Relatório — Fluxo em Redes (Caminho Mínimo)

Gerado em 2026-01-20T15:24:36.938620Z

Resumo executivo

sim_id	sim_name	n	m	neg_edges	runtime_s	dist_reachable	dist_mean	dist_max
1	Bellman	10	22	7	2.059999678749591e-05	10	-6.3	39.0
1	Bellman	100	1307	462	0.0004124999977648	100	-126.24	50.0
2	Dijkstra	10	25	0	3.599999763537198e-05	10	24.0	53.0
2	Dijkstra	100	2549	0	0.0004664000007323	100	6.7	12.0
3	Floyd	10	32	9	0.0012268999998923	10	24.6	50.0
3	Floyd	100	2499	564	1.2436999999990803	100	0.77	20.0

Simulação 1 — Bellman recursivo em DAG

n	m	neg_edges	runtime_s	dist_mean	dist_std
10	22	7	2.059999678749591e-05	-6.3	33.556072475782976
100	1307	462	0.0004124999977648	-126.24	90.15133055035848

Execução n=10

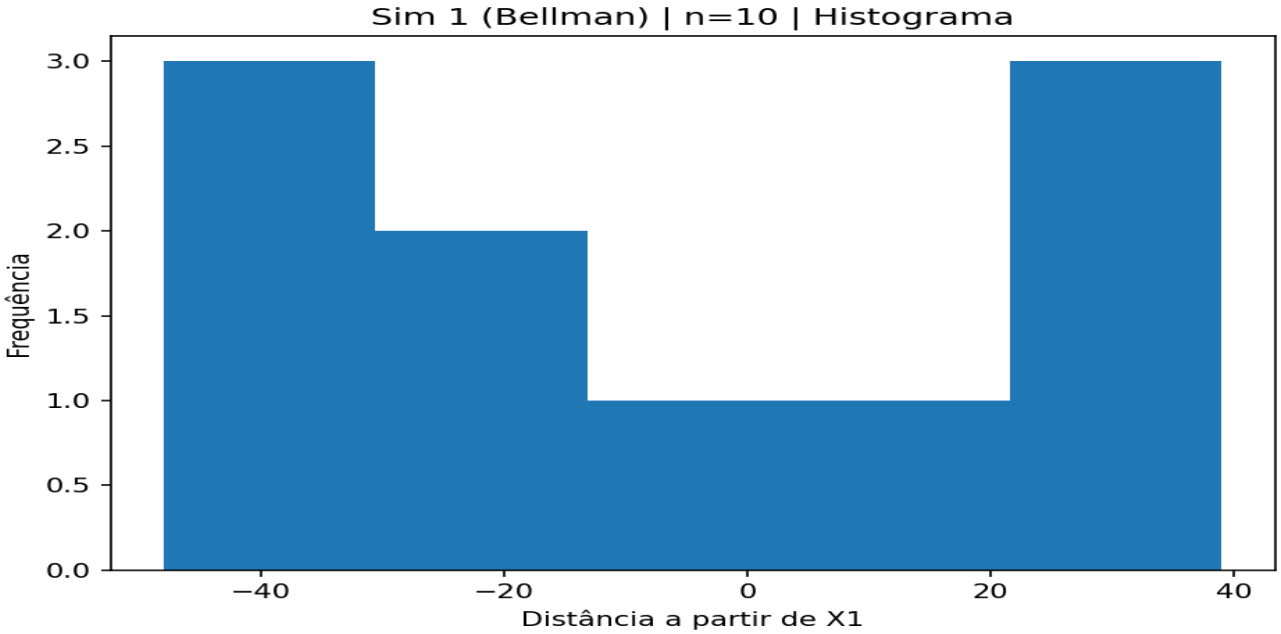
Arestas m=22 (densidade efetiva 0.244), arestas negativas=7. Alcançáveis=10/10. Tempo=0.000021s.

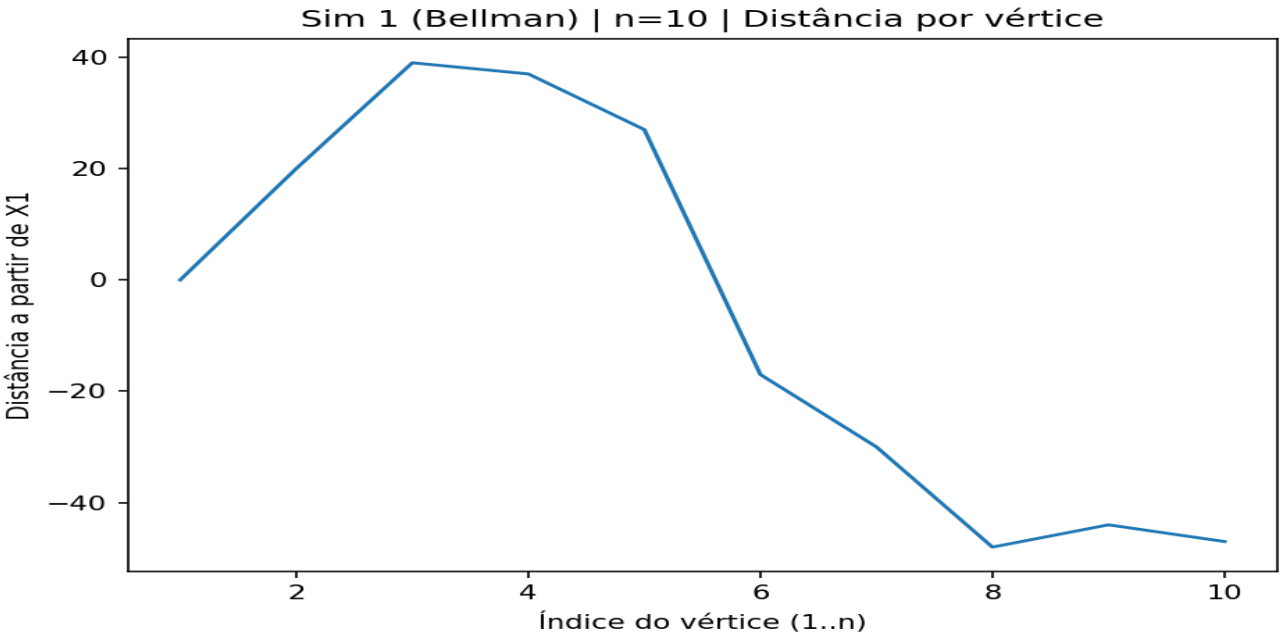
Top 5 mais distantes

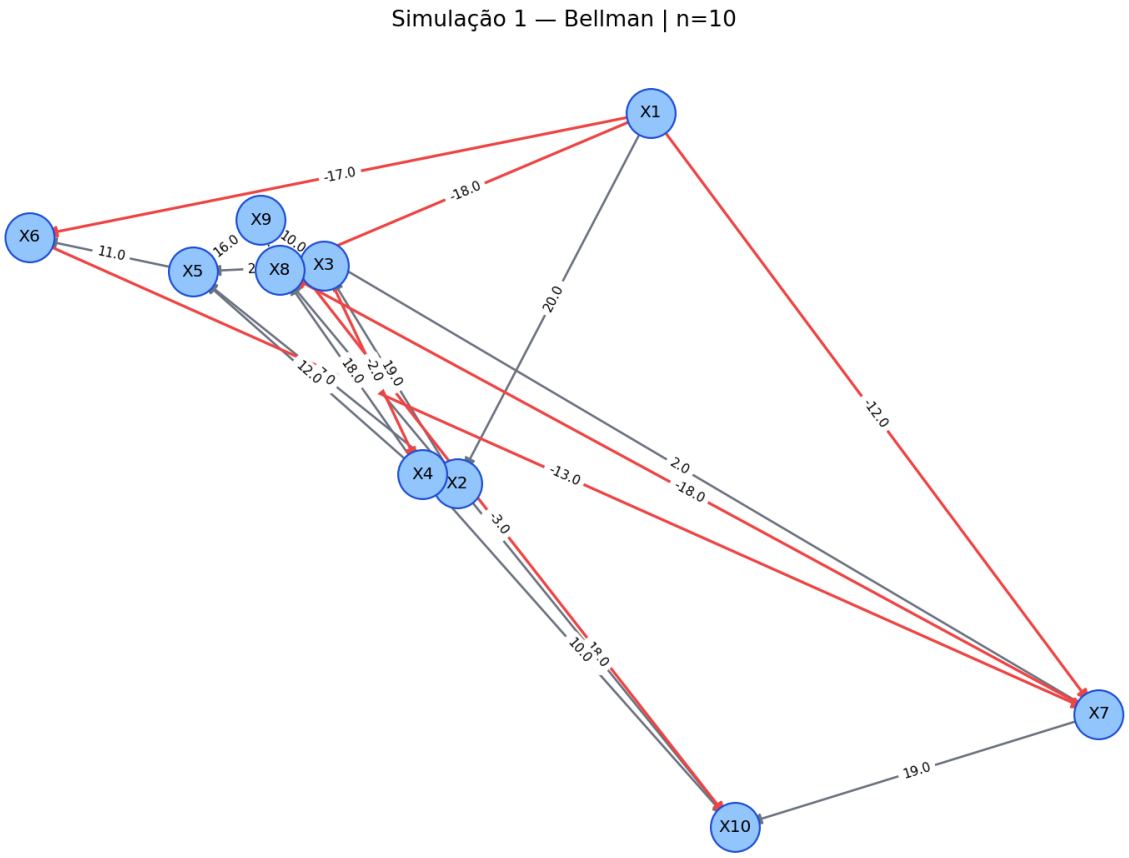
label	distance	path
X3	39.0	X1 -> X2 -> X3
X4	37.0	X1 -> X2 -> X3 -> X4
X5	27.0	X1 -> X2 -> X5
X2	20.0	X1 -> X2
X1	0.0	X1

Top 5 mais próximos

label	distance	path
X1	0.0	X1
X6	-17.0	X1 -> X6
X2	20.0	X1 -> X2
X5	27.0	X1 -> X2 -> X5
X7	-30.0	X1 -> X6 -> X7


Sim 1 (Bellman) | n=10 | Histograma
Frequência
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−40
−20
0
20
40
Distância a partir de X1


Sim 1 (Bellman) | n=10 | Distância por vértice
Distância a partir de X1
40
20
0
−20
−40
2
4
6
8
10
Índice do vértice (1..n)



Execução n=100

Arestas m=1307 (densidade efetiva 0.132), arestas negativas=462. Alcançáveis=100/100. Tempo=0.000412s.

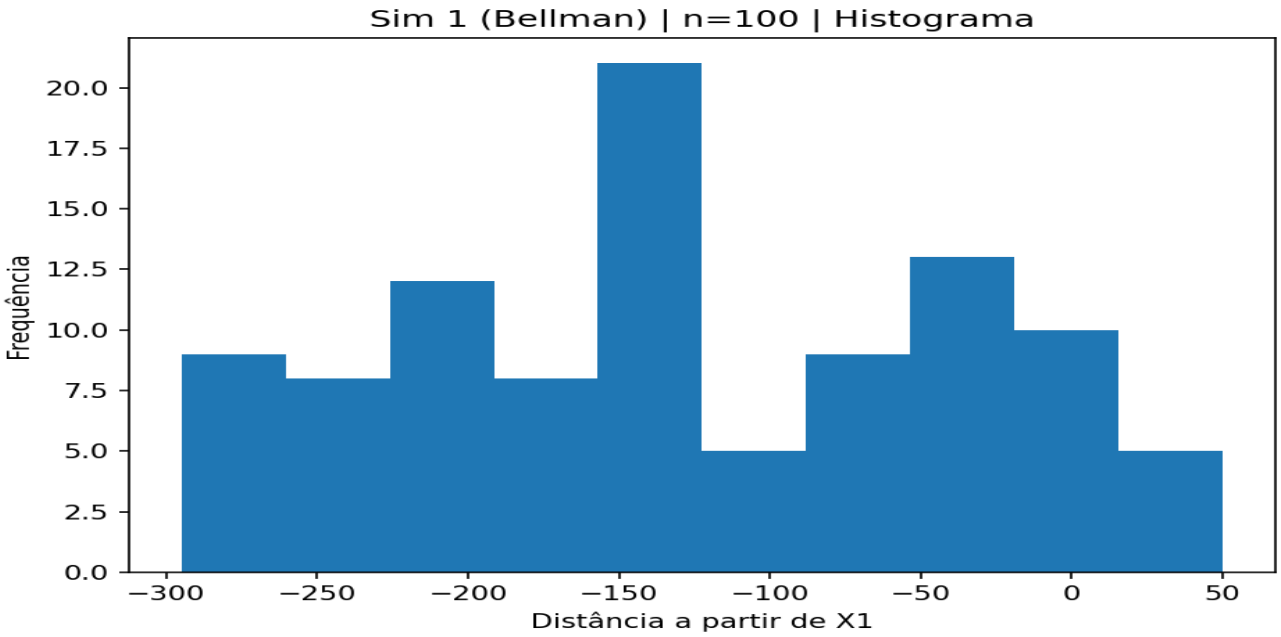
Top 5 mais distantes

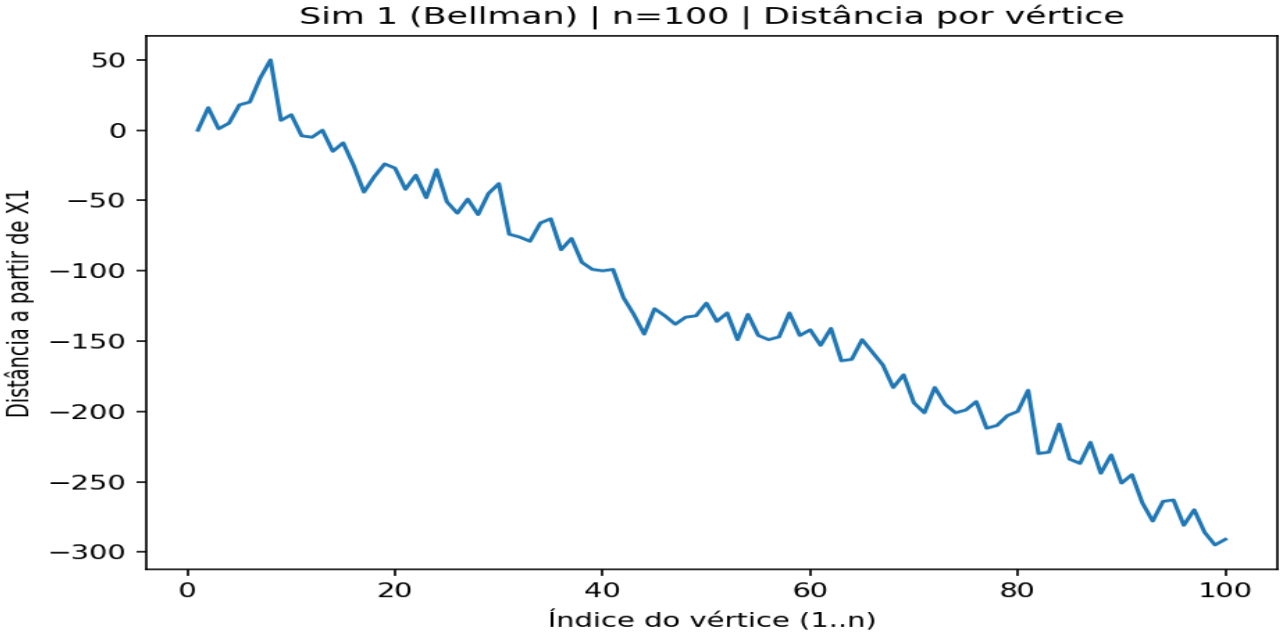
label	distance	path
X8	50.0	X1 -> X2 -> X3 -> X4 -> X6 -> X7 -> X8
X7	37.0	X1 -> X2 -> X3 -> X4 -> X6 -> X7
X6	20.0	X1 -> X2 -> X3 -> X4 -> X6
X5	18.0	X1 -> X2 -> X3 -> X4 -> X5
X2	16.0	X1 -> X2

Top 5 mais próximos

label	distance	path
X1	0.0	X1
X13	0.0	X1 -> X2 -> X3 -> X9 -> X10 -> X11 -> X12 -> X13
X3	1.0	X1 -> X2 -> X3
X11	-4.0	X1 -> X2 -> X3 -> X9 -> X10 -> X11

X4	5.0	X1 -> X2 -> X3 -> X4





Simulação 2 — Dijkstra com Heap (Best-First)

n	m	neg_edges	runtime_s	dist_mean	dist_std
10	25	0	3.599999763537198e-05	24.0	17.894133116750865
100	2549	0	0.0004664000007323	6.7	2.418677324489565

Execução n=10

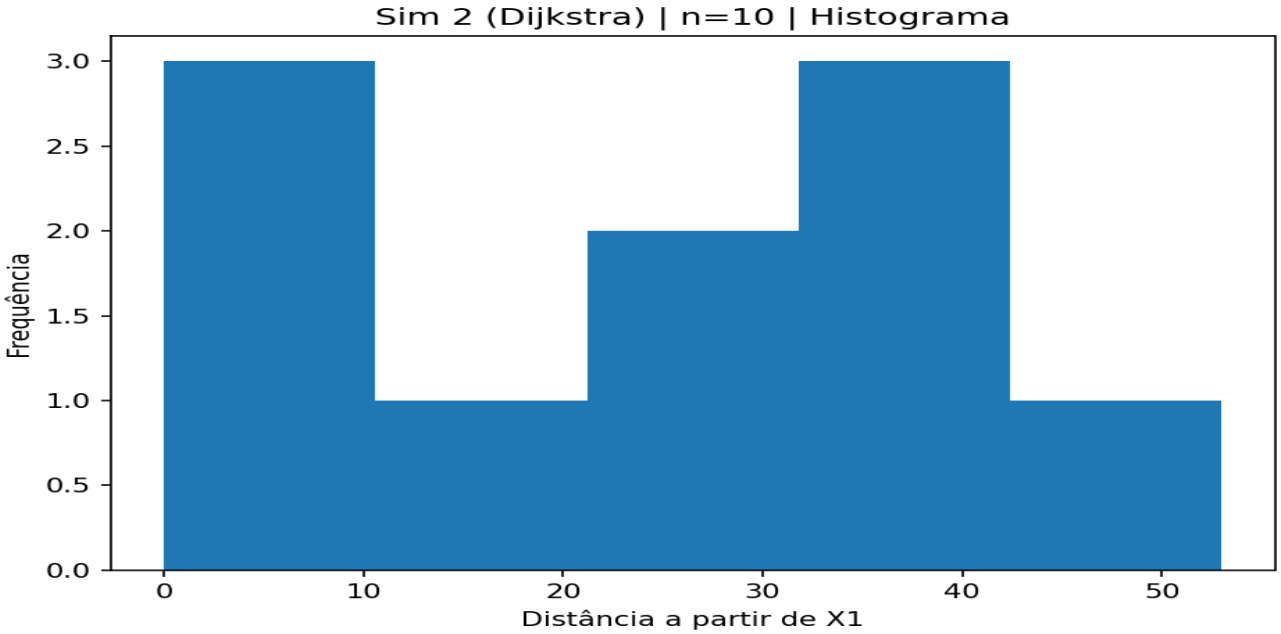
Arestas m=25 (densidade efetiva 0.278), arestas negativas=0. Alcançáveis=10/10. Tempo=0.000036s.

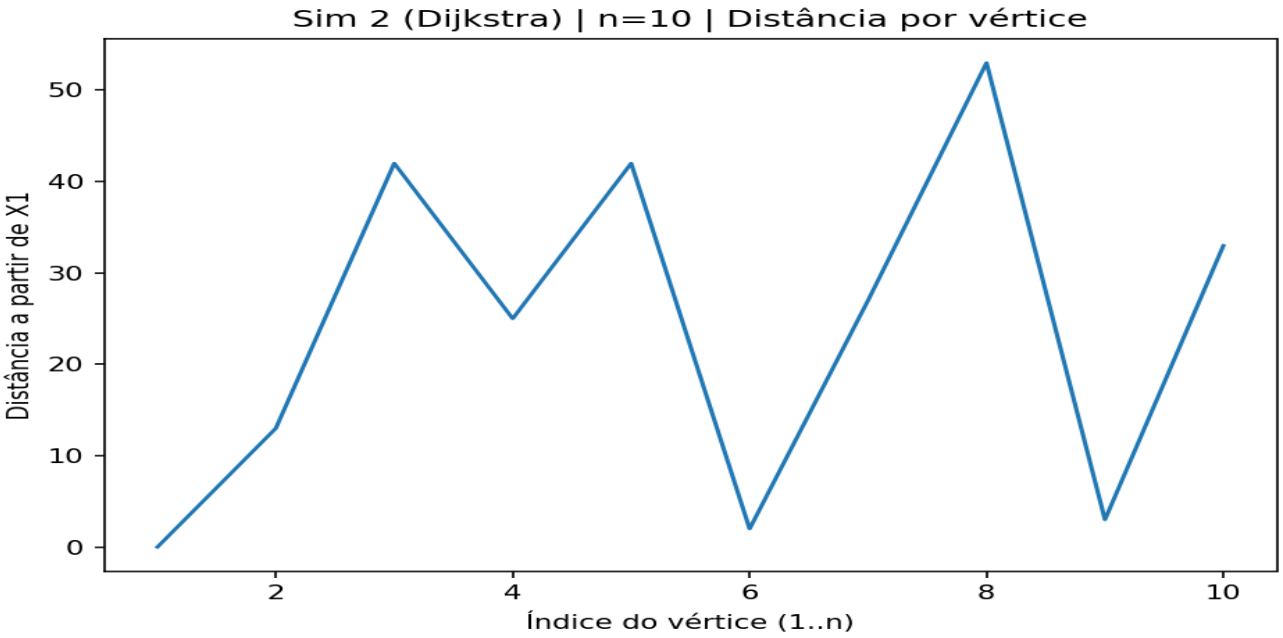
Top 5 mais distantes

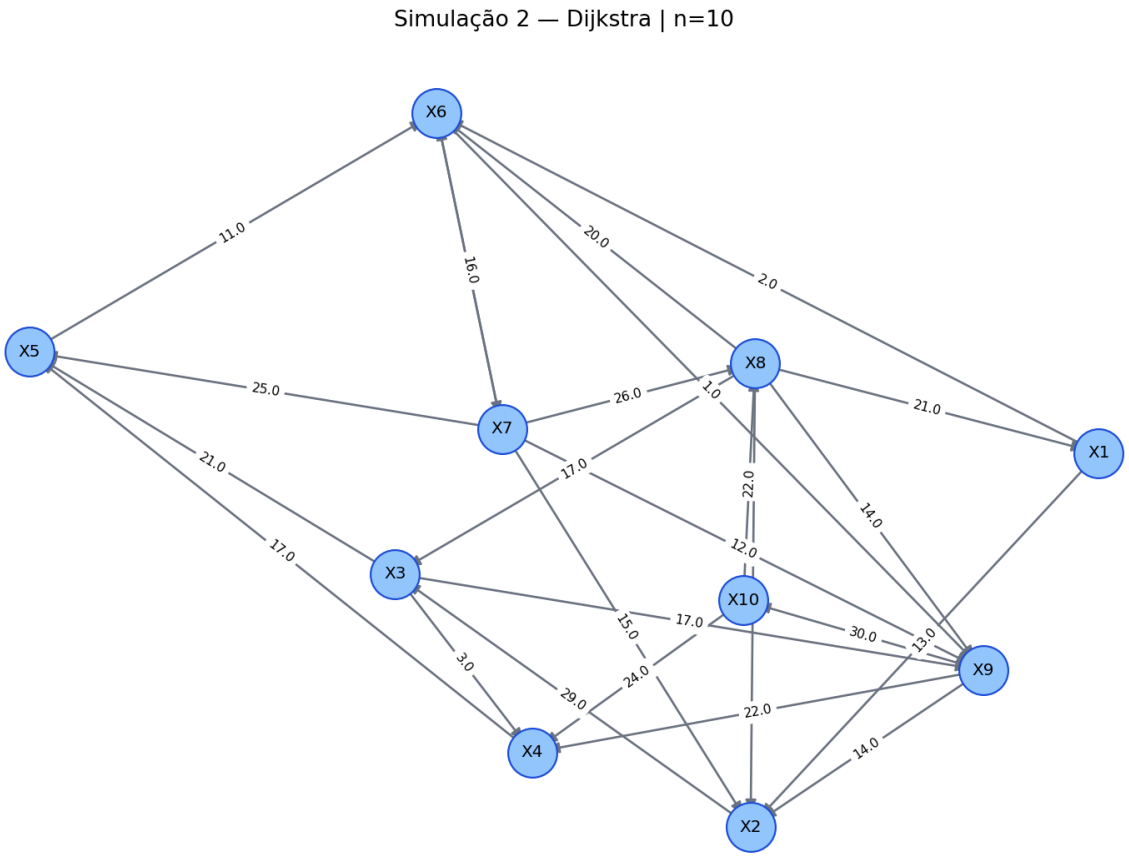
label	distance	path
X8	53.0	X1 -> X6 -> X7 -> X8
X3	42.0	X1 -> X2 -> X3
X5	42.0	X1 -> X6 -> X9 -> X4 -> X5
X10	33.0	X1 -> X6 -> X9 -> X10
X7	27.0	X1 -> X6 -> X7

Top 5 mais próximos

label	distance	path
X1	0.0	X1
X6	2.0	X1 -> X6
X9	3.0	X1 -> X6 -> X9
X2	13.0	X1 -> X2
X4	25.0	X1 -> X6 -> X9 -> X4


Sim 2 (Dijkstra) | n=10 | Histograma
Frequência
Distância a partir de X1
0.0
0.5
1.0
1.5
2.0
2.5
3.0
0
10
20
30
40
50


Sim 2 (Dijkstra) | n=10 | Distância por vértice
Distância a partir de X1
Índice do vértice (1..n)
0
10
20
30
40
50
2
4
6
8
10



Execução n=100

Arestas m=2549 (densidade efetiva 0.257), arestas negativas=0. Alcançáveis=100/100. Tempo=0.000466s.

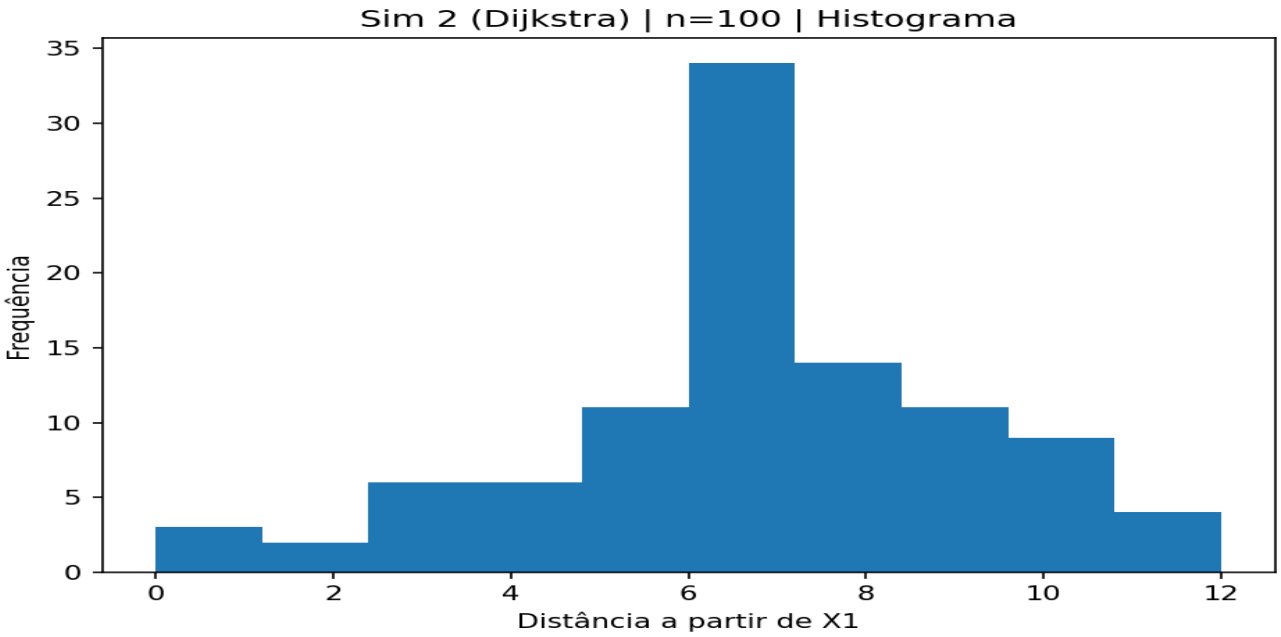
Top 5 mais distantes

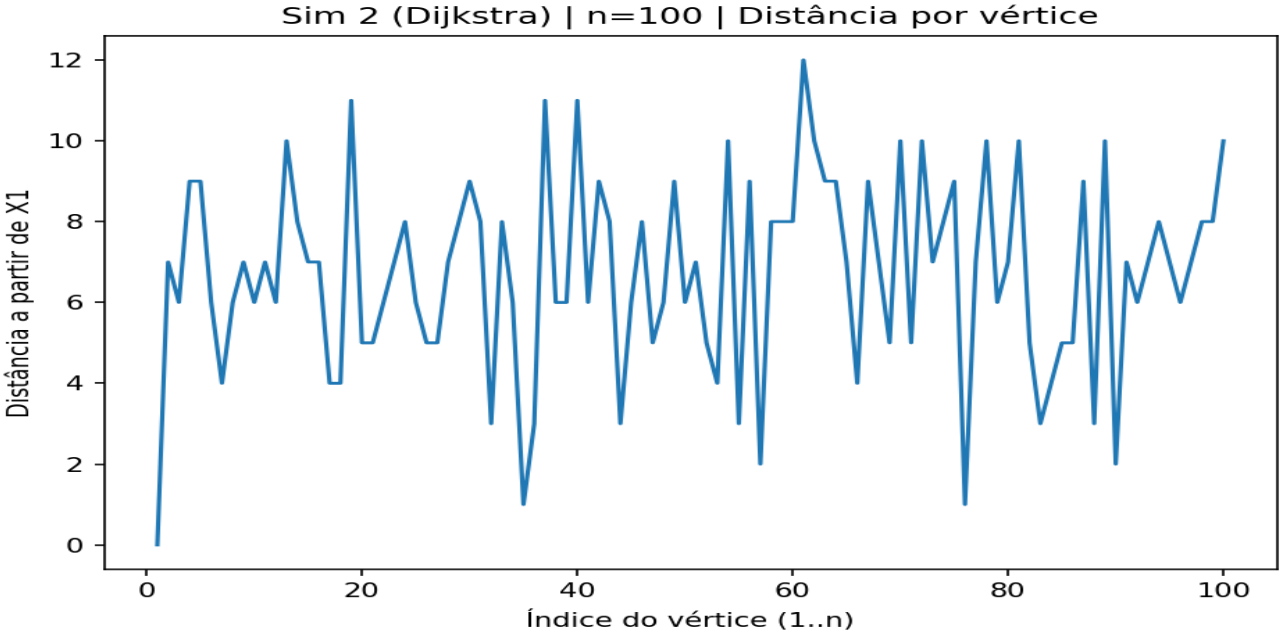
label	distance	path
X61	12.0	X1 -> X32 -> X38 -> X23 -> X59 -> X4 -> X61
X19	11.0	X1 -> X76 -> X57 -> X55 -> X19
X37	11.0	X1 -> X76 -> X57 -> X36 -> X71 -> X6 -> X37
X40	11.0	X1 -> X32 -> X86 -> X14 -> X40
X70	10.0	X1 -> X70

Top 5 mais próximos

label	distance	path
X1	0.0	X1
X35	1.0	X1 -> X35
X76	1.0	X1 -> X76
X57	2.0	X1 -> X76 -> X57

X90	2.0	X1 -> X35 -> X90





Simulação 3 — Floyd-Warshall (matriz de custos)

n	m	neg_edges	runtime_s	dist_mean	dist_std
10	32	9	0.0012268999998923	24.6	13.965672200076874
100	2499	564	1.2436999999990803	0.77	11.333009309093503

Execução n=10

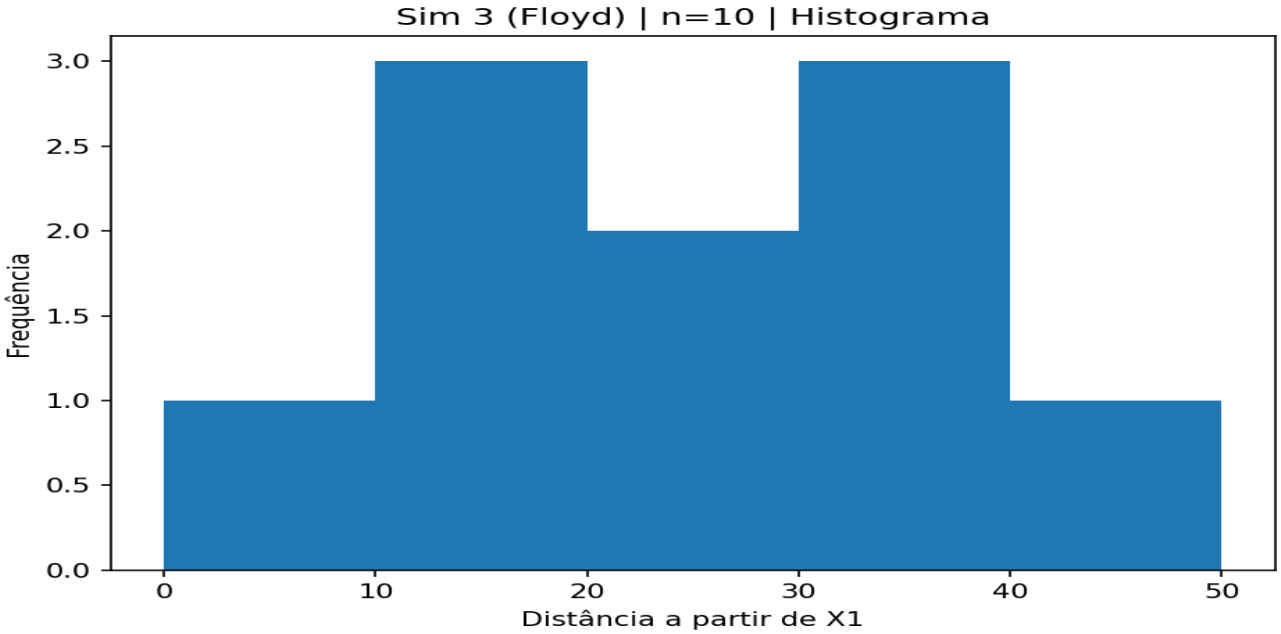
Arestas m=32 (densidade efetiva 0.356), arestas negativas=9. Alcançáveis=10/10. Tempo=0.001227s.

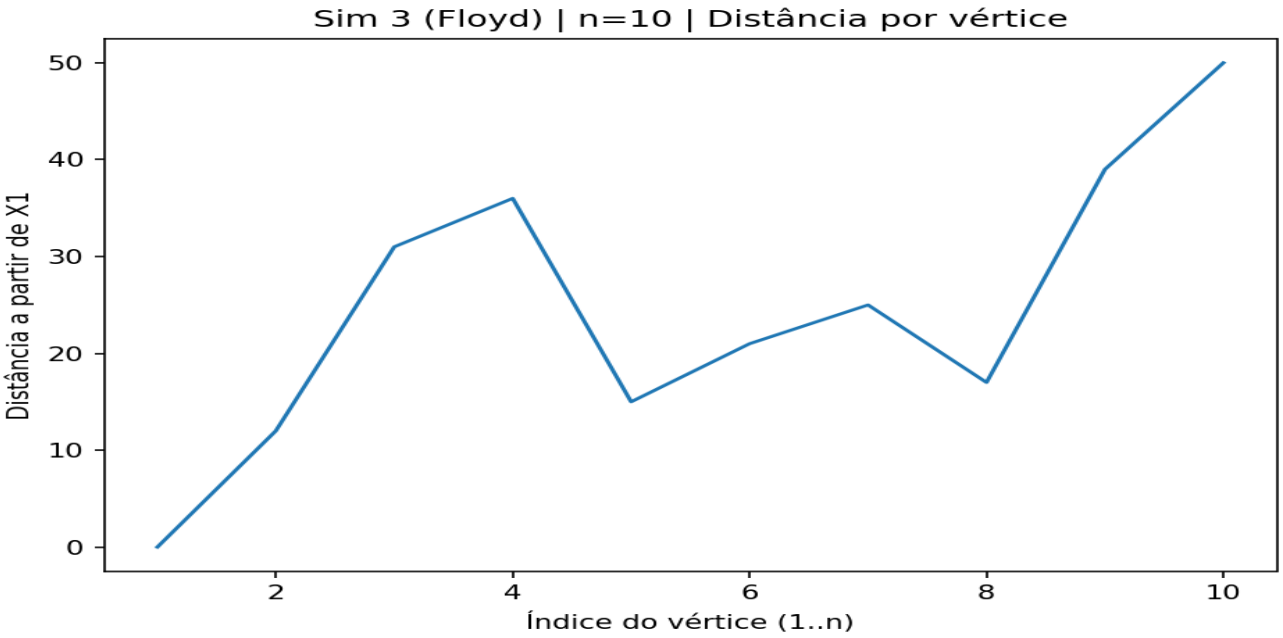
Top 5 mais distantes

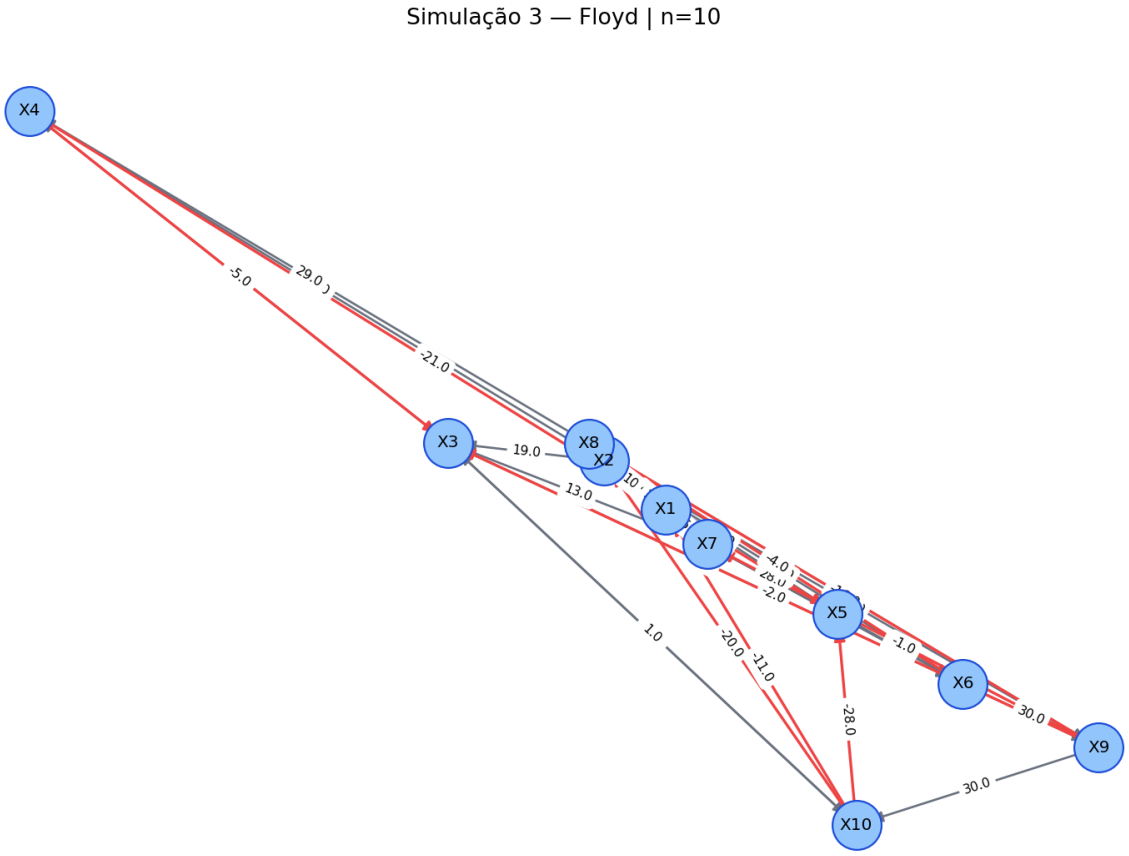
label	distance	path
X10	50.0	X1 -> X2 -> X3 -> X10
X9	39.0	X1 -> X2 -> X9
X4	36.0	X1 -> X2 -> X4
X3	31.0	X1 -> X2 -> X3
X7	25.0	X1 -> X7

Top 5 mais próximos

label	distance	path
X1	0.0	X1
X2	12.0	X1 -> X2
X5	15.0	X1 -> X2 -> X4 -> X5
X8	17.0	X1 -> X2 -> X6 -> X8
X6	21.0	X1 -> X2 -> X6


Sim 3 (Floyd) | n=10 | Histograma
Frequência
Distância a partir de X1
0.0
0.5
1.0
1.5
2.0
2.5
3.0
0
10
20
30
40
50


Sim 3 (Floyd) | n=10 | Distância por vértice
Distância a partir de X1
Índice do vértice (1..n)
0
10
20
30
40
50
2
4
6
8
10



Execução n=100

Arestas m=2499 (densidade efetiva 0.252), arestas negativas=564. Alcançáveis=100/100. Tempo=1.243700s.

Top 5 mais distantes

label	distance	path
X41	20.0	X1 -> X12 -> X41
X46	19.0	X1 -> X47 -> X87 -> X83 -> X46
X79	19.0	X1 -> X47 -> X87 -> X90 -> X79
X25	18.0	X1 -> X47 -> X87 -> X90 -> X79 -> X25
X50	18.0	X1 -> X58 -> X64 -> X37 -> X95 -> X50

Top 5 mais próximos

label	distance	path
X1	0.0	X1
X33	1.0	X1 -> X77 -> X56 -> X33
X91	1.0	X1 -> X77 -> X67 -> X91
X68	-1.0	X1 -> X47 -> X87 -> X70 -> X68

X92	-1.0	X1 -> X47 -> X7 -> X43 -> X92