

# Particle Swarm Optimization Based Multi-Objective User Association for LTE-A Heterogeneous Networks

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## Short Report

**Keywords:** Cell range expansion, Heterogeneous network, Multi-objective optimization, Particle swarm optimization, User association

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## Abstract

Heterogeneous networks (HetNets) are a promising communication paradigm to satisfy the diverse requirements of Long Term Evolution-Advanced (LTE-A). Associating users with different base station tiers using the conventional technique based on the highest received SINR is not viable in HetNets due to its rigid association, which only aims at throughput maximization. Many efforts have been made to tackle the optimization problem of user association with a single objective such as throughput, fairness or energy efficiency. In this paper, we propose a novel multi-objective user association technique using particle swarm optimization (PSO) with the aim of jointly maximizing the throughput and the network balance index (NBI). By incorporating weight factors into the proposed scheme, the system operator has the flexibility to configure the priority levels of throughput and NBI. Numerical results demonstrate that our proposed multi-objective user association technique achieves better performance in terms of fitness values compared to the single-objective user association schemes.

## Full Text

Due to technical limitations, full-text HTML conversion of this manuscript could not be completed. However, the latest manuscript can be downloaded and [accessed as a PDF](#).

## Figures

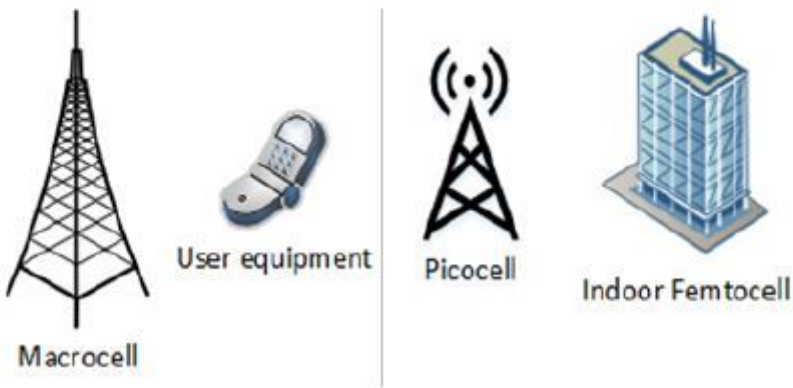
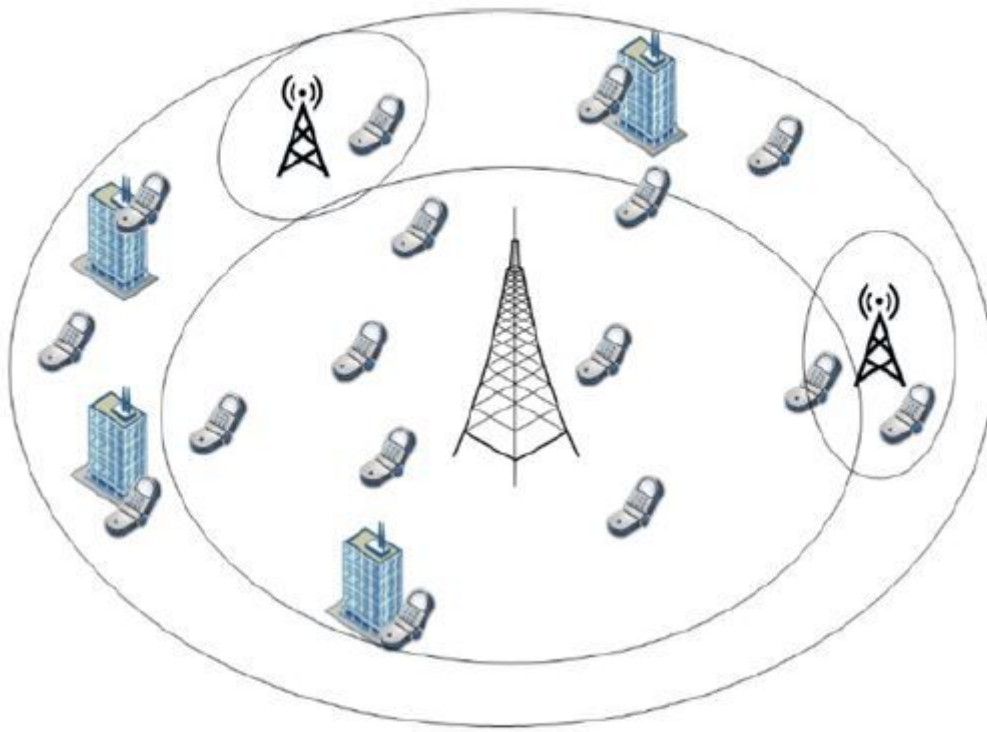
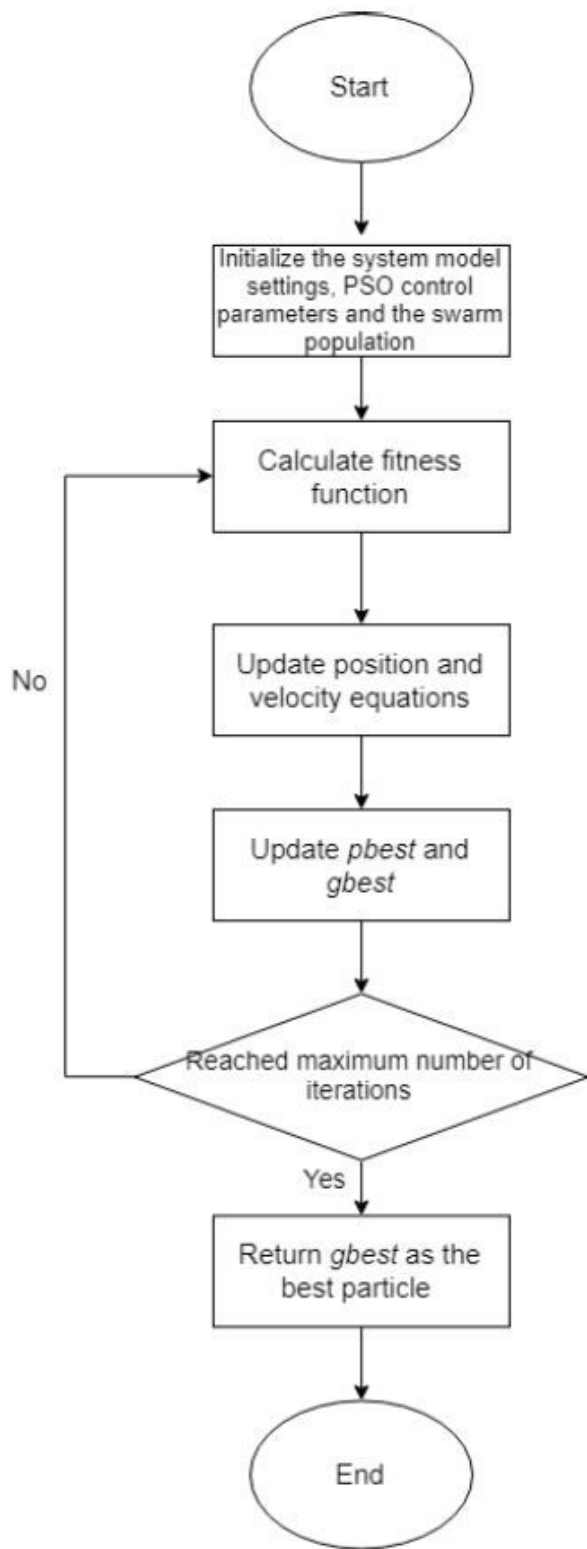


Figure 1

Three-tier wireless heterogeneous network



**Figure 2**

Flowchart of the proposed MOPSO-UA

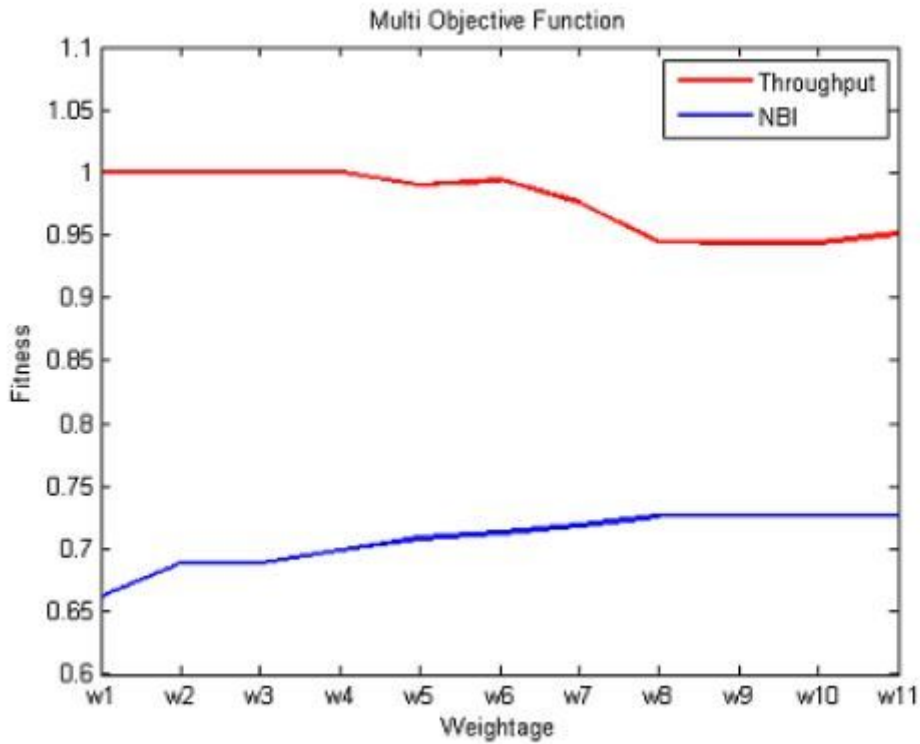


Figure 3

Fitness function values corresponding to different weightage values

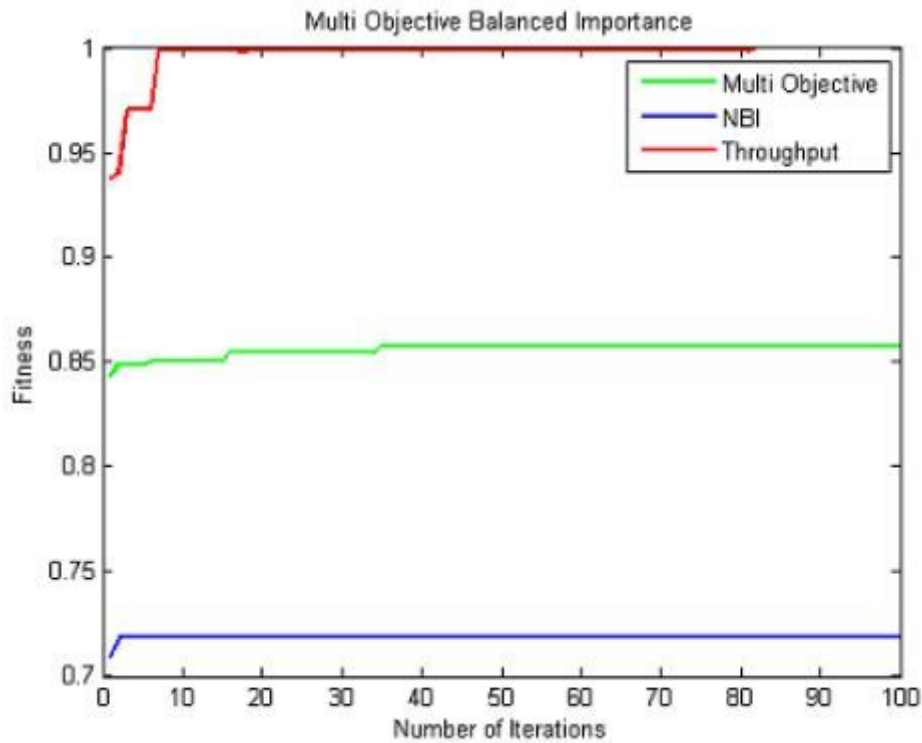


Figure 4

Multi-objective function with balanced priority for objectives Fig. 5

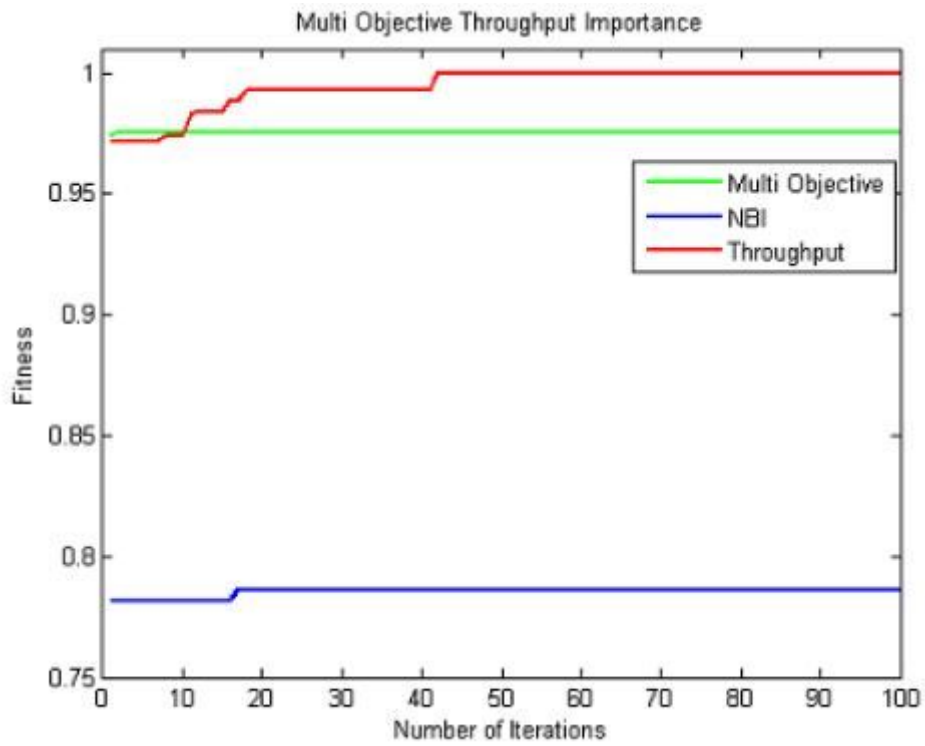


Figure 5

Multi-objective function with throughput priority

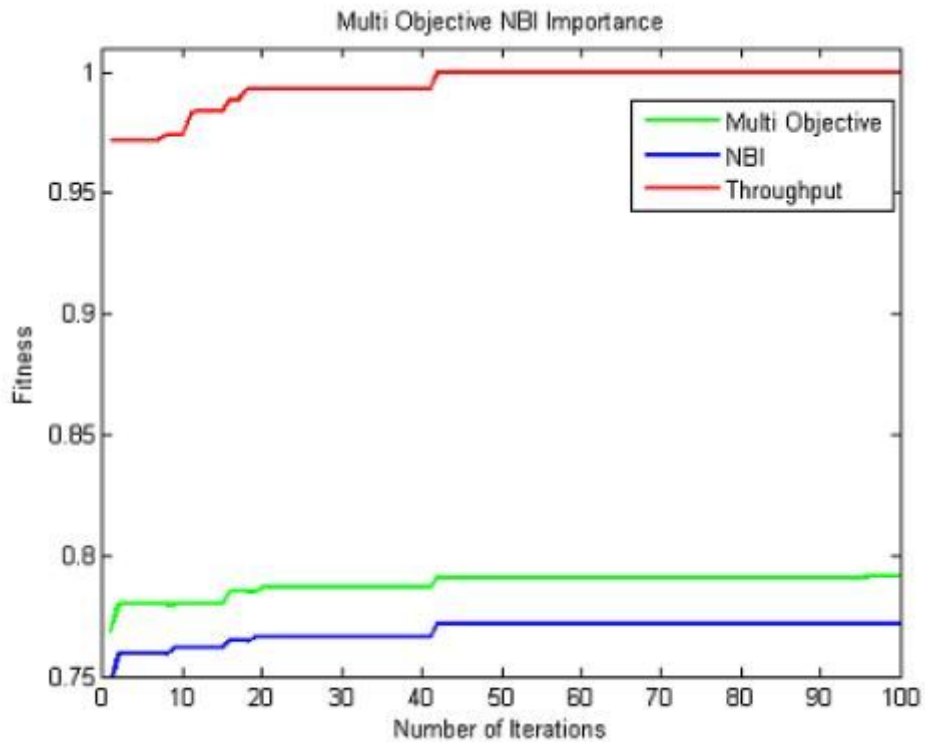


Figure 6

Multi-objective function with NBI priority