

Supplementary information

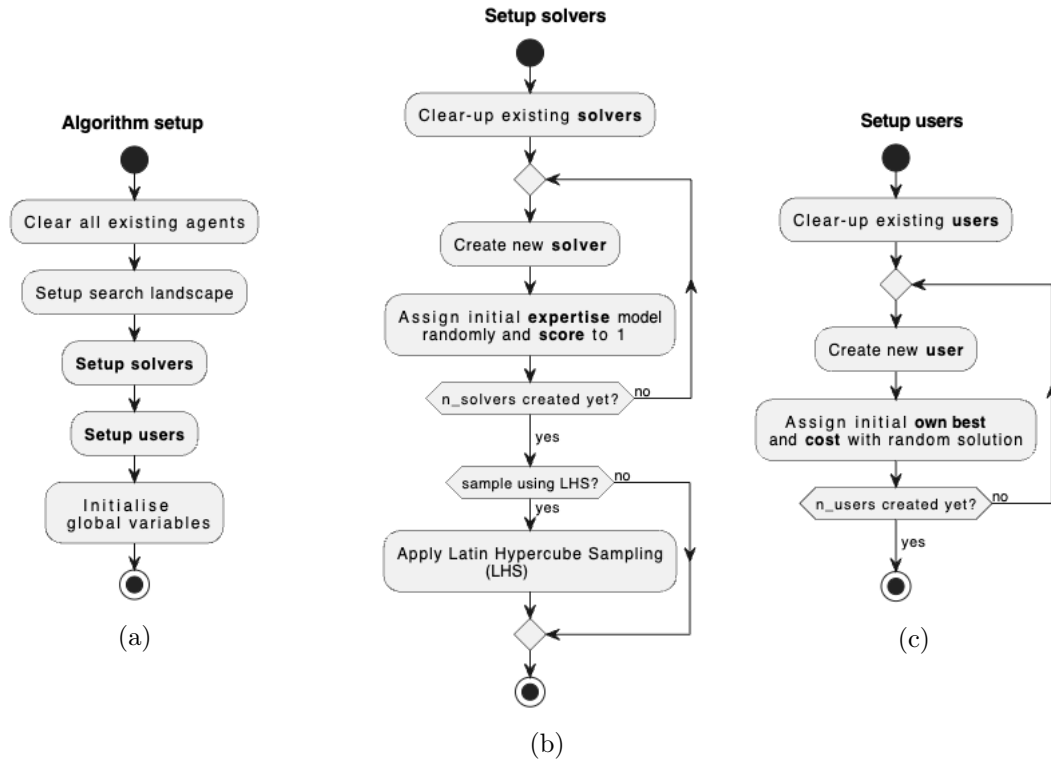


Fig. 13 Flowcharts detailing the initialisation procedures for CIAO. These charts depict the following: (a) Overall algorithm initialisation; (b) *Solver* subset setup; and (c) *User* subset setup.

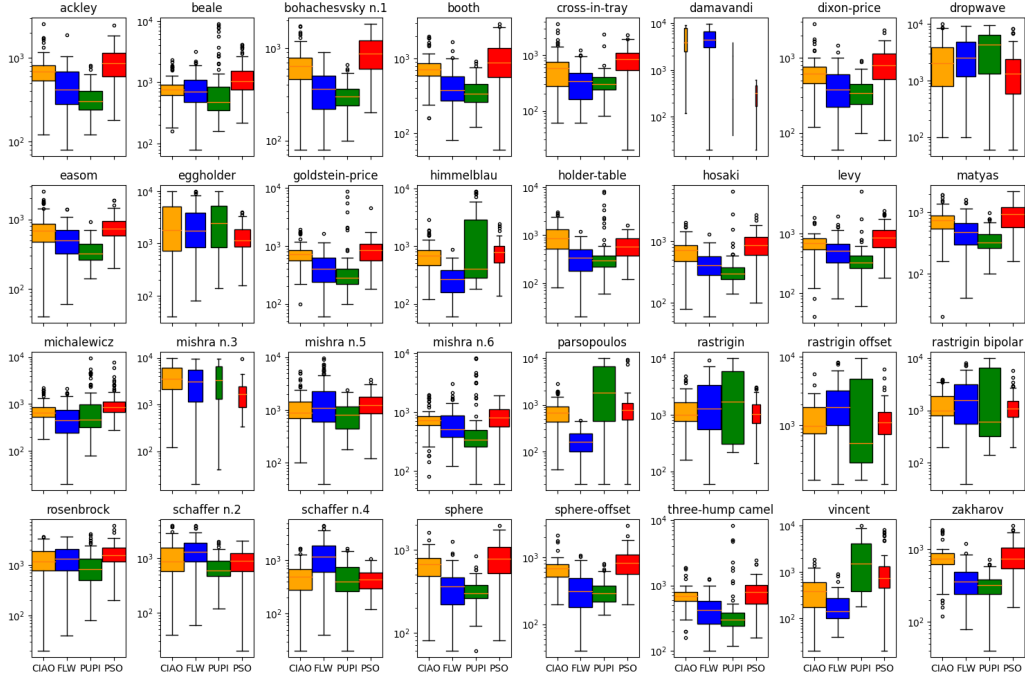


Fig. 14 Comparison of evaluation efficiency for successful runs ($R = 200 \times 200$). This figure presents an array of 32 boxplots, one per benchmark problem, comparing the efficiency in terms of number of evaluations required by CIAO and other agent-based metaheuristics to find the optimal solution at a resolution of $R = 200 \times 200$. The analysis is based on 100 runs for each algorithm with a limited budget of 10,000 function evaluations. Refer to Figure 11 for boxplot interpretation.

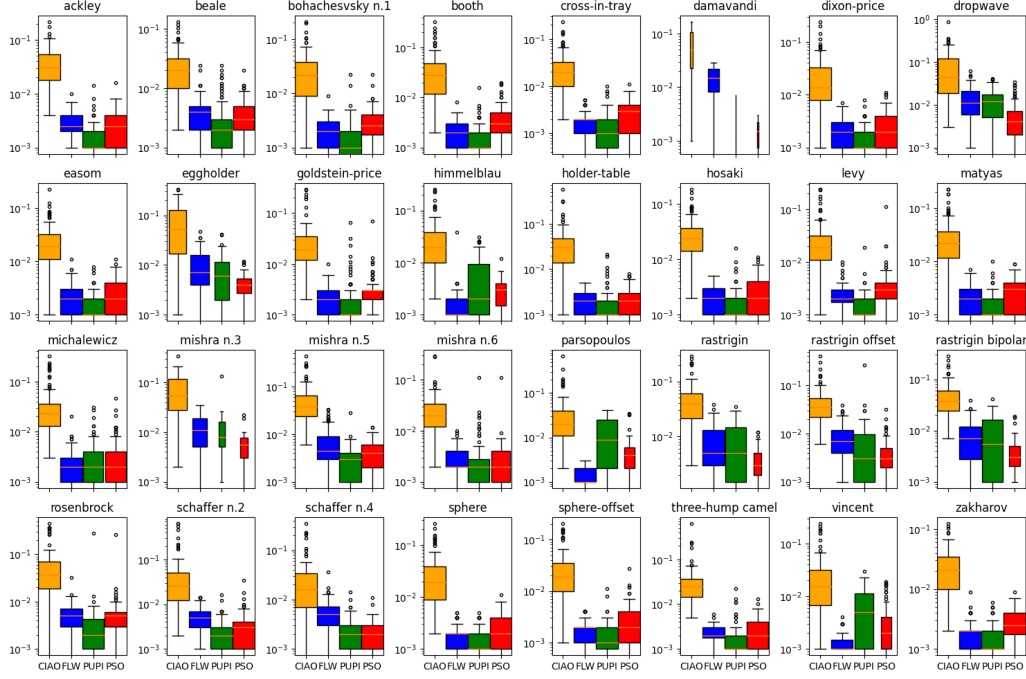


Fig. 15 Comparison of runtime for successful runs ($R = 40K$). This figure presents an array of 32 boxplots, one per benchmark problem, comparing the efficiency in terms of execution time (in milliseconds) required by CIAO and other agent-based metaheuristics to find the optimal solution at a resolution of $R = 200 \times 200$. The analysis is based on 100 runs for each algorithm with a limited budget of 10,000 function evaluations. Refer to Figure 11 for boxplot interpretation.