Design of Weather Forecasting System Thr

Mechanical Engineering (Government College of Technology, Coimbatore)

DESIGN OF WEATHER FORECASTING SYSTEM THROUGH UNIFIED MODELING LANGUAGE

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ABSTRACT

Among modeling languages Unified Modeling Language (UML) has become most popular. UML is commonly used in the design and implementation of any system and software architectures. To achieve functional and non functional requirements of the system UML model helps. In order to initiate the programming phase of building software UML tools enabled the creation of source code from UML diagram. The main objective of this paper to model a Weather Forecasting System (An ANN approach) using UML. Weather forecasting is a challenging area. To protect life and property weather warnings is important forecast. The future weather conditions is predicted by trained ANN. In this paper we proposed a UML model for Weather Forecasting using Neural Network which provide a technique for predicting weather. This proposed enhanced method for weather forecasting has advantages over other techniques.

Keywords: *UML model, Artificial Neural Networks, Weather Forecasting, Single Layer Perceptron , Multi Layer Perceptron, Back Prapogation.*

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INTRODUCTION

In software industries Object Oriented Development process is widely used. Object-Oriented Programming has heavily contributed toward a standardized method of modeling known as the Unified Modeling Language (UML). UML has become synonym for software modeling. UML is commonly used to model the software architecture as per the requirements and it includes a set of graphic notation techniques to create visual models of software-intensive systems.

With the help of different UML diagrams for building the software Source code can be easily be generated. The correctness of source code depends on the UML specification which needs to be standard, complete, precise, and unambiguous. A good UML specification leads to clearly defined semantics and an efficient code can be generated. The present work WFS is based upon the Forecasting Weather's condition.

I. RELATED WORK

Many works were done related to the weather forecasting system. They are summarized below.

Y.Radhika and M.Shashi presents an application of Support Vector Machines (SVMs) for weather prediction. Daily maximum temperature which is a time series data at location is studied to predict the maximum temperature of the next day.

Fuzzy logic technique also used as predicting weather presented by Bjarne K. Hansen and Denis Riordan. A fuzzy weather forecast is determined for each attribute individually and is evenly distributed on each hour T. It is valued on the basis of data similarity and proper weights of classification. The behavior of the fuzzy weather forecasts using different sets of forecast data.

Mohsen Hayati *et.al,* studied about Artificial Neural Network based on MLP was trained and tested using ten years (1996-2006) meteorological data and results show that MLP network has the minimum forecasting error and can be considered as a good method to model the short-term temperature forecasting systems.

Brian A. Smith *et.al,* gives methods with reduced average prediction error by increasing the number of distinct observations used in training.

II. PROPOSED APPROACH

The proposed System using an Enhanced approach using ANN is tested using the dataset of last 5 years (2005-2010) from . The results are compared with previous methods results. These methods are Genetic algorithm, Fuzzy system, Neural Network and Support Vector Machine.

The proposed enhanced method for weather forecasting has advantages over these techniques. This model produced the most accurate forecasts in comparison with these existing methods. This system helps the meteorologist to predict the future weather easily with accuracy.

III. WEATHER FORECASTING SYSTEM ARCHITECTURE

The system is developed in java. Daily data sets of last 5years (2005-2010) of Madhya Pradesh, Bhopal. The system takes input from the datasets and produces the result for both optimal weights and biases. The system building process consists of following sequential steps:

1.Selection of the data set

2.Initialize weights of Neural Network

3.Train Neural Network

4.Apply Decision Tree

5.Generate Rules

6.Test Results

A. UML Usecase Diagram

An interaction between a user and a system is described by use case diagram. Use case diagrams describe what a system does from the standpoint of an external observer. The emphasis is on what a system does rather than how. Use case diagrams are closely connected to scenarios. A scenario is an example of what happens when someone interacts with the system. A use case diagram is a collection of actors, use cases, and their communications.

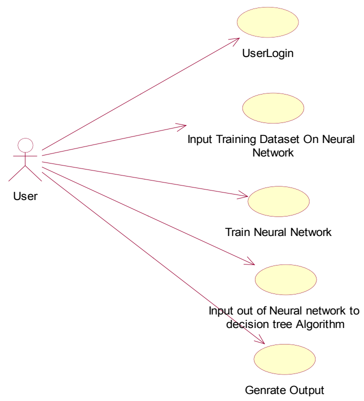
UserLogin
Input Training Dataset On Neural Network
User
Train Neural Network
Input out of Neural network to decision tree Algorithm
Genrate Output

Fig.1 Usecase Diagram

For initial development we can use this use case. In this use case diagram we can see five use cases and one actor. Use case are self explanatory and they represent the main functions of Weather Forecasting System. There are mainly five use cases first is user login which gives authorize person login in system than provide dataset for neural network following this use case next is train the neural network. Input, out of neural network given to decision tree algorithm for extracting rules and than generate final output.

B. UML Class Diagram

An overview of a system, its classes and the relationships among them is gives by a Class diagram . Class diagrams are static, they display what interacts but not what happens when they do interact so it describes the structure of a system by showing the system's classes, their attributes, and the relationships between the classes.

Since the class diagram is the main building block in object oriented modeling, Class diagram is used both for general conceptual modeling of the application and for detailed modeling; translating the models into programming code.

The class diagram Fig shows the classes of the Weather Forecasting System. NewWeatherForecast is the main class of the system. It coordinates with login class. Login class coordinates with frmNeural.

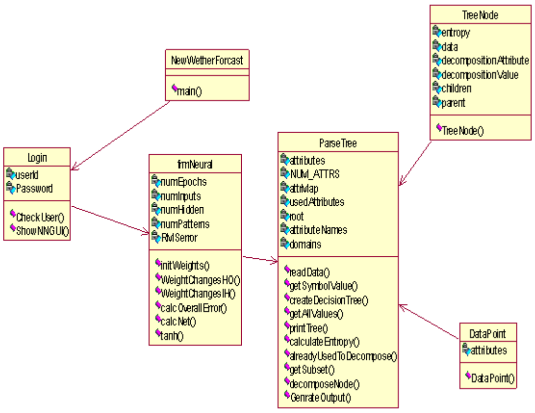

Fig. 2 UML Class Diagram

Class frmNeural describes neural networks weight changes, overall network error after each epoch and calculate the outputs of the hidden neurons. ParseTree class describe extracting Decision Rules or Decision Trees from the trained network.

C. Interaction Diagram

Interaction diagram is used to describe some type of interactions among the different elements in the model. So this interaction is a part of dynamic behaviour of the system. The purposes of interaction diagrams are to visualize the interactive behaviour of the system. Two types of Interaction diagram are Sequence diagram and Collaboration diagram.

a) Sequence Diagram-

Sequence diagrams are used to demonstrate the behavior of objects in a usecase by describing the objects and the messages they pass. The diagrams are read from left to right and descending. Here first user interact with NewWeather which send message to login, n shows NN GUI. After that weight initialize to frmNeural. frmNeural send message to ParseTree which send message to TreeNode. and finally ParseTree send message to DataPoint. At last ParseTree generate output.

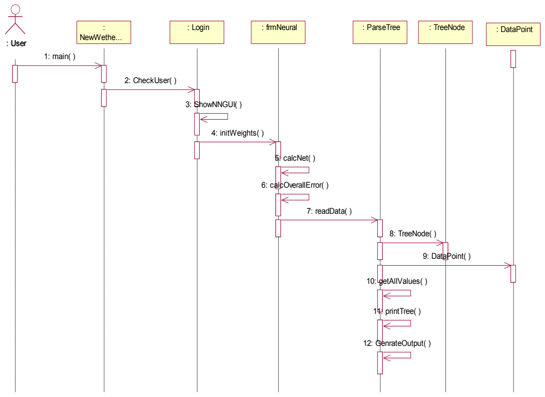

Fig 3. Sequence Diagram

b) ***Collaboration Diagram-*** The second interaction diagram is collaboration diagram. It shows the object organization as shown below. Collaboration diagram shows the relationship between objects and the order of messages passed between object. The objects are listed as icons and arrows indicate the messages being passed between objects. The numbers next to the messages are called sequence numbers. As the name suggests, they show the sequence of the messages as they are passed between the objects.

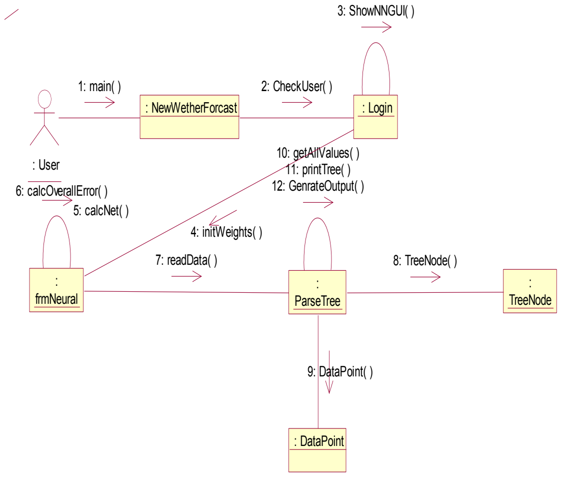

Fig 4. Collaboration Diagram

IV. CONCLUSION

In this paper, we have proposed an enhanced approach for Weather Forecasting System which is more efficient than existing methods. We also designed a complete UML modeling for the Weather Forecasting System. This system has advantages over other techniques. In this approach non-linear relationship that exists between the historical data (temperature, wind speed, humidity, etc.,) supplied to the system during the training phase. On this basis, make a prediction of what the temperature would be in future. It gives good performance over other existing methods.

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