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**Algorithm 5:** Dijkstra's Algorithm

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**Input:** (directed) graph  $G = (V, E)$  given as adjacency list, weight function  $w : E \rightarrow \mathbb{R}_{\geq 0}$ , root node  $r \in V$

**Output:** distance function  $d : V \rightarrow \mathbb{R}_{\geq 0}$ , predecessor function  $\text{pred} : V \rightarrow V \cup \{0\}$

```
1 foreach  $v \in V$  do
2   |  $d(v) \leftarrow \infty$ 
3   |  $\text{pred}(v) \leftarrow 0$ 
4  $d(r) \leftarrow 0$ 
5  $S \leftarrow \emptyset$ 
6  $B \leftarrow \{r\}$  // priority queue
7 while  $B \neq \emptyset$  do
8   |  $b \leftarrow \text{extract\_min}(B)$  // node with minimal  $d$ 
9   |  $S \leftarrow S \cup \{b\}$ 
10  | foreach  $v \in \text{Adj}(b) \setminus S$  do
11  |   |  $B \leftarrow B \cup \{v\}$ 
12  |   | if  $d(b) + w(b, v) < d(v)$  then
13  |   |   |  $\text{pred}(v) \leftarrow b$ 
14  |   |   |  $d(v) \leftarrow d(b) + w(b, v)$ 
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