

To Whom It May Concern:

I am applying for a postdoc position in the school of Computer Science at IPM and I would like to express my interest and enthusiasm in continuing my research career in your reputed institute. I earned a Ph.D. in Information Science under the supervision of Prof. Hassan Karimi in School of Computing and Information at the University of Pittsburgh, USA in 2021. My research interests span mathematical optimization, operations research, artificial intelligence, and multi-agent systems with applications in transportation, routing, scheduling, public health, and resource allocation, among others.

In my PhD dissertation, I conducted extensive research to provide a scalable, robust, and flexible solution for solving large-scale dynamic ridesharing problem, a NP-hard optimization problem. To address the problem, I proposed a distributed optimization model and developed a set of algorithms to solve the mathematical model. The main challenge was that how to decompose the underlying optimization problem into subproblems. I tried to bridge the gap between theory and practice to find a practical decomposition method by getting insight from spectral graph theory, and then formulating each subproblem as distributed constraint optimization problem (DCOP) with factor graph representation, and finally solving subproblems in parallel using min-sum algorithm. In order to evaluate the proposed approach, I implemented a simulator in Java and used two metrics for evaluation: solution quality and running time. I used IBM CPLEX to find a lower bound for the original optimization problem.

I also enjoy working on *spatial* optimization problems such as determining locations of resources while optimizing an objective function (e.g., minimizing cost, waiting time, or maximizing coverage). In one of my research papers, I proposed a method for solving a large-scale MCLP (Maximal Covering Location Problem) where demands can be located everywhere on the road network. MCLP is a NP-hard problem and finding an exact algorithm by integer linear programming (ILP) is a challenge. I developed two algorithms, exact (branch-and-bound) and heuristic (Particle Swarm Optimization), to solve the optimization problem. As a proof of concept, the proposed method was tested for optimal deployment of AEDs (Automated External Defibrillators) in Pittsburgh.

I have the ability to work independently and conduct research in various areas, including but not limited to applied mathematics, machine learning, artificial intelligence, algorithms, and statistics. I am confident that my research experience in academia, previous roles in industry as software engineer, database administrator, and GIS (Geospatial Information Systems) consultant, technical skills, relevant coursework, excellent communication, strong writing ability, and creativity will allow me to thrive in the postdoc position at IPM.

For further information, please see my CV. Thank you in advance for your time and consideration!

Best Regards,
Hadi Hajari