4. Greedy Algorithms (Part II)

- Dijkstra's algorithm demo
- improved Dijkstra's algorithm demo
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Dijkstra's algorithm demo

- Initialize $S = \{ s \}$, $d(s) = 0$.
- Repeatedly choose unexplored node $v$ which minimizes

$$
\pi(v) = \min_{e = (u, v) : u \in S} d(u) + \ell_e,
$$

add $v$ to $S$; set $d(v) = \pi(v)$.

![Graph diagram](image.png)
Dijkstra's algorithm demo

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Dijkstra's algorithm demo

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**Diagram:**

- $s$ is the starting node.
- Nodes are connected with edges labeled with their weights.
- The algorithm progresses by updating the distances to nodes.
- The path is highlighted with blue arrows.
Dijkstra's algorithm demo

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![Diagram showing Dijkstra's algorithm steps](image)
Dijkstra's algorithm demo

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Dijkstra's algorithm demo

\[\begin{align*}
0 + 16 &= 16 \\
7 + 7 &= 14 \\
8 + 5 &= 13 \\
8 + 6 &= 14
\end{align*}\]
Dijkstra's algorithm demo

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\[ \pi(v) = \min_{e = (u,v) : u \in S} d(u) + \ell_e, \]

add $v$ to $S$; set $d(v) = \pi(v)$. 

![Dijkstra's algorithm diagram]

\[ 13 + 2 = 15 \]
\[ 8 + 6 = 14 \]
Dijkstra's algorithm demo

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Dijkstra's algorithm demo

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Section 4.4
Improved Dijkstra's algorithm demo

- Initialize $\pi(s) = 0$.
- Repeatedly choose $u \notin S$ with minimum $\pi(v)$.
  - for each edge $(u, v)$ leaving $u$, set $\pi(v) = \min \{ \pi(v), \pi(u) + \ell(u, v) \}$
  - add $u$ to $S$
Improved Dijkstra's algorithm demo

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Improved Dijkstra's algorithm demo

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Improved Dijkstra's algorithm demo

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Improved Dijkstra's algorithm demo

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Improved Dijkstra's algorithm demo

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Improved Dijkstra's algorithm demo

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