

## Bellman-Ford Algorithm

The Bellman-Ford Algorithm is used to find the Shortest Path from a single source vertex to all other vertices in a weighted graph.

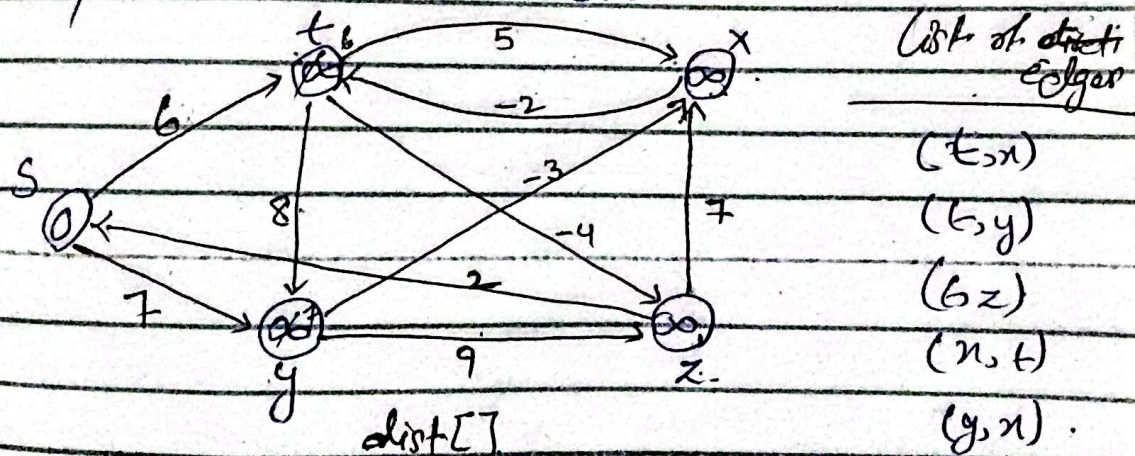


\* Unlike Dijkstra's algorithm, Bellman-Ford can handle graphs with negative edge weights, making it more versatile.

\* The Bellman-Ford Algorithm uses a dynamic programming approach to find the shortest paths. It iteratively relaxes the edges of the graph, updating the shortest path estimates, until no more improvement can be made or until negative weight cycle is detected.

How it works

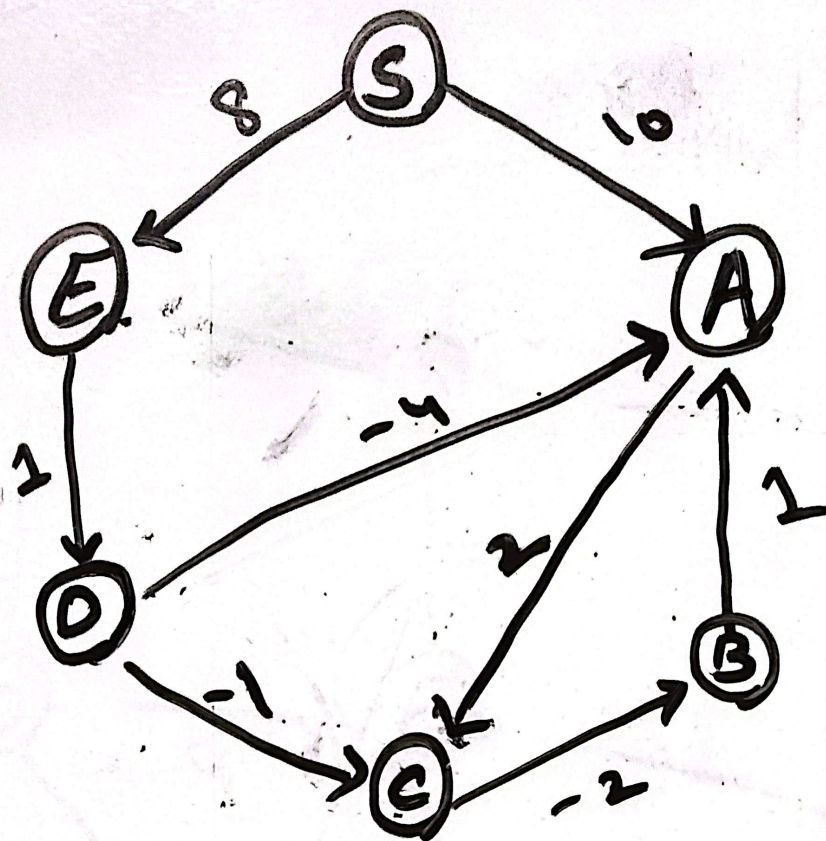
- ① Source at first step source is zero and remain vertex as infinity.
- ② loop runs  $V-1$  times.



i	s	t	n	y	z	
initially	0	$\infty$	$\infty$	$\infty$	$\infty$	
1	0	6	$\infty$	7	$\infty$	(z,s)
2	0	6	4	7	2	(s,t)
3	0	2	4	7	2	(s,y)
4	0	2	4	7	-2	
4+1	0	2	4	7	-2	4+1 $\rightarrow$ to check negative weight cycle if change

$\rightarrow$  no changes means no negative cycle.





List  
 (S, A)  
 (S, E)  
 (A, C)  
 (B, A)  
 (C, B)  
 (D, A)  
 (D, C)  
 (E, D)

$$v-1=5$$

dist[]

i	S	A	B	C	D	E
initially	0	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$
1	0	10	10	12	9	8
2	0	5	10	8	9	8
3	0	5	5	7	9	8
4	0	5	5	7	9	8
5	0	5	5	7	9	8