A Neural Network Approach For Estimating Examinees' Proficiency Levels In Computerized Adaptive Testing

El-Alfy, ESM; Jafri, SS

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King Fahd University of Petroleum & Minerals

http://www.kfupm.edu.sa

Summary

This paper studies the potential of using neural network models for estimating examinees' proficiency levels in computerized adaptive testing. Computerized adaptive testing (CAT) has recently become increasingly important to standardized testing. An essential constituent of CAT is the estimation of each examinee proficiency level. Previously, this estimation has been carried out using the maximum likelihood estimator (MLE) or a Bayesian procedure. As being parametric techniques, the quality of estimates strongly depends on some restrictive assumptions. Neural network, with its strong theoretical background and ability to learn and generalize, provides a more flexible non-parametric function approximation and tends to be more efficient in estimation accuracy. It can be used for estimating the proficiency levels of examinees. In this work, several models have been simulated and compared namely multi-layer perceptron (MLP), principal-component analysis (PCA), radial-basis function (RBF) and support-vector machines (SVM). Simulation results reveal that neural-network models are capable of providing good estimates of examinees' proficiecy levels. The accuracy of the classification estimation varies based on the network complexity and the size of the training data set.

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