

Department of Applied Mathematics and Statistics  
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STUDENT SEMINAR

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304 Whitehead Hall  
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**SEARCHING FOR A SHORTEST PATH IN A LARGE SPARSE GRAPH  
UNDER MEMORY LIMITATIONS: A SUCCESSIVE MIXED  
BIDIRECTIONAL SEARCH METHOD**

ABSTRACT

The problem of finding a shortest path between two nodes in a directed positively weighted graph lies at the core of network optimization. Although the problem has been well studied for decades, there are always new challenges arising from a variety of applications. Among those challenges, an important one is limitation on memory, which leads to the necessity of revising the existing algorithms or designing a new one. In this talk, we will propose a successive mixed bidirectional search algorithm. The key idea is to apply, in a single pass of the bidirectional search, a forward Dijkstra's algorithm that stores the "closed list" and a backward Dijkstra's algorithm that does not store the closed list. In addition to proving the correctness of our algorithm in terms of its completeness and optimality, we also explore possible improvement. Moreover, we compare the performance of our algorithm with that of the popular divide-and-conquer technique, either as bidirectional search or as unidirectional search, in terms of theoretical properties, memory savings, and computational efficiency.