# Chapter 16
# A Comprehensive Review of Nature-Inspired Algorithms for Feature Selection

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## ABSTRACT

*Due to advancement in technology, a huge volume of data is generated. Extracting knowledgeable data from this voluminous information is a difficult task. Therefore, machine learning techniques like classification, clustering, information retrieval, feature selection and data analysis has become core of recent research. These techniques can also be solved using Nature Inspired Algorithms. Nature Inspired Algorithms is inspired by processes, observed from nature. Feature Selection is helpful in finding subset of prominent components to enhance prescient precision and to expel the excess features. This chapter surveys seven nature inspired algorithms, namely Particle Swarm Optimization, Ant Colony Optimization Algorithms, Artificial Bees Colony Algorithms, Firefly Algorithms, Bat Algorithms, Cuckoo Search and Genetic Algorithms and its application in feature selections. The significance of this chapter is to present comprehensive review of nature inspired algorithms to be applied in feature selections.*

## INTRODUCTION

### Bio Inspired Computing

Huge volume of data is generated from variety of sources at a high speed of velocity in day to day life. Extracting knowledgeable data from this voluminous information is a difficult task. Therefore, machine learning techniques like classification, clustering, information retrieval, feature selection and data analysis has become core of recent research. These techniques can also be solved using Nature Inspired Algorithms.

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Nature Inspired Algorithms is inspired by processes, observed from nature. Nature inspired algorithms will tackle hard real world problems and solve complex optimization problems. Depends on the inspirations, nature inspired algorithms are classified as biology, physics and chemistry based algorithms. Majority of these algorithms are developed based on the characteristics and behavior of biological systems. This fraction of algorithms is called as bio inspired algorithms and the implementation of these algorithms in computing is known as bio inspired computing. Bio inspired computing is a field that learning from nature; the application of methods and systems found in nature to the study and design of engineering systems and modern technology. Bio-inspired computing is gradually gaining prominence since these algorithms are intelligent, can learn and adapt like biological organisms. Bio-inspired algorithms form a majority of all the nature-inspired algorithms. From the set theory point of view, the swarm intelligence based algorithms are a subset of bio-inspired algorithms, while the bio inspired algorithms are a subset of the nature-inspired algorithms.

Among the bio-inspired algorithms, a special class of algorithms has been developed by drawing inspiration from swarm intelligence. Therefore, some of the bio inspired algorithms can be called as swarm-intelligence based algorithms. In fact, algorithms based on swarm intelligence are among the most popular. Good examples of bio inspired computing algorithms are namely (Arpan, 2016), (Cholavendhan, SivaKumar & Karnan 2014), (Binitha & Siva,2012), Particle Swarm Optimization (PSO), Ant Colony Optimization Algorithms (ACO), Artificial Bees Colony Algorithms (ABC), Firefly Algorithms (FA), Bat Algorithms (BA), Cuckoo Search (CS) and Genetic Algorithms (GA).

## FEATURE SELECTION

Feature Selection is helpful in finding subset of prominent components to enhance prescient precision and to expel the excess features. Thus, the learning model receives a concise structure without forfeiting the predictive accuracy built by using only the selected prominent features. Feature selection reduces dimensionality of the data by eliminating features which are noisy, redundant, and irrelevant for a classification problem. It is most often a challenge for the researchers due to its computational complexity. The process of eliminating these types of features from a dataset is referred to as feature selection. This helps us to simplify the models, reduce the computation cost of model training, and enhance the generalization abilities of the model and prevention of over-training. Feature selection techniques are broadly classified into three types. They are:

- Filter approach;
- Wrapper approach;
- Embedded approach.

Feature selection algorithms that perform the selection process separately without any learning algorithms involvement are called as a *filter* approach. In this approach, irrelevant features are filtered before using an induction algorithm. This technique can be applied to most real world problems where it is not interrelated with particular induction process. Feature selection algorithms that are bound together with the learning algorithms to select the subset of features are called as *wrapper* approach. In this method, the selection process is based on the estimated accuracy from an induction process. *Embedded* approach