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ORIGINAL RESEARCH

Knowledge Discovery of Sundarban Mangrove Species: A Way Forward for Managing Species Biodiversity

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Abstract

The Mangrove ecosystem is continuously losing its dignity. A few studies have focused on understanding the changing behavior of Sundarban Mangrove Forest. However, knowledge-based database interpretation and employable pattern extraction may be an efficient approach to stand against the degrading nature of the mangrove ecosystem. Comprehending the gravity of the present scenario, the main contribution of this paper lies in the task of information retrieval by assessing the natural growth of native mangrove species of Sundarban. We have followed a methodology that makes use of association rule mining and biclustering approaches in order to come up with an off-the-shelf mechanism to analyze the data. This explores rules showing the effect of soil pH, water salinity on mangrove community structure, and on individual mangrove species and finds relation to biodiversity indices. The rules can predict probable sites for mangrove species expansion by computing the probability of introducing a new species to a particular site. Our study also generates the frequently co-occurred species lists along with the supporting sites. It could help in mangrove ecosystem restoration by identifying the most probable species that is missing from a particular site, maybe due to the gradual historical disappearance. Hence, this analytical study would enhance the possibilities of restoration of the mangrove ecosystem under survey in a systematic and empirical way.

Keywords Ecosystem · Biodiversity · Sundarban Mangrove Forest · Biclustering · Association rule mining · Knowledge discovery

Introduction

Background and Technological Detail

Sundarban Mangrove Forest is a home to many near-threatened, vulnerable, and critically endangered species. Being highly productive and ecological service provider, it plays a crucial role in the livelihood support of a huge number of people. Though it has a large contribution to socio-economic and ecological benefits, it has been noted that between 1986 to 2012, 124.418 sq. km. mangrove has already been lost [31]. Recent studies on biomass and net primary productivity [21], global sea-level rise, and the effect on Sundarban mangroves [24], spatial-temporal dynamic changes of Indian Sundarban with respect to climate change [16], express the urgency for mangrove conservation and restoration for alleviating global warming to some extent.

Promising advancements of knowledge discovery using computational methodologies could be exploited in the field of ecological study for discovering useful information [10]. Knowledge discovery is the employment of a sophisticated algorithmic approach that can extract hidden, but implicit and novel information from a large dataset in the form of useful patterns. Knowledge discovery from a dataset is also known as KDD. It includes four individual tasks. Data collection is done from different sources like web, database, data warehouse, etc., and may contain redundant data, missing data, or noisy data. Thus filtering and competent data

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