Using Agent Negotiations for Weather Forecasting from Multiple Perspectives

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Declaration

I declare that this dissertation does not incorporate, without acknowledgment, any material previously submitted for a Degree or a Diploma in any University and to the best of my knowledge and belief, it does not contain any material previously published or written by another person or myself except where due reference is made in the text. I also hereby give consent for my dissertation, if accepted, to be made available for photocopying and for interlibrary loans, and for the title and summary to be made available to outside organization.

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Dedication

To my parents . . .

With love and gratitude

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Abstract

Most of the real world problems can be solved using more than one method which may return slightly different solutions. For instance, a number of methods including statistical methods, artificial neural networks, fuzzy logic and genetic algorithm can be used to model many real world problems such as weather forecasting. Yet these methodologies in isolation may have a common issue of considerably high false positive rate. However, it is evident that human beings can modify/improve solutions generated in the individual capacity through negotiations among them. This concept has been employed in the Multi Agent Systems (MAS) technology which can model complex real world problems to achieve quality solutions beyond the individual capacity.

In this project, MAS has been used to ensemble weather forecasting results individually generated by Artificial Neural Network (ANN) and Genetic Algorithms (GA) through negotiation among solutions. It considers ANN and GA as two agents. It has selected this application domain to demonstrate the concept since weather forecasting is important for many sectors such as agriculture, fisheries and transportation. A reliable weather forecast report is of great importance for those sectors to plan their activities by mitigating difficulties they face from bad weather conditions. Many countries have also used ANN and GA for the weather forecasting domain. Our MAS solution forecasts the rainfall for next twenty four hours with the use of Maximum temperature, Minimum temperature, Relative humidity day time, relative humidity night time and Rainfall as inputs for ANN and GA agents. The defined two agents are used to operate on an Artificial Neural Network and Genetic Algorithm solutions that start negotiation & deliberation to produce a more rational forecasting. Historical weather data based on the Colombo city area was used to train the Artificial Neural Networks and genetic algorithm based forecasting models. The trained dataset includes two months of daily basis temperature, relative humidity and rainfall data. In order to evaluate the solution part of the historical weather data set has been used as the test data. The experiment concludes that even when solutions by ANN agent and GA agent shows a disparity at the beginning, they reach to commonly agreeable solution through the negotiation in the multi agent solution with a 65% of overall success.

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