

## 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 new path is shorter, reduce distance
11             If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :
12                  $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$ 
13
14  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 new path is shorter, reduce distance
11         | If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :
12         | |  $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$ 
13
14  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
```

**Empty bodies**



**code with empty raw text**

**code with empty raw block**

## code with non-sequence raw block

```
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 line wrapping

indent-guides: 1pt + black

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 new path is shorter, reduce distance
11 |   |   |   If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :
12 |   |   |   |    $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$ 
13 |   |   |   |   blah blah blah blah blah blah blah blah blah
14 |   |   |   |   blah blah blah blah
15 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 |   |   |   |   blah blah blah blah blah blah blah blah blah
11 |   |   |   |   blah blah blah
12 |   |
13 |   return dist
```

## 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 new path is shorter, reduce distance  
            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

keyword-styles: none

```
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 new path is shorter, reduce distance
11             If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :
12                  $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$ 
13
14  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 new path is shorter, reduce distance
11             If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :
12                  $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$ 
13
14  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 new path is shorter, reduce distance
11             If dist[i, j] > dist[i, k] + dist[k, j]:
12                 dist[i, j]  $\leftarrow$  dist[i, k] + dist[k, j]
13
14  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 new path is shorter, reduce distance
11             If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :
12                  $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$ 
13
14  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 new path is shorter, reduce distance
11             If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :
12                  $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$ 
13
14  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 new path is shorter, reduce distance  
11             If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :  
12                  $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$   
13  
14  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 new path is shorter, reduce distance
11             If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :
12                  $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$ 
13
14  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  $\text{dist}$

---

```
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 new path is shorter, reduce distance
11             If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :
12                  $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$ 
13
14  Return  $\text{dist}$ 
```

## Text styling

main-text-styles: `x => text(fill: green)[#x]`

line-number-styles: `x => text(fill: red)[#x]`

comment-styles: `x => text(fill: blue, x) (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 new path is shorter, reduce distance
11             If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :
12                  $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$ 
13
14  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: x => text(size: 15pt)[#x]

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 new path is shorter, reduce distance
11 |           If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :
12 |                $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$ 
13
14 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]
9 [j]:
10
11 [j]         dist[i][j] = dist[i][k] + dist[k]
```

## Indent guides with big line numbers

indent-guides: 1pt + black

line-number-styles: x => (size: 15pt)[#x]

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 new path is shorter, reduce distance
11 |    |    |    If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :
12 |    |    |    |     $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$ 
13
14 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
```

## algo indent guides with big comments

indent-guides: 1pt + black

comment-styles: x => text(size: 15pt, x)

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 new path is shorter, reduce distance
11             If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :
12                  $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$ 
13
14  Return  $\text{dist}$ 
```

## 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 new path is shorter, reduce distance
11 |   |   |   If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :
12 |   |   |   |    $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$ 
13
14 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 new path is shorter, reduce distance
11 | | If dist[i, j] > dist[i, k] + dist[k, j]:
12 | | | dist[i, j] ← dist[i, k] + dist[k, j]
13
14 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
```

## Broken indent guides with small inset

row-gutter: 15pt  
inset: 3pt  
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 new path is shorter, reduce distance
11      If  $\text{dist}[i, j] > \text{dist}[i, k] + \text{dist}[k, j]$ :
12           $\text{dist}[i, j] \leftarrow \text{dist}[i, k] + \text{dist}[k, j]$ 
13
14  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
```