

Facility Location Problem: Optimasi Penentuan Lokasi Dapur Untuk Program Makan Bergizi Gratis Dengan Metode Genetic Algorithm = Facility Location Problem: Optimization of Kitchen Location Determination for Free Nutritional Meal Program Using Genetic Algorithm Method

Deskripsi Lengkap: <https://lib.ui.ac.id/detail?id=9999920570720&lokasi=lokal>

Abstrak

Program Makan Bergizi Gratis (MBG) menargetkan 19,5 juta siswa pada 2025; untuk mencapainya, lokasi dapur produksi harus diatur secara efisien. Masalah penentuan lokasi ini dimodelkan sebagai capacitated p-median dengan kapasitas 3 500 porsi per dapur dan tujuan meminimalkan total jarak pengiriman. Studi kasus melibatkan 813 sekolah dasar di Kota Pekanbaru. Tiga pendekatan dibandingkan: greedy clustering, Genetic Algorithm (GA) murni, dan GA yang diinisialisasi dengan hasil greedy. Pendekatan ketiga—GA-greedy berpopulasi 10 dan 200 generasi—memberikan kinerja terbaik. Rata-rata jarak siswa ke dapur turun 31 persen, dari 1,4177 km menjadi 0,9787 km, sedangkan jarak maksimum berkurang 15 persen, dari 2,5591 km menjadi 2,1631 km. Seluruh kendala kapasitas terpenuhi, menghasilkan tingkat kelayakan 99,90 persen dengan hanya satu pelanggaran minor. Waktu komputasi 91,67 detik—sekitar 3,3 kali lebih cepat dibanding GA murni—dengan nilai fungsi tujuan akhir 214.559,27. Temuan ini menunjukkan bahwa kombinasi heuristik greedy dan algoritma evolusioner mampu menghasilkan konfigurasi dapur yang terukur, cepat dihitung, dan adaptif terhadap variasi spasial. Kerangka kerja ini layak dijadikan acuan perancangan logistik MBG tingkat nasional maupun program pangan publik sejenis.

.....The Free Nutritious Meals Program (MBG) aims to serve 19.5 million Indonesian students by 2025, requiring an efficient layout of production kitchens. The location problem is formulated as a capacitated p-median model with a kitchen capacity of 3,500 meals per day and the objective of minimizing total delivery distance. A case study was conducted on 813 primary schools in Pekanbaru City. Three solution approaches were evaluated: pure greedy clustering, pure Genetic Algorithm (GA), and a GA initialized with greedy results. The third approach—greedy-seeded GA with a population of 10 and 200 generations—delivered the best performance. Average student-to-kitchen distance fell by 31 percent, from 1.4177 km to 0.9787 km, while the maximum distance dropped by 15 percent, from 2.5591 km to 2.1631 km. All capacity constraints were satisfied, yielding 99.90 percent feasibility with only one minor violation. Computation time was 91.67 seconds, approximately 3.3 times faster than the pure GA, and the final objective value reached 214.559.27. These results demonstrate that combining greedy heuristics with evolutionary algorithms produces scalable, time-efficient kitchen configurations that adapt to spatial variation. The framework is suitable for nationwide MBG logistics planning and other public food distribution initiatives.