
Algorithm 6: Bellman-Ford

Input: directed graph $G = (V, E)$, weight function

$w : E \rightarrow \mathbb{R}$, root node $r \in V$

Output: FALSE if G contains a negative cycle reachable from r ,

TRUE otherwise, in the latter case also:

distance function $d : V \rightarrow \mathbb{R}$,

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 for  $i \leftarrow 1, \dots, |V| - 1$  do
6   | foreach  $uv \in E$  do
7     | | if  $d(u) + w(uv) < d(v)$  then
8       | | |  $d(v) \leftarrow d(u) + w(uv)$ 
9       | | |  $\text{pred}(v) \leftarrow u$ 
10 foreach  $uv \in E$  do
11   | if  $d(u) + w(uv) < d(v)$  then
12   | | return FALSE
13 return TRUE
```
