

عنوان مقاله:

Balancing Accuracy and Efficiency: The ϵ -Multi-objective Dijkstra Algorithm for Large-Scale Optimization Problems

محل انتشار:

هفتمین همایش بین المللی مهندسی فناوری اطلاعات، کامپیوتر و مخابرات ایران (سال: 1402)

تعداد صفحات اصل مقاله: 13

نویسندگان:

,Amaneh Mollaei - Master's student in Computer Engineering, Urmia University

,Asghar Asgharian Sardroud - Ph.D. in Computer Engineering, Assistant Professor, Urmia University

خلاصه مقاله:

Multi-objective optimization problems with large underlying networks arise in many critical transportation, logistics, and infrastructure applications. However, conventional multi-objective shortest path algorithms struggle to scale due to the combinatorial explosion of the search space as problem size increases. This paper proposes a novel approximation algorithm called the ϵ -Multi-objective Dijkstra Algorithm (ϵ -MDA) that leverages an ϵ -dominance technique to enable efficient, near-optimal solutions for large problem instances. Extensive experiments on grid and network graphs demonstrate that ϵ -MDA achieves over $10,000\times$ speed up compared to the exact Multi-objective Dijkstra Algorithm while still providing high-quality approximate Pareto fronts. This work represents a significant advance in overcoming the scalability challenges of multiobjective optimization for real-world network-based decision problems across transportation, logistics, emergency services, and more. The proposed ϵ -MDA algorithm and empirical results lay the algorithmic foundation and evidence needed to tackle large-scale multi-objective combinatorial optimization problems where conventional methods fail.

کلمات کلیدی:

Multi-objective Optimization, ϵ -Multi-objective Dijkstra Algorithm, Multi-objective Shortest Path, Computational Complexity, Approximation Algorithm, Computational Efficiency, Algorithmic Innovation, Optimization Challenges, Shortest Path Algorithms, Label Setting Algorithms, Performance Analysis, Empirical Evaluation

لینک ثابت مقاله در پایگاه سیویلیکا:

<https://civilica.com/doc/1939798>

