ABSTRACT

Several researchers have proposed various metrics for Object Oriented systems. The metrics have shown significant correlation to quality factors like reliability, maintainability and fault proneness. However a need for constant improvement in quality prediction using object oriented metrics exists. This has been a motivation to explore object oriented metrics and prediction models across many object oriented systems and languages.

Due to the sheer number of metrics available it becomes a difficult task to select relevant metrics for specific requirements. There is a need for compilation of metrics that are suitable across programming languages. An evaluation model has been proposed to analyze existing object oriented metrics and group them based on their suitability for object oriented languages – C++, Java and C#.

Existing metric computation tools have certain limitations. They are available to specific OO language and support a smaller set of the Object Oriented metrics. In the present form, they are not extensible to new Object Oriented languages and metrics. An automated metrics computation tool has been proposed to support different Object Oriented languages and metrics. The tool is based on the standards from Object Management Group.

Replicated metrics are investigated to capture a particular object oriented feature. The existing cohesion measures have limitations and there is
scope for improvement. A new cohesion metric, High Precision Cohesion Metric (HPCM) has been proposed based on the number of common attributes used between method pairs and the average attributes used in the class. The metric is presented using Briand’s Unified Framework for Cohesion. HPCM is evaluated for fault prediction. The results indicate that HPCM predicts faults better compared to other cohesion metrics.

The theoretical validation of the HPCM metric is carried out based on correlation study with other class characteristics. The metric is also empirically validated by substituting it in place of the Lack of Cohesion Metric (LCOM) in the Chidamber and Kemerer (CK) metric suite for fault prediction. The results indicate that CK metric suite with HPCM performs better in fault prediction compared to LCOM metric.

Artificial Neural Network (ANN) is a widely used fault prediction model. From the literature survey, it is found that many algorithms are proposed to train Artificial Neural Networks with varying degrees of success in improving the prediction accuracy of the model. Traditional training algorithms, like gradient descent get trapped in local optima. Swarm intelligence algorithms are experimented for training ANN. The prediction accuracy and time taken for training ANN using Ant Colony Optimization, Artificial Bee Colony, Firefly and Particle Swarm Optimization algorithms are compared.