Abstract

Artificial Neural Networks (ANN) is one of the Artificial Intelligence (AI) field focussed on biological *neuron* modelling system to make computer system with learning ability. One of popular learning Algorithm is *Backpropagation*. *Backpropagation* counts system *error* to update network weights based on *error* value. But Backpropagation has disadvantages in time consuming and need more learning data to make better system performance. this disadvantages can be solved by modified Backpropagation using heuristic or numeric techniques. One of the algorithm for solving this weakness is *Conjugate Gradient*. *Conjugate Gradient* searches solution based on conjugate direction to improve convergence speed in learning phase. This paper proposed MLP architecture using several *Conjugate Gradient* algorithms, *Polak Riebere plus, Fletcher Rieeves, Powell Beale, Dai Yuan, and Chen Du* using *Secant Method* and *Strong wolfe condition* line searches. Case study which is used in this paper was weather parameters forecasting system which is consists of Temperature, Air Pressure, Humidity, and Rain. This choosen case study based on forecasting non-linear characteristic and complete data availability and weather importance on human activities. Result shown, *Conjugate Gradient* algorithm can shorten learning epoch compared standard *Backpropagation* with minimum average learning epoch 2 for temperature data, 1 for air pressure data, 1 for air humidity data, and 3 for rainfall data. maximum accuracy prediction using *Conjugate Gradient* for air temperature data is 94.04%, for air humidity data is 94.11%, and for air pressure data is 99.89% and for rainfall data is 63.74%.

Keywords: *backpropagation, conjugate gradient, line search, secant method, strong wolfe condition, weather parameter*