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Optimized Weather Forecasting using Enhanced Multilayer Perceptron for Seaweed Cultivation

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ABSTRACT

Seaweed is considered a high-value source of protein for humans and cattle. In this work proposed classification model used to predict the production of seaweed K.alvarezii cultivation based on seasons by weather forecasting using Enhanced MultiLayer Perceptron (MLP) Neural Network. In this MLP neural network model was built to evaluate future predictions based on attributes that are outlook, temperature, and humidity from end of training data. The dataset was collected from Kaggle for classification and classified using Enhanced Multilayer Perceptron is implemented and its performance are evaluated. The MLP function has time taken to test a model on training data 0.42 seconds, enhanced MLP gives 0.09 seconds by increasing number of neurons in hidden layer.

Keywords: weather forecasting, seaweed cultivation, neural network, ANN, Multilayer Perceptron.

1. INTRODUCTION

Inspite of one of the most developing and industrialised states, Tamil Nadu is facing a climate changing problems of coastal erosion, severe weather events and rising temperatures manifesting more recently. As per the 2019 draft action plan on climate change, the State government planned to carry out 199 projects in seven key sectors by the year 2030. The proposed budget for executing this plan was a whopping Rs 3.24 lakh crore. Rising sea levels, hotter temperatures and stronger currents along this coast, considered one of the best for commercial seaweed cultivation. Scientists say they are caused by climate change. “With the rise in sea temperature and salinity, seaweed growth has declined in the last decade,” said K Eswaran, a scientist who heads the field research unit of the Central Salt and Marine Chemicals Research Institute in Ramanathapuram district. “Women who harvest seaweed have definitely been impacted, with their incomes coming down by at least 20%.”Seaweed is leading commodity in aquaculture in Tamilnadu. Acclimatization and large scale cultivation of this alga was achieved on the coast of mandapam, south east coast of India, during 1995 to 1997. The development of seaweed cultivation areas can be caused by the biophysical environmental conditions of the waters and

climatic conditions. Planting season is one of the important factors in seaweed farming because it greatly influences the production or the end result produced. The response of seaweed growth varies over time and seasons of the year. A cultivation approach based on change the season and the environmental conditions of its waters optimal for seaweed growth. Seaweed growth has increasing by finding the weather forecasting based on whether rainy season or summer season.

Machine Learning build a model based on dataset that is used to make predictions. some implementations of machine learning use data set and neural networks in a way that imitate the working of a biological brain. Supervised learning is a type machine learning algorithm that use training data set to make predictions. Mutilayer Perceptron make use of a supervised learning technique which is called back propagation for training. MLP are the classical type of neural network, MLPs are apt for classification prediction problems where inputs are set aside a class or label.

2. REVIEW OF LITERATURE

In recent years there have been great strides in building classifiers for predictions on various datasets using varies machine learning algorithms. Machine learning, in particular, has shown improvement in accuracy on various datasets. Some of the works have been described below:

Abinaya P L Janani N [1] evaluated the performance of on forecast rainfall using WEKA data mining tool with three classifiers: 1.Navive Bayes 2. Decision Tree algorithm 3. K Nearest Neighbour 4. SVM (Support Vector Machine) and the outputs were compared based on the accuracy achieved.

Lemuel Clerk P Velasco, Ruth P.Serquina,etc [2] The need to explore different methods in selecting ANN parameters as this will help establish a reliable ANN model for rainfall forecasting.

Irfan M Malan S Muchdar F Abdullah N Juharni [3] The purpose of this research was to determine the production of seaweed K.alvarezii cultivation based on seasons. Production data collected is wet and dry production data by season.

Vaibhav. A.Mantri ,Ramalingam Dineshkumar, Mudassar Anisoddin Kazi, M. Vignesh [4] Neural-network approach in seaweed research: An emerging field for prediction and modelling critical parameters In this studies pertaining to artificial neural network (ANN) model used in studies performed to predict the thermophysical properties of Saccharina latissima, early detection of Sargassum bloom, cadmium–zinc ions biosorption by the Sargassum filipendula, optimization of different physiochemical parameters for seedling production in Gracilaria dura.

Meenakshisundaram Ganesan*, Nitin Trivedi, Vishal Gupta, S. Venu Madhav, Chennur Radhakrishna Reddy* and Ira A. Levine [5]

Seaweed resources in India – current status of diversity and cultivation: prospects and challenges In this research, the current status of Indian seaweed resources and their utilization, as well as developments in seaweed farming technologies, the status of seaweed industry and recent efforts to transform seaweed farming into a social enterprise. It also highlights the challenges encountered for mainstreaming these resources so as to evolve into a marine industry.

3. METHODOLOGY

In this section, the proposed work for weather forecasting data set is predicted by Weka tool. Collected weather and climate data for the experiment from the online repository of Kaggle. The variables on the data set of each weather measured values of climate features such as Temperature, Humidity, Wind Speed, Pressure, Daily summary. The dataset consists of 2709 instances and 12 attributes. The dataset with these attributes and its values are used in Enhanced MLP neural network method to weather forecasting for Seaweed Cultivation. MLP neural network is the classical type of neural network. They were comprised of one or more layers of neurons. Input data is give into the input layer, there may be one or more hidden layers thus providing levels of abstraction and predictions are made on the visible layer, known as output layer.

Algorithm (forward pass):

Require: pattern ~x, MLP, enumeration of all neurons in topological order
Ensure: calculate output of MLP

1: for all input neurons i do

2: set a i ← x i 3: end for

4: for all hidden and output neurons i in topological order do

5: set net i ← w i 0 + P j ∈ Pred(i) wij a j

6: set a i ← flog (net i)

7: end for

8: for all output neurons i do

9: assemble a i in output vector ~y

10: end for

11: return ~

MLPNN model has twelve input neurons consisting of the average temperature, minimum temperature, maximum temperature, average wind speed, maximum wind speed, relative humidity, total rainfall, visibility, the date, the month, and the year. Two MLPNN models were implemented with the first MLPNN model having small number of hidden neurons along with training algorithm, a supervised learning algorithm for feed-forward neural networks with super linear convergence and Hyperbolic-Tangent activation function. The Enhanced MLPNN model had more than hidden neurons along with SCG training algorithm and sigmoid activation function.

Comparative study of classification algorithm

Classifier	Time Taken to test Model	Time Taken build a Model
Multilayer Perceptron	0.42	145.15
Enhanced Multilayer Perceptron	0.09	37.37

Table -1: Sample Table format

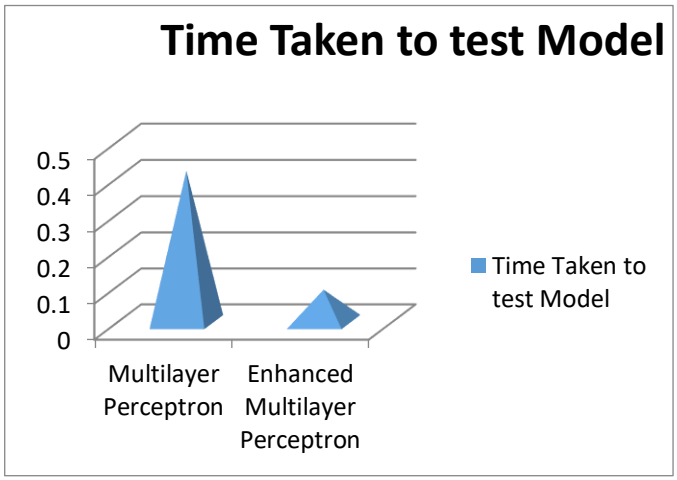

Fig-2 Time taken to build a model

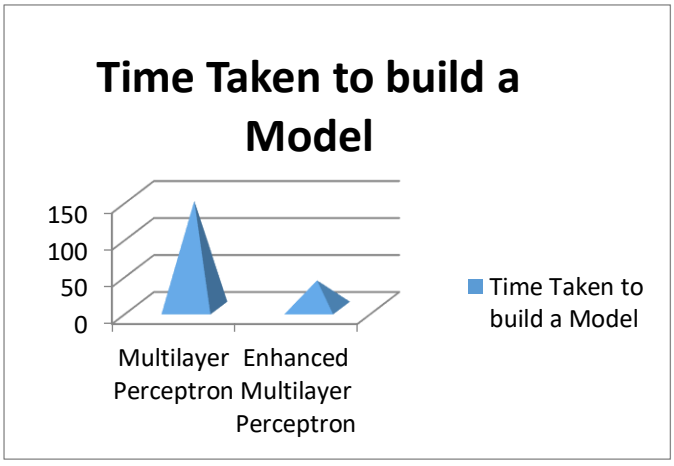

Fig-1 Time taken to test model

CONCLUSION AND FUTURE WORK

The main aim of this work is to forecasting weather for seaweed cultivation and production based on season. MLP neural network model was built to evaluate future predictions based on attributes that are outlook, temperature, humidity, windy and play from end of training data. This paper presents the analysis of seaweed cultivation and production increased during the rainy season or dry season. The MLP function has time taken to test a model on training data 0.42 seconds, enhanced MLP gives 0.09 seconds by increasing number of neurons in hidden layer. In the future, using image recognition model used to predict the better shoot tips properties of K .alvarezii, production of seaweed K.alvarezii cultivation and optimization of different shoot tips parameters for seedling production in micro propagation of tissue cultured plants.

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