Optimal User Pairing Approach for NOMA-based Cell-free Massive MIMO Systems

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Abstract: This study investigates a non-orthogonal multiple access (NOMA)-assisted cell-free massive multiple-input multiple-output (MIMO) system, considering the impact of both in... **View more**

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Abstract:

This study investigates a non-orthogonal multiple access (NOMA)-assisted cell-

free massive multiple-input multiple-output (MIMO) system, considering the impact of both individual and linear-combination channel estimations. To make the best use of NOMA as an enabler for cell-free massive MIMO systems, user pairing should be employed effectively. Random user pairing naturally leads to a non-optimal solution, whereas an exhaustive search approach is unfavorable for practical systems owing to the high complexity. In this study, we propose an optimal user pairing strategy to group users that jointly optimize the minimum downlink rate per user and power allocation at an acceptable cost of complexity. To address this problem, we first relax the binary variables to continuous variables and then develop an iterative algorithm based on the inner approximation method, yielding at least one locally optimal solution. Numerical results show that the proposed user pairing algorithm outperforms existing counterparts, such as conventional beamforming, random pairing, far pairing, and close-pairing strategies, while it can be performed dynamically, that is, two arbitrary users satisfying the formulated problem can be paired regardless of geographical distance. Finally, our approach demonstrates that the combination channel estimation-based NOMA-assisted cell-free massive MIMO achieves the best result in terms of the downlink rate per user when associated with the proposed algorithm.

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