Chapter 11

Newly Developed Nature–Inspired Algorithms and their Applications to Recommendation Systems

Utku Köse  
Usak University, Turkey

ABSTRACT

Because of their mathematical backgrounds and coherent structures, Artificial Intelligent-based methods and techniques are often used to find solutions for different types of problems encountered. In the related context, nature-inspired algorithms are also important for providing more accurate solutions. Because of their nature-based, flexible process structures, the related algorithms can be applied to different types of problems. At this point, recommendation systems are one of the related problem areas where nature-inspired algorithms can be used to get better results. In the literature there are many research studies that are based on using nature-inspired algorithms within recommendation systems. This chapter aims to discuss usage of some newly developed nature-inspired algorithms in typical recommendation systems. In this aim, features and functions of some new nature-inspired algorithms will be explained first. Later, using the related algorithms in recommendation systems will be discussed. Following that, there will be a discussion on future of nature-inspired algorithms and also their roles in the recommendation approach or system-based applications.

INTRODUCTION

Today, in the field of Computer Science, there is a remarkable research effort especially on solving real world based challenging, difficult problems. At this point, different types of intelligent approaches, methods, and techniques are designed and developed to find necessary solutions for the related problems. In this context, nature-inspired algorithms have also an important role on finding optimal solutions by using more advanced approaches, which were developed according to some dynamics, functions, or events that are occurred within the nature.
Because of obtained successful results, there has been an increasing interest on nature-inspired algorithms and currently, there is also a big effort on designing and developing newer ones that aim to find better solutions for encountered problems. Some popular algorithms like Particle Swarm Optimization (PSO), Ant Colony Optimization (ACO), and Artificial Bee Colony (ABC) are already applied to different types of problems to get better results. Additionally, some researchers also try to improve features and functions of these algorithms to obtain more optimal results. But on the other hand, some researchers also design more effective and efficient algorithms that provide more optimal and accurate calculation approaches rather than the mentioned ones. As a result of the related studies, some newer algorithms like River Formation Dynamics (RFD) Algorithm, Intelligent Water Drops (IWDs) Algorithm, Gravitational Search Algorithm (GSA), Firefly Algorithm and Charged System Search (CSS) Algorithm have taken place in the related literature.

As mentioned before, nature-inspired algorithms are used for solving real-world based difficult, challenging problems. However, as different from real-world based problems, the related algorithms can also be used within different user-based systems or environments. For instance, recommendation systems are one of these environments that nature-inspired algorithms can be used to provide better experiences for users.

In this chapter, some newly developed nature-inspired algorithms and their using in recommendation systems will be discussed. In this sense, objectives of the chapter can be listed as below:

- Introducing features and functions of some newly developed nature-inspired algorithms.
- Showing how nature-inspired algorithms can be used within recommendation systems.
- Discussing about the future of nature-inspired algorithms and their roles on applications associated with recommendation approaches or systems.

**SOME NEWLY DEVELOPED NATURE-INSPIRED ALGORITHMS**

As it was mentioned before, there is an increasing interest and effort on developing newer and more effective nature-inspired algorithms in recent years. The related researchers, who try to develop new algorithms, aim to provide more accurate and efficient approaches in order improve process performances in finding optimal solutions. In this sense, three of these newly developed nature-inspired algorithms will be explained in this section. Before discussing about applications on recommendation systems, it is better to introduce basics and working mechanisms of the related algorithms.

**Intelligent Water Drops (IWDs) Algorithm**

In general terms, Intelligent Water Drops (IWDs) Algorithm is a nature-inspired algorithm, which is based on the observation of the behavior of water drops. It is an algorithm, which was developed on the dynamic of a natural river system, reactions, and actions that happen among water drops in a natural river (Shah-Hosseini, 2007, 2008, 2009).

In the nature, it can be seen that natural rivers have many different turns and twists along their paths and at this point, it can be thought that why these turns and twists are created and is there any logic or some kind of intelligence behind them? Furthermore, it can also be thought that is it possible to design and develop intelligent algorithms according to the related mechanisms within natural rivers? All of these thought have been starting point for Shah-Hosseini to design and develop IWDs algorithm. IWDs Algorithm tries to model the related mechanisms in a natural river and implement them in an algorithm structure. Within the algorithm, intelligent water drops
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