

Chapter 8

Nature-Inspired Techniques for Data Security in Big Data

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ABSTRACT

Inspired computing is based on biomimicry of natural occurrences. It is a discipline in which problems are solved using computer models which derive their abstractions from real-world living organisms and their social behavior. It is a branch of machine learning that is very closely related to artificial intelligence. This form of computing can be effectively used for data security, feature extraction, etc. It can easily be integrated with different areas such as big data, IoT, cloud computing, edge computing, and fog computing for data security. The chapter discusses some of the most popular biologically-inspired computation algorithms which can be used to create secured framework for data security in big data like ant colony optimization, artificial bee colony, bacterial foraging optimization to name a few. Explanation of these algorithms and scope of its application are given. Furthermore, case studies are presented to help the reader understand the application of these techniques for security in big data.

INTRODUCTION

Biologically inspired computing, better known as Bio-inspired computing is a discipline in which problems are solved using computer models which derive their abstractions from real-world living organisms and their social behavior. It can be considered a branch of Machine Learning which is very closely related to artificial intelligence. Its foundation is based upon the subjects of Computer Science, Biology

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and Mathematics. Thus, Bio-inspired computing can go a long way in studying the diverse patterns and variations found among living beings which can be used to build better computer systems for solving complex problems in the future.

This form of computing can be effectively used for extracting a limited number of distinguishing features for a set of data which may have many irrelevant data features. It is also helpful in situations where the Classical Methods of Computation can be put to limited use only, like in cases involving pattern recognition in a data set which may have incomplete or vague information. It is also has an edge over the Classical Methods of Computation where the system needs to adapt itself to changes and variations over a period of time. In other words, it is more adaptive compared to its rather rule-bound counterpart (Sekhar, Bysani, & Kiranmai, 2018), Bio Inspired computing is a sub branch of machine learning can be implement using various languages. (Sekhar, & Siddesh, 2018).

Some of the most popular Biologically inspired Computation algorithms covered under this section involve methods like Neural Networks, Artificial Bee Colony, Genetic Algorithm, Particle Swarm Optimization, Ant Colony Optimization, Bacterial Foraging Optimization, Cuckoo Search, Firefly Algorithm, Leaping Frog Algorithm, Bat Algorithm, Flower Pollination Algorithm and Artificial Plant Optimization. The chapter presents the working of and drawbacks of each algorithm. Further the applications of the algorithms in big data security are discussed with the help of case studies.

Types of Bio-inspired Computing Algorithms

Some of the algorithms discussed in the chapter are:

- Artificial Bee Colony Algorithm
- Bacterial Foraging Algorithm
- Cuckoo Search Algorithm
- Leaping Frog Algorithm
- Bat Algorithm
- Flower Pollination Algorithm
- Firefly Algorithm

Artificial Bee Colony Algorithm

Introduction

Areas like Engineering, Economy and Management are prone to certain Optimization Problems. To tackle such Optimization problems, there is a need for some effective and efficient Optimization Algorithms. These algorithms are divided into two categories -Evolution-categories (Fogel, 2000) and Swarm Intelligence categories (Eberhart Kennedy., 2001) optimization algorithms. Over the past few years many Swarm Intelligence based optimization algorithms have been put forward which on analyzing the demeanor of insects, birds or fishes concepts can be helped in solving numerical optimization complexities in various scientific domains.

One such Optimization methodology is the Artificial Bee Colony (ABC) also known as the ABC Algorithm. The ABC technique was introduced by Karaboga in 2005, he used the base concept of honeybees while trying to obtain a valuable meal (Karaboga, 2005). The swarm of honey-bees possesses

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