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ENVISION OF SOIL FACTORSUSING DEEP LEARNING

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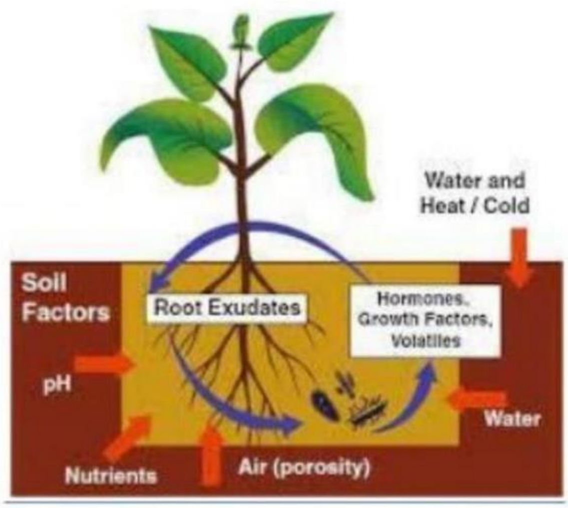
Abstract : The Envision of Soil Factors aims to provide a comprehensive understanding of the various factors that influence soil health and quality. It involves the analysis and evaluation of key elements that impact soil composition, structure, fertility, and overall ecosystem function.The understanding of soil factors and their influence on agricultural productivity is essential for sustainable and efficient crop production. This abstract presents an envisioning study aimed at comprehensively analyzing various soil factors and their impact on agricultural systems. By examining key soil properties, including nutrient content, pH levels, moisture retention capacity, organic matter content, and soil structure, this study aims to provide valuable insights into optimizing crop yield and improving soil health.

INTRODUCTION- Soil is a vital resource that plays a crucial role in supporting agricultural productivity and food security. Understanding the complex interactions between soil factors and crop growth is fundamental for optimizing agricultural practices and sustainable land management. The Envision of Soil Factors study aims to provide a comprehensive analysis of various soil properties and their influence on crop performance, thereby offering valuable insights for enhancing agricultural productivity.

The study recognizes that soil is a dynamic and heterogeneous medium, influenced by multiple factors such as nutrient content, pH levels, moisture retention capacity, organic matter content, and soil structure. These factors collectively determine the soil's fertility, water-holding capacity, and nutrient availability, directly impacting crop growth and yield.



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METHODOLOGY:

A feedforward neural network is a type of artificial neural network where information flows only in one direction, from the input layer through intermediate hidden layers to the output layer. It is a fundamental and widely used algorithm in machine learning and deep learning.

Here is a high-level overview of the feedforward neural network algorithm:

1. Architecture Design: Specify the number of layers in the network, the number of nodes (neurons) in each layer, and the activation functions to be used. The input layer size is determined by the number of features in the input data, and the output layer size depends on the type of task (e.g., classification or regression).

2. Weight Initialization: Initialize the weights and biases of the network randomly or using specific initialization techniques. Proper initialization helps the network converge faster and avoid getting stuck in local optima.

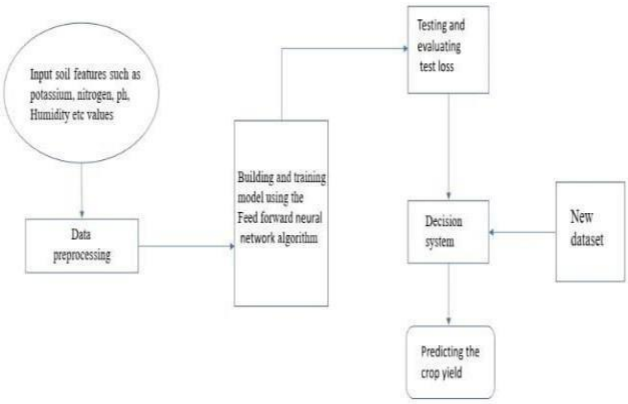
3. Forward Propagation: Pass the input data through the network in a forward direction. The input values are multiplied by the corresponding weights, and biases are added. The resulting weighted sum is then passed through an activation function to introduce non-linearity and produce the output of each neuron in the subsequent layers.

4. Loss Calculation: Compare the network's output with the true labels or target values using an appropriate loss function. Common loss functions include mean squared error (MSE) for regression tasks and cross-entropy loss for classification tasks.

ACTIVATION-RELU LAYER: • ReLU (Rectified Linear Unit) is an activation function commonly used in neural networks, particularly in deep learning models. It is a simple and computationally efficient activation function that has gained popularity due to its ability to alleviate the vanishing gradient problem and improve training convergence.
The ReLU function is defined as follows:

$$f(x) = \max(0, x)$$

In other words, the output of the ReLU activation function is the maximum of 0 and the input value. If the input value is positive, the ReLU function returns the input value itself. If the input value is negative, the ReLU function returns 0. This results in a piecewise linear function with a simple threshold at zero.



MATHEMATICAL MODEL:

A feedforward neural network, also known as a multilayer perceptron (MLP), is a type of artificial neural network where the information flows in one direction, from the input layer through the hidden layers to the output layer. The mathematical model of a feedforward neural network can be described as follows:

Input Layer:

The input layer consists of a set of neurons, each representing a feature or input variable. The input values are denoted as $x_1, x_2, ..., x_n$.
Hidden Layers:

A feedforward neural network may have one or more hidden layers sandwiched between the input and output layers.

Each hidden layer consists of a set of neurons, also known as activation units.

The activation units in a hidden layer are connected to the neurons in the previous layer and the neurons in the subsequent layer (if any).

For each activation unit j in hidden layer h, the output value is computed using the weighted sum of the inputs followed by the application of an activation function.

The weighted sum for activation unit j in hidden layer h is calculated as:

$z_j^h = \sum (w_{ji}^h * a_i) + b_j^h$,

where w_{ji}^h is the weight connecting input neuron i to hidden neuron j in layer h, a_i is the output of the input neuron i, and b_j^h is the bias term for hidden neuron j in layer h.

The output of activation unit j in hidden layer h is obtained by applying an activation function f():

$a_j^h = f(z_j^h)$.

Output Layer:

The output layer consists of a set of neurons, each representing an output variable or class label.

The activation units in the output layer are connected to the neurons in the last hidden layer.

Similar to the hidden layers, the output of each activation unit in the output layer is computed using a weighted sum of the inputs followed by the application of an activation function.

The weighted sum for activation unit k in the output layer is calculated as:

$z_k = \sum (w_{kj}^H * a_j^H) + b_k$,

where w_{kj}^H is the weight connecting hidden neuron j in the last hidden layer to output neuron k, a_j^H is the output of hidden neuron j, and b_k is the bias term for output neuron k.

The output of activation unit k in the output layer is obtained by applying an activation function g():

$y_k = g(z_k)$.

Activation functions:

ReLU (Rectified Linear Unit) is an activation function commonly used in neural networks, particularly in deep learning models. It is a simple and computationally efficient activation function that has gained popularity due to its ability to alleviate the vanishing gradient problem and improve training convergence.

The ReLU function is defined as

follows: $f(x) = \max(0, x)$

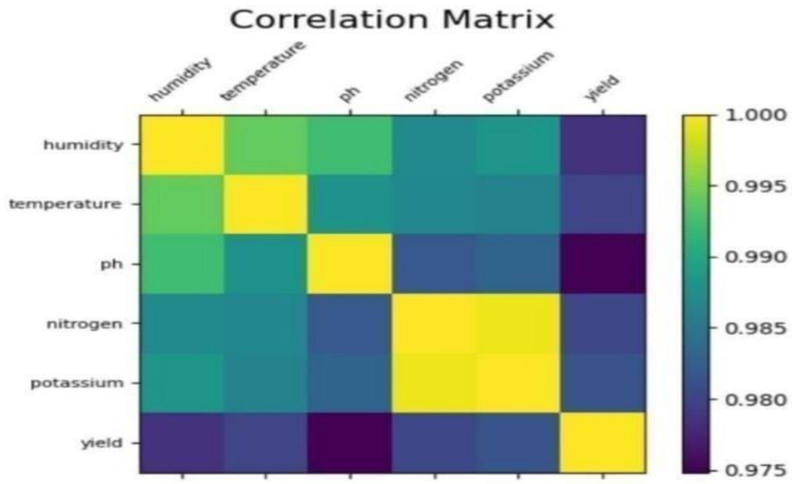
In other words, the output of the ReLU activation function is the maximum of 0 and the input value. If the input value is positive, the ReLU function returns the input value itself. If the input value is negative, the ReLU function returns 0. This results in a piecewise linear function with a simple threshold at zero.

CONCLUSION:

In conclusion, an envisioning project focused on soil factors is a comprehensive and important endeavor. By considering various aspects of soil properties, composition, and conditions, the project aims to gain a holistic understanding of the soil ecosystem and its implications for land management and environmental sustainability. We have observed that FFNN algorithm is helpful in predicting the crop yield and it is useful in building a model that has minimum test loss. Hidden layers makes it more powerful to evaluate.

The simplified architecture of Feedforward Neural Networks presents useful advantages when employing neural networks individually to achieve moderation or cohesively to process larger, synthesized outputs

RESULTS



Test loss: 0.9235379695892334

REFERENCES:

Agricultural crop yield prediction using artificial neural network approach SS Dahikar, SV Rode - International journal of innovative research in …, 2014 – Citeseer

A comprehensive review of crop yield prediction using machine learning approaches with special emphasis on palm oil yield prediction M Rashid, BS Bari, Y Yusup, MA Kamaruddin… - IEEE …, 2021 - ieeexplore.ieee.org

Analysis of crop yield prediction using data mining techniques D Ramesh, BV Vardhan - … Journal of research in engineering and …, 2015 - academia.edu

A novel approach for efficient crop yield prediction PSM Gopal, R Bhargavi - Computers and Electronics in Agriculture, 2019 – Elsevier

Crop yield prediction using machine learning algorithms A Nigam, S Garg, A Agrawal… - 2019 Fifth International …2019 ieeexplore.ieee.org 13

Crop yield prediction using deep reinforcement learning model for sustainable agrarian applications D Elavarasan, PMD Vincent - IEEE access, 2020 - ieeexplore.ieee.org

Machine learning approaches for crop yield prediction and nitrogen status estimation in precision agriculture: A review A Chlingaryan, S Sukkarieh, B Whelan - Computers and electronics in …, 2018 - Elsevier

Crop yield prediction using time series models A Choudhury, J Jones - Journal of Economics and Economic …, 2014 - academia.edu

Crop yield prediction and efficient use of fertilizers S Bhanumathi, M Vineeth… - … on Communication and …, 2019 - ieeexplore.ieee.org

A survey on data mining techniques for crop yield prediction RA Medar, VS Rajpurohit - International Journal of Advance …, 2014 - academia.edu