

# The Roommates Problem Revisited

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## Abstract

One of the oldest but least understood matching problems is Gale and Shapley's (1962) "roommates problem": is there a stable way to assign  $2N$  students into  $N$  roommate pairs? Unlike the classic marriage problem or college admissions problem, there need not exist a stable solution to the roommates problem. However, the traditional notion of stability ignores the key physical constraint that roommates require a room, and it is therefore too restrictive. Recognition of the scarcity of rooms motivates replacing stability with Pareto optimality as the relevant solution concept. The main contributions of this paper are to completely characterize the set of Pareto improvements of any assignment and to provide an efficient algorithm for finding a Pareto improvement starting from any status quo. In this way, the paper reframes a classic matching problem, which previously had no general solution, to become both solvable and economically more meaningful.