

Comparing PSO and GA Optimizers in MLP to Predict Mobile Traffic Jam Times

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Abstract- Freely-usable frequency spectrum is dwindling quickly in the face of increasingly greater demand. As mobile traffic overwhelm the frequency allocated to it, some frequency bands such as for terrestrial TV are insufficiently used. Yet the fixed spectrum allocation dictated by International Telecommunications Union disallows under-used frequency from being taken by those who need it more. This under-used frequency is, however, accessible for unlicensed exploitation using the Cognitive Radio. The cognitive radio would basically keep monitoring occupation of desirable frequencies by the licensed users and cause opportunistic utilization by unlicensed users when this opportunistic use cannot cause interference to the licensed users. In Kenyan situation, the most appropriate technique would be Overlay cognitive radio network. When the mobile traffic is modeled, it is easier to predict the exact jam times and plan ahead for emerging TV idle channels at the exact times. This paper attempts to explore the most optimal predictive algorithms using both literature review and experimental method. Literature on the following algorithms were reviewed; simple Multilayer perceptron, both simple and optimized versions of support vector machine, Naïve Bayes, decision trees and K-Nearest Neighbor. Although in only one occasion did the un-optimized multilayer perceptron out-perform the others, it still rallied well in the other occasions. There is, therefore, a high probability that optimizing the multilayer perceptron may enable it out-perform the other algorithms. Two effective optimization algorithms are used; genetic algorithm and particle swarm optimization. This paper describes the attempt to determine the performance of genetic-algorithm--optimized multilayer perceptron and particle-swarm-optimization-optimized multilayer perceptron in predicting mobile telephony jam times in a perennially-traffic jammed mobile cell. Our results indicate that particle-swarm-optimization-optimized multilayer perceptron is probably a better performer than most other algorithms.

Keywords – MLP; PSO; GA; Mobile traffic

I. INTRODUCTION

Freely-usable frequency spectrum is dwindling quickly in the face of increasingly-greater demand [1]. The irony is that as mobile traffic the world over, especially, overwhelm the frequency allocated to it, some frequency bands such as for terrestrial TV are insufficiently used [2]. Yet the fixed spectrum allocation dictated by International Telecommunications Union (ITU) disallows under-used frequency from being taken by those who need it more. This under-used frequency is, however, accessible for unlicensed exploitation using the Cognitive Radio (CR). The cognitive radio would basically keep monitoring occupation of desirable frequencies by the licensed users and cause opportunistic utilization by unlicensed users when this opportunistic use cannot cause interference to the licensed users [3]. Some individuals state that the digital migration has vacated the bigger spectrum and mitigated the