NETWORK OPTIMIZATION

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Executive Summary

Homework 3. Due date: February 12
Collaborators:

3 Dijkstra's Algorithm

Implement Dijkstra's algorithm, or work out the following example by hand. The graph has nodes labeled 1 *to* 6*, and arcs* (i, j) *for every* i *and* j *such that* $i < j$*. The arc lengths are given in the table. Use Dijkstra's algorithm to find the shortest path from node* 1 *to node* 6*.*

The original, provided node and edge table:

	1	2	3	4	5	6
1		260	570	1100	1860	3360
2			450	860	1500	2820
3				460	900	1920
4					660	1560
5						1020
6						

The following table illustrates the application of Dijkstra's algorithm iteratively. At each step, the distance to each node from every mark node is calculated and the 'best' (least) distance is noted in the table. Each node that is marked is underlined in the row of the table at which it becomes marked. The predecessor of this node is denoted by its subscript.

Table 1: Dijkstra's Algorithm

S	d(1)	d(2)	d(3)	d(4)	d(5)	d(6)
$\emptyset$	$\underline{0}$	∞	∞	∞	∞	∞
$\{1\}$		$\underline{260}_1$	570_1	1100_1	1860_1	3360_1
$\{1,2\}$			$\underline{570}_1$	1100_1	1760_2	3080_2
$\{1,2,3\}$				$\underline{1030}_3$	1470_3	2490_3
$\{1,2,3,4\}$					$\underline{1470}_3$	2490_3
$\{1,2,3,4,5\}$						$\underline{2490}_3$
$\{1,2,3,4,5,6\}$	∞	∞	∞	∞	∞	∞

Therefore, the three nodes that are parents in the shortest path are $1, 3$, and 6 with a total minimum distance of 5820. The actual calculations displayed in the above graph and comparisons for each round were done in Excel. Therefore, they are ommitted. However, at each round the distance to the remaining unmarked nodes was calculated along the path of each marked node.