evaporated, for brief periods of time, it may be seen on the ground as a trail of ants and the course that they have travelled. The ant pheromone is one example. It's all about the pheromones. An ant traces the road that has been travelled the most by other ants, and concludes that this most frequented trail is the ideal place to look for food because of this. It is possible to discover the best answer or the best route by using this basic method.