

Plain algo and code

title: "Floyd-Warshall" (algo only)

parameters: ("V", "E", "w") (algo only)

```
FLOYD-WARSHALL( $V, E, w$ ):
1  Let  $\text{dist}[u, v] \leftarrow \infty$  for  $u, v$  in  $V$ 
2  For  $(u, v)$  in  $E$ :
3       $\text{dist}[u, v] \leftarrow w(u, v)$                                 // edge weights
4  For  $v$  in  $V$ :
5       $\text{dist}[v, v] \leftarrow 0$                                     // base case
6
7  For  $k \leftarrow 1$  to  $|V|$ :
8      For  $i \leftarrow 1$  to  $|V|$ :
9          For  $j \leftarrow 1$  to  $|V|$ :
10             If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :
11                  $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$ 
12
13 Return  $\text{dist}$ 
```

```
1  def floyd_warshall(G):
2      # let G be an adjacency matrix
3      dist = G
4
5      for k in range(len(G)):
6          for i in range(len(G)):
7              for j in range(len(G)):
8                  if dist[i][j] > dist[i][k] + dist[k][j]:
9                      dist[i][j] = dist[i][k] + dist[k][j]
10
11     return dist
```

Basic styling parameters

fill: none
stroke: 2pt + black
radius: 10pt
row-gutter: 8pt
column-gutter: 8pt
inset: 15pt
indent-size: 12pt (algo only)
indent-guides: 1pt + gray
indent-guides-offset: 4pt
comment-prefix: [#sym.triangle] (algo only)

FLOYD-WARSHALL(V, E, w):

```
1 Let  $\text{dist}[u, v] \leftarrow \infty$  for  $u, v$  in  $V$ 
2 For  $(u, v)$  in  $E$ :
3   |  $\text{dist}[u, v] \leftarrow w(u, v)$                                 ▷ edge weights
4 For  $v$  in  $V$ :
5   |  $\text{dist}[v, v] \leftarrow 0$                                     ▷ base case
6
7 For  $k \leftarrow 1$  to  $|V|$ :
8   | For  $i \leftarrow 1$  to  $|V|$ :
9     | For  $j \leftarrow 1$  to  $|V|$ :
10      | | If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :
11      | | |  $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$ 
12
13 Return  $\text{dist}$ 
```

```
1 def floyd_warshall(G):
2   | # let G be an adjacency matrix
3   |  $\text{dist} = G$ 
4   |
5   | for  $k$  in  $\text{range}(\text{len}(G))$ :
6   |   | for  $i$  in  $\text{range}(\text{len}(G))$ :
7   |     | for  $j$  in  $\text{range}(\text{len}(G))$ :
8   |       | | if  $\text{dist}[i][j] > \text{dist}[i][k] + \text{dist}[k][j]$ :
9   |       | | |  $\text{dist}[i][j] = \text{dist}[i][k] + \text{dist}[k][j]$ 
10  |
11  | return  $\text{dist}$ 
```

Empty bodies



code with empty raw block

1

code indent guides with custom tab size

indent-guides: 1pt + black

tab-size: 2

```
1  def floyd_warshall(  
2      |  G  
3      |  ):  
4      # let G be an adjacency matrix  
5      dist = G  
6  
7      for k in range(len(G)):  
8          |  for i in range(len(G)):  
9              |  for j in range(len(G)):  
10                 |  if dist[i][j] > dist[i][k] + dist[k][j]:  
11                     |  dist[i][j] = dist[i][k] + dist[k][j]  
12  
13     return dist
```

No line numbers

line-numbers: false

```
FLOYD-WARSHALL( $V, E, w$ ):  
Let  $\text{dist}[u, v] \leftarrow \infty$  for  $u, v$  in  $V$   
For  $(u, v)$  in  $E$ :  
     $\text{dist}[u, v] \leftarrow w(u, v)$  // edge weights  
For  $v$  in  $V$ :  
     $\text{dist}[v, v] \leftarrow 0$  // base case  
  
For  $k \leftarrow 1$  to  $|V|$ :  
    For  $i \leftarrow 1$  to  $|V|$ :  
        For  $j \leftarrow 1$  to  $|V|$ :  
            If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :  
                 $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$   
  
Return  $\text{dist}$ 
```

```
def floyd_warshall(G):  
    # let G be an adjacency matrix  
    dist = G  
  
    for k in range(len(G)):  
        for i in range(len(G)):  
            for j in range(len(G)):  
                if dist[i][j] > dist[i][k] + dist[k][j]:  
                    dist[i][j] = dist[i][k] + dist[k][j]  
  
    return dist
```

algo without keywords

strong-keywords: false

```
FLOYD-WARSHALL( $V, E, w$ ):
1  Let  $\text{dist}[u, v] \leftarrow \infty$  for  $u, v$  in  $V$ 
2  For  $(u, v)$  in  $E$ :
3       $\text{dist}[u, v] \leftarrow w(u, v)$  // edge weights
4  For  $v$  in  $V$ :
5       $\text{dist}[v, v] \leftarrow 0$  // base case
6
7  For  $k \leftarrow 1$  to  $|V|$ :
8      For  $i \leftarrow 1$  to  $|V|$ :
9          For  $j \leftarrow 1$  to  $|V|$ :
10             If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :
11                  $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$ 
12
13  Return  $\text{dist}$ 
```

algo with custom keywords

keywords: ("in", "to")

```
FLOYD-WARSHALL( $V, E, w$ ):
1  Let  $\text{dist}[u, v] \leftarrow \infty$  for  $u, v$  in  $V$ 
2  For  $(u, v)$  in  $E$ :
3       $\text{dist}[u, v] \leftarrow w(u, v)$                                 // edge weights
4  For  $v$  in  $V$ :
5       $\text{dist}[v, v] \leftarrow 0$                                     // base case
6
7  For  $k \leftarrow 1$  to  $|V|$ :
8      For  $i \leftarrow 1$  to  $|V|$ :
9          For  $j \leftarrow 1$  to  $|V|$ :
10             If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :
11                  $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$ 
12
13  Return  $\text{dist}$ 
```


algo without title

title: none

```
(V, E, w):
1  Let dist[u, v]  $\leftarrow \infty$  for u, v in V
2  For (u, v) in E:
3      dist[u, v]  $\leftarrow w(u, v)$                                 // edge weights
4  For v in V:
5      dist[v, v]  $\leftarrow 0$                                     // base case
6
7  For k  $\leftarrow 1$  to |V|:
8      For i  $\leftarrow 1$  to |V|:
9          For j  $\leftarrow 1$  to |V|:
10             If dist[i, j] > dist[i, k] + dist[k, j]:
11                 dist[i, j]  $\leftarrow$  dist[i, k] + dist[k, j]
12
13  Return dist
```

algo without parameters

parameters: ()

```
FLOYD-WARSHALL():
1  Let  $\text{dist}[u, v] \leftarrow \infty$  for  $u, v \in V$ 
2  For  $(u, v) \in E$ :
3       $\text{dist}[u, v] \leftarrow w(u, v)$  // edge weights
4  For  $v \in V$ :
5       $\text{dist}[v, v] \leftarrow 0$  // base case
6
7  For  $k \leftarrow 1$  to  $|V|$ :
8      For  $i \leftarrow 1$  to  $|V|$ :
9          For  $j \leftarrow 1$  to  $|V|$ :
10             If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :
11                  $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$ 
12
13  Return  $\text{dist}$ 
```

algo without header

title: none

parameters: ()

```
1  Let  $\text{dist}[u, v] \leftarrow \infty$  for  $u, v$  in  $V$ 
2  For  $(u, v)$  in  $E$ :
3       $\text{dist}[u, v] \leftarrow w(u, v)$                                 // edge weights
4  For  $v$  in  $V$ :
5       $\text{dist}[v, v] \leftarrow 0$                                     // base case
6
7  For  $k \leftarrow 1$  to  $|V|$ :
8      For  $i \leftarrow 1$  to  $|V|$ :
9          For  $j \leftarrow 1$  to  $|V|$ :
10             If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :
11                  $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$ 
12
13  Return  $\text{dist}$ 
```

algo with content-type parameters

parameters: ([#text(blue, [V])], [#text(red, [E])], [#text(green, [w])])

FLOYD-WARSHALL(**V**, **E**, **w**):

```
1  Let  $\text{dist}[u, v] \leftarrow \infty$  for  $u, v$  in  $V$ 
2  For  $(u, v)$  in  $E$ :
3       $\text{dist}[u, v] \leftarrow w(u, v)$                                 // edge weights
4  For  $v$  in  $V$ :
5       $\text{dist}[v, v] \leftarrow 0$                                     // base case
6
7  For  $k \leftarrow 1$  to  $|V|$ :
8      For  $i \leftarrow 1$  to  $|V|$ :
9          For  $j \leftarrow 1$  to  $|V|$ :
10             If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :
11                  $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$ 
12
13 Return  $\text{dist}$ 
```

algo with content-type title

title: [#set text(red);Floyd-Warshall]

Floyd-Warshall():

```
1  Let  $\text{dist}[u, v] \leftarrow \infty$  for  $u, v$  in  $V$ 
2  For  $(u, v)$  in  $E$ :
3       $\text{dist}[u, v] \leftarrow w(u, v)$                                 // edge weights
4  For  $v$  in  $V$ :
5       $\text{dist}[v, v] \leftarrow 0$                                     // base case
6
7  For  $k \leftarrow 1$  to  $|V|$ :
8      For  $i \leftarrow 1$  to  $|V|$ :
9          For  $j \leftarrow 1$  to  $|V|$ :
10             If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :
11                  $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$ 
12
13 Return  $\text{dist}$ 
```

algo with custom header

Floyd-Warshall Algorithm

Inputs: graph $G = (V, E)$
weight function $w : E \rightarrow \mathbb{R}$

Outputs: distance matrix dist

```
1  Let dist[ $u, v$ ]  $\leftarrow \infty$  for  $u, v$  in  $V$ 
2  For ( $u, v$ ) in  $E$ :
3      dist[ $u, v$ ]  $\leftarrow w(u, v)$                                 // edge weights
4  For  $v$  in  $V$ :
5      dist[ $v, v$ ]  $\leftarrow 0$                                     // base case
6
7  For  $k \leftarrow 1$  to  $|V|$ :
8      For  $i \leftarrow 1$  to  $|V|$ :
9          For  $j \leftarrow 1$  to  $|V|$ :
10             If dist[ $i, j$ ]  $>$  dist[ $i, k$ ] + dist[ $k, j$ ]:
11                 dist[ $i, j$ ]  $\leftarrow$  dist[ $i, k$ ] + dist[ $k, j$ ]
12
13  Return dist
```

Text styling

main-text-styles: (fill: green)

line-number-styles: (fill: red)

comment-styles: (fill: blue) (algo only)

FLOYD-WARSHALL(V, E, w):

```
1  Let  $\text{dist}[u, v] \leftarrow \infty$  for  $u, v \in V$ 
2  For  $(u, v) \in E$ :
3       $\text{dist}[u, v] \leftarrow w(u, v)$  // edge weights
4  For  $v \in V$ :
5       $\text{dist}[v, v] \leftarrow 0$  // base case
6
7  For  $k \leftarrow 1$  to  $|V|$ :
8      For  $i \leftarrow 1$  to  $|V|$ :
9          For  $j \leftarrow 1$  to  $|V|$ :
10             If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :
11                  $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$ 
12
13  Return  $\text{dist}$ 
```

```
1  def floyd_warshall(G):
2      # let G be an adjacency matrix
3      dist = G
4
5      for k in range(len(G)):
6          for i in range(len(G)):
7              for j in range(len(G)):
8                  if dist[i][j] > dist[i][k] + dist[k][j]:
9                      dist[i][j] = dist[i][k] + dist[k][j]
10
11  return dist
```

Indent guides with big main text

indent-guides: 1pt + black
main-text-styles: (size: 15pt)

```
FLOYD-WARSHALL( $V, E, w$ ):  
1  Let  $\text{dist}[u, v] \leftarrow \infty$  for  $u, v$  in  $V$   
2  For  $(u, v)$  in  $E$ :  
3       $\text{dist}[u, v] \leftarrow w(u, v)$                                 // edge weights  
4  For  $v$  in  $V$ :  
5       $\text{dist}[v, v] \leftarrow 0$                                     // base case  
6  
7  For  $k \leftarrow 1$  to  $|V|$ :  
8      For  $i \leftarrow 1$  to  $|V|$ :  
9          For  $j \leftarrow 1$  to  $|V|$ :  
10             If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :  
11                  $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$   
12  
13 Return  $\text{dist}$ 
```

```
1  def floyd_warshall(G):  
2      # let G be an adjacency matrix  
3      dist = G  
4  
5      for k in range(len(G)):  
6          for i in range(len(G)):  
7              for j in range(len(G)):  
8                  if dist[i][j] > dist[i][k] + dist[k][j]:  
9                      dist[i][j] = dist[i][k] + dist[k][j]  
10  
11     return dist
```


Indent guides with big line numbers

indent-guides: 1pt + black

line-number-styles: (size: 15pt)

FLOYD-WARSHALL(V, E, w):

```
1  Let  $\text{dist}[u, v] \leftarrow \infty$  for  $u, v$  in  $V$ 
2  For  $(u, v)$  in  $E$ :
3  |    $\text{dist}[u, v] \leftarrow w(u, v)$                                 // edge weights
4  For  $v$  in  $V$ :
5  |    $\text{dist}[v, v] \leftarrow 0$                                     // base case
6
7  For  $k \leftarrow 1$  to  $|V|$ :
8  |   For  $i \leftarrow 1$  to  $|V|$ :
9  |   |   For  $j \leftarrow 1$  to  $|V|$ :
10 |   |   |   If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :
11 |   |   |   |    $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$ 
12
13 Return  $\text{dist}$ 
```

```
1  def floyd_warshall(G):
2  |   # let G be an adjacency matrix
3  |   dist = G
4  |
5  |   for k in range(len(G)):
6  |   |   for i in range(len(G)):
7  |   |   |   for j in range(len(G)):
8  |   |   |   |   if dist[i][j] > dist[i][k] + dist[k][j]:
9  |   |   |   |   |   dist[i][j] = dist[i][k] + dist[k][j]
10 |
11 |   return dist
```

algo indent guides with big comments

indent-guides: 1pt + black

comment-styles: (size: 15pt)

FLOYD-WARSHALL(V, E, w):

1 **Let** $\text{dist}[u, v] \leftarrow \infty$ **for** u, v **in** V

2 **For** (u, v) **in** E :

3 $\text{dist}[u, v] \leftarrow w(u, v)$ // edge weights

4 **For** v **in** V :

5 $\text{dist}[v, v] \leftarrow 0$ // base case

6

7 **For** $k \leftarrow 1$ **to** $|V|$:

8 **For** $i \leftarrow 1$ **to** $|V|$:

9 **For** $j \leftarrow 1$ **to** $|V|$:

10 **If** $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$:

11 $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$

12

13 **Return** dist

Alignment

indent-guides: 1pt + black

block-align: bottom + right

FLOYD-WARSHALL(V, E, w):

```
1  Let  $\text{dist}[u, v] \leftarrow \infty$  for  $u, v \in V$ 
2  For  $(u, v) \in E$ :
3     $\text{dist}[u, v] \leftarrow w(u, v)$                                 // edge weights
4  For  $v \in V$ :
5     $\text{dist}[v, v] \leftarrow 0$                                     // base case
6
7  For  $k \leftarrow 1$  to  $|V|$ :
8    For  $i \leftarrow 1$  to  $|V|$ :
9      For  $j \leftarrow 1$  to  $|V|$ :
10       If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :
11          $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$ 
12
13  Return  $\text{dist}$ 
```

```
1 def floyd_warshall(G):
2     # let G be an adjacency matrix
3     dist = G
4
5     for k in range(len(G)):
6         for i in range(len(G)):
7             for j in range(len(G)):
8                 if dist[i][j] > dist[i][k] + dist[k][j]:
9                     dist[i][j] = dist[i][k] + dist[k][j]
10
11     return dist
```

Breakable

indent-guides: 1pt + black

breakable: true

FLOYD-WARSHALL(V, E, w):

```
1  Let  $\text{dist}[u, v] \leftarrow \infty$  for  $u, v$  in  $V$ 
2  For  $(u, v)$  in  $E$ :
3  |    $\text{dist}[u, v] \leftarrow w(u, v)$                                 // edge weights
4  For  $v$  in  $V$ :
5  |    $\text{dist}[v, v] \leftarrow 0$                                     // base case
6
7  For  $k \leftarrow 1$  to  $|V|$ :
8  |   For  $i \leftarrow 1$  to  $|V|$ :
9  |   |   For  $j \leftarrow 1$  to  $|V|$ :
```

```

10 |   |   |   If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :
11 |   |   |   |    $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$ 
12
13 Return dist

```

```

1 def floyd_warshall(G):
2     # let G be an adjacency matrix
3     dist = G
4
5     for k in range(len(G)):
6         for i in range(len(G)):
7             for j in range(len(G)):

```

```
8 | | | if dist[i][j] > dist[i][k] + dist[k][j]:  
9 | | | | dist[i][j] = dist[i][k] + dist[k][j]  
10  
11 | return dist
```