

Figure 1: **Gradient Descent:** 0:  $f$  without length & Constrained spring scenario: 1 Corners & Grid size: 5

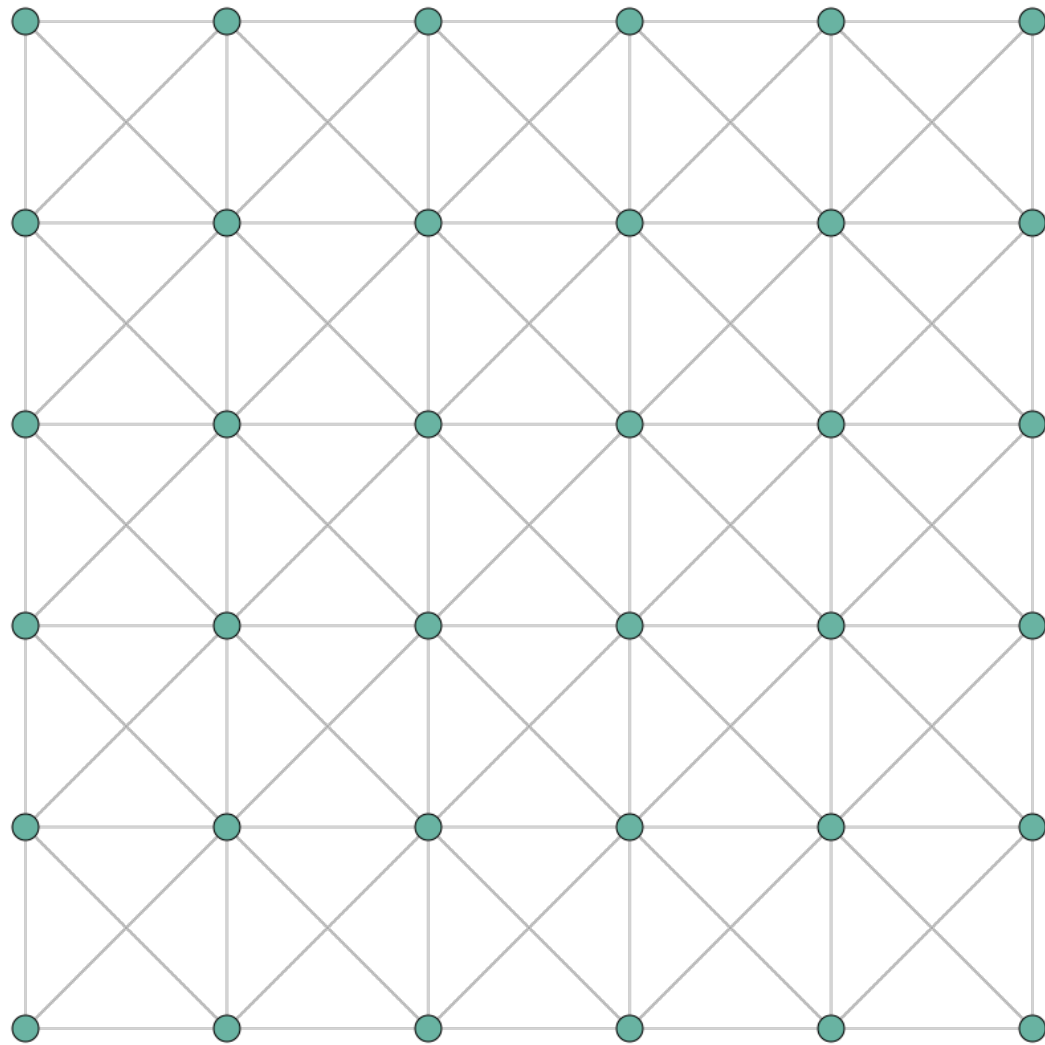


Figure 2: **Gradient Descent:** 1:  $f$  with length & Constrained spring scenario: 1 Corners & Grid size: 5

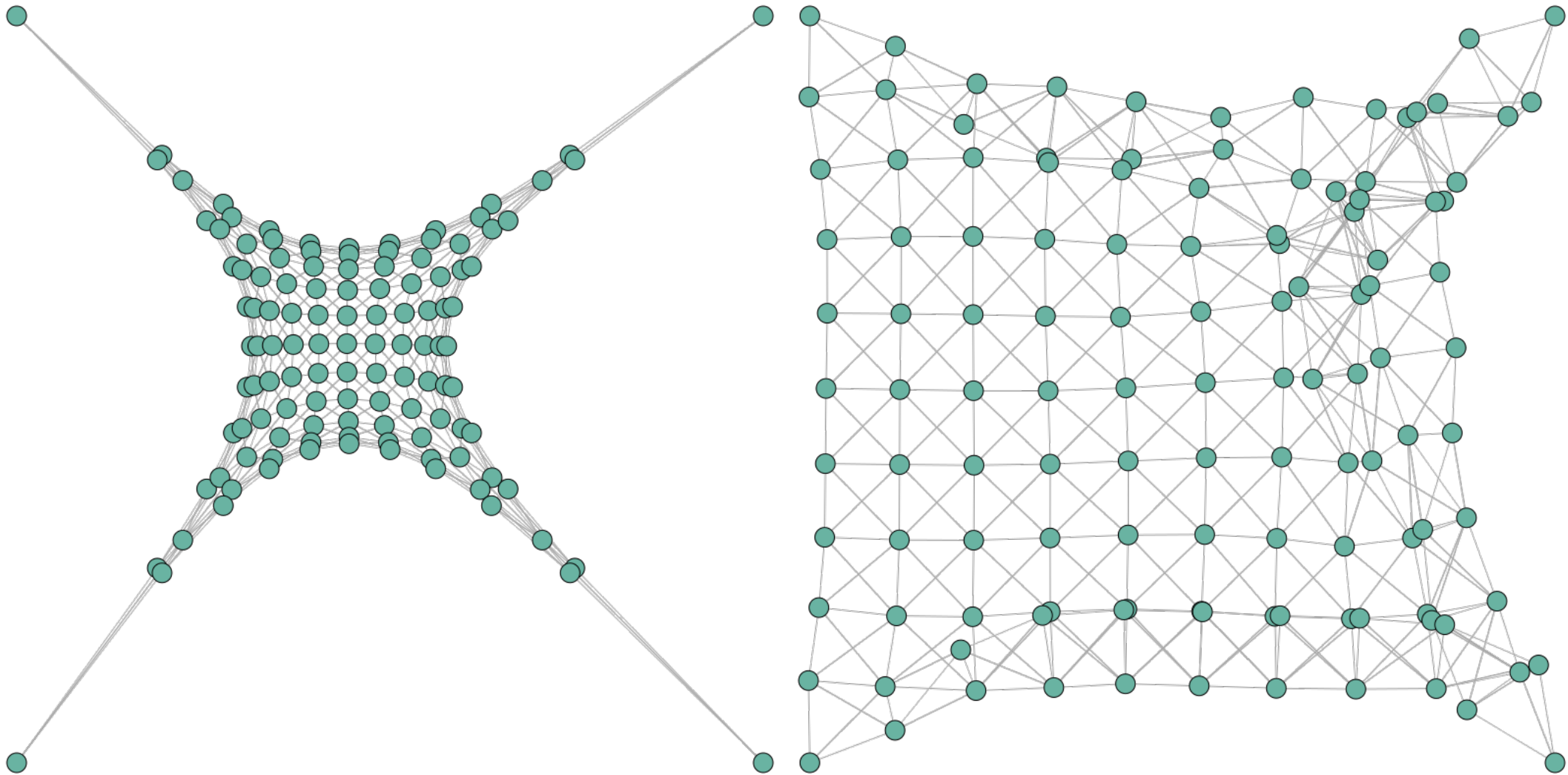


Figure 3: **Gradient Descent:** 0:  $f$  without length & Constrained spring scenario: 1 Corners & Grid size: 10

Figure 4: **Gradient Descent:** 1:  $f$  with length & Constrained spring scenario: 1 Corners & Grid size: 10

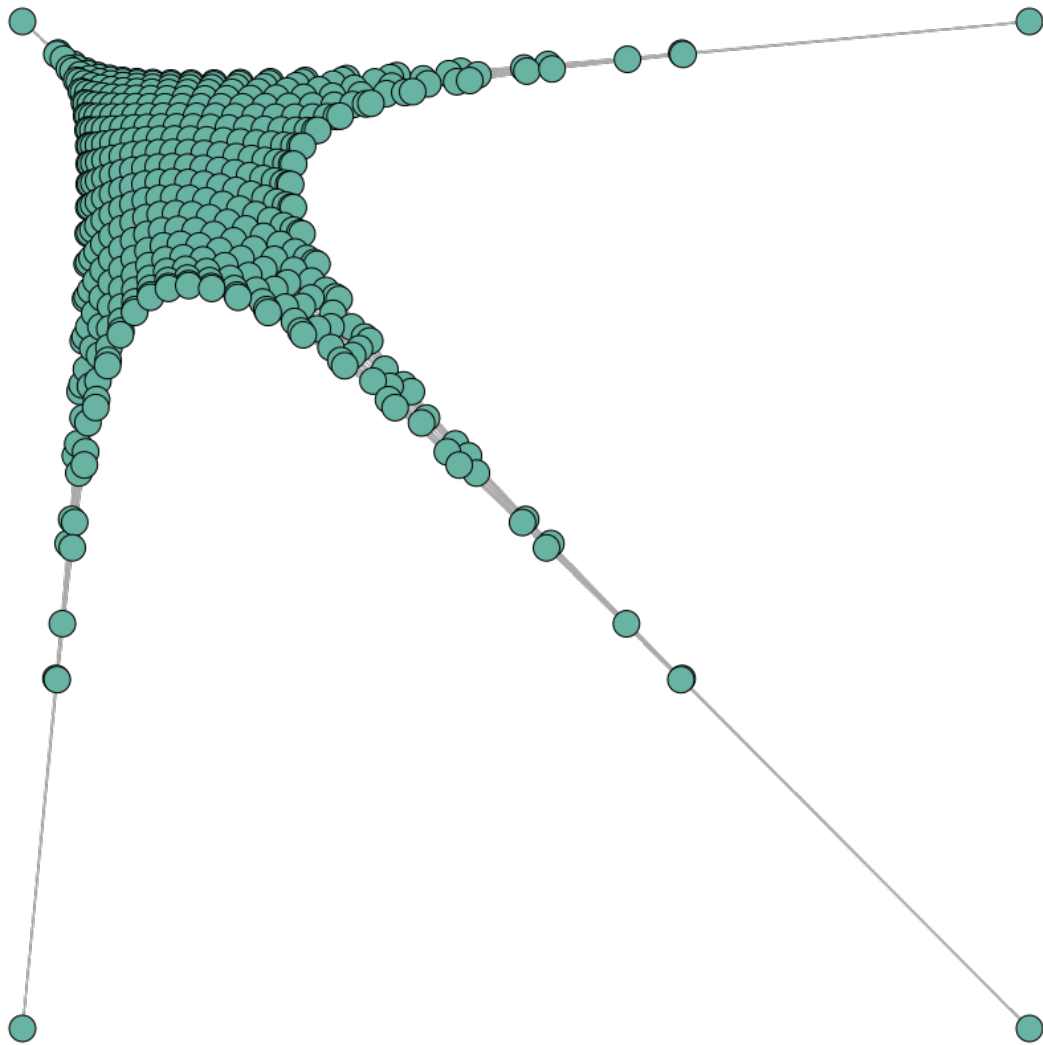


Figure 5: **Gradient Descent**: 0:  $f$  without length & Constrained spring scenario: 1 Corners & Grid size: 20

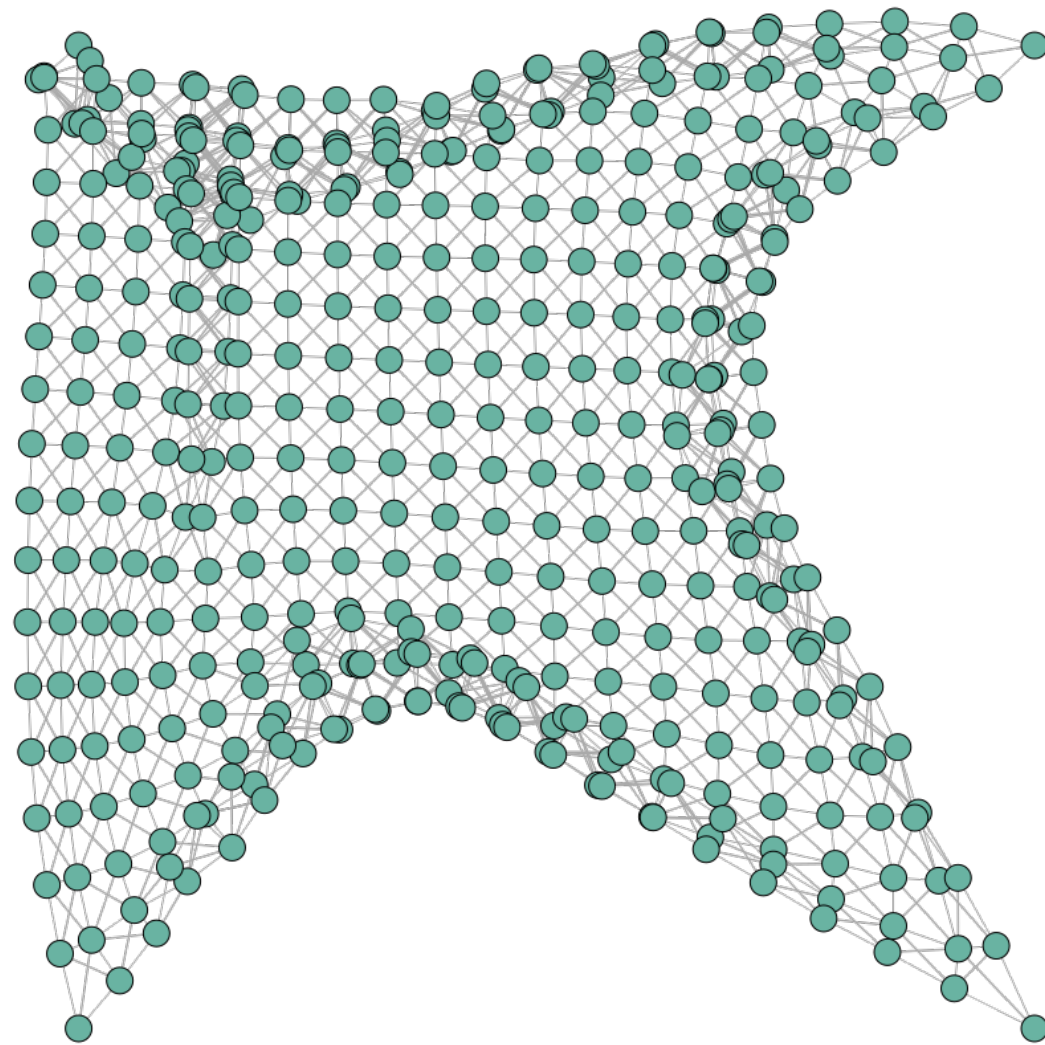


Figure 6: **Gradient Descent**: 1:  $f$  with length & Constrained spring scenario: 1 Corners & Grid size: 20

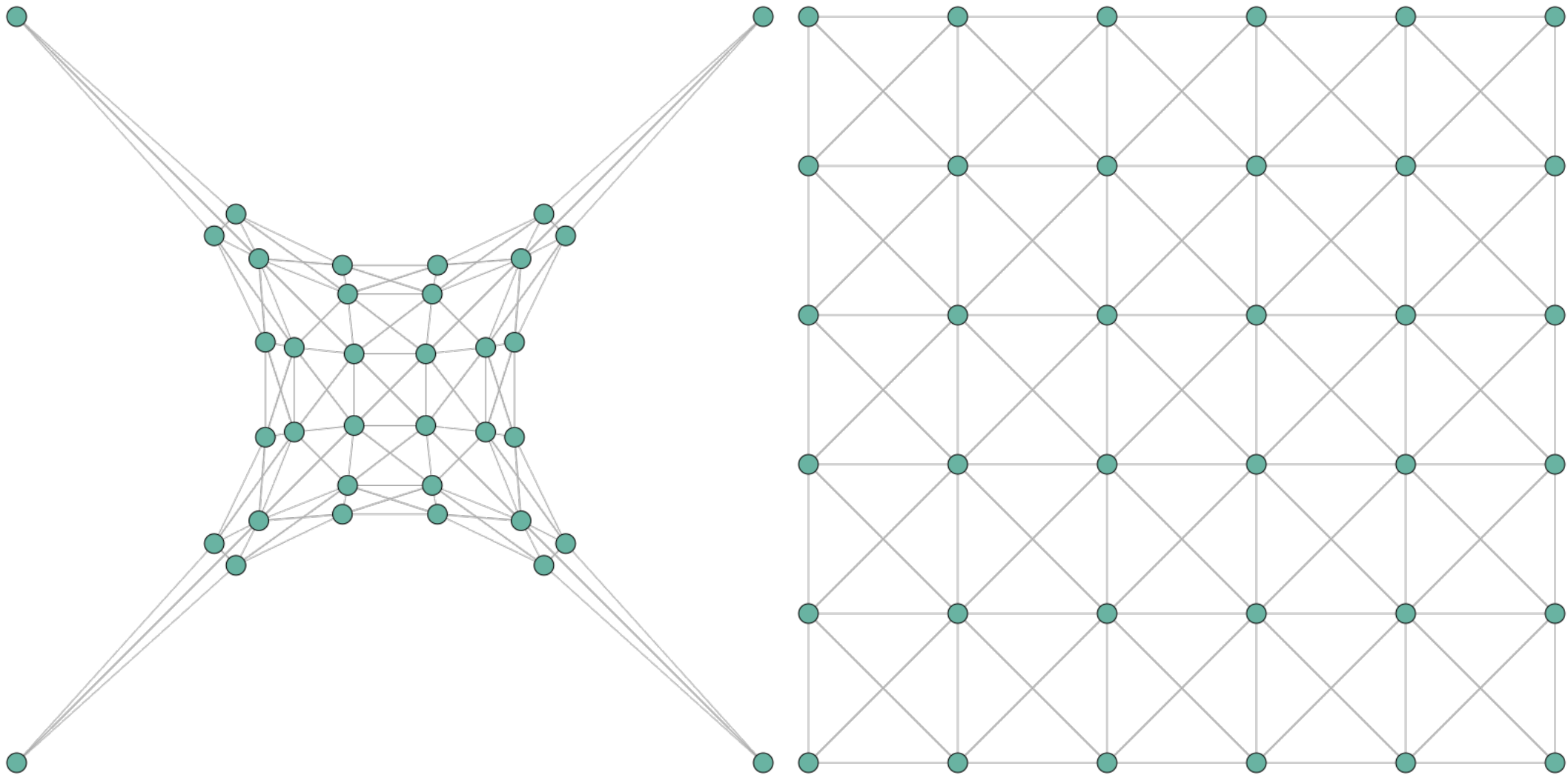


Figure 7: **Newton Method with projected hessian: 0: f without length & Grid size: 5** Figure 8: **Newton Method with projected hessian: 1: f with length & Grid size: 5**

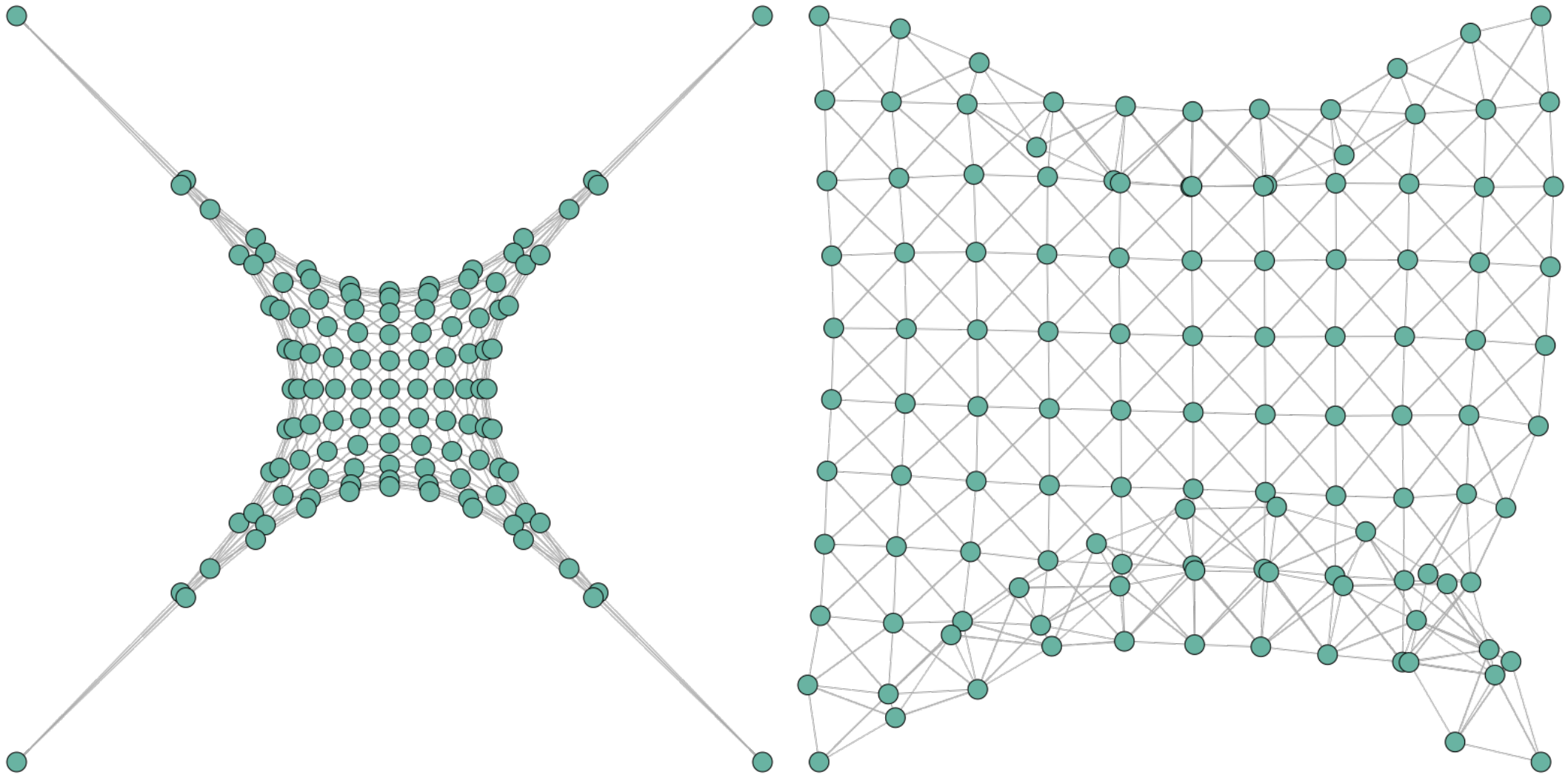


Figure 9: **Newton Method with projected hessian: 0: f without length & Grid size: 10** Figure 10: **Newton Method with projected hessian: 1: f with length & Grid size: 10**



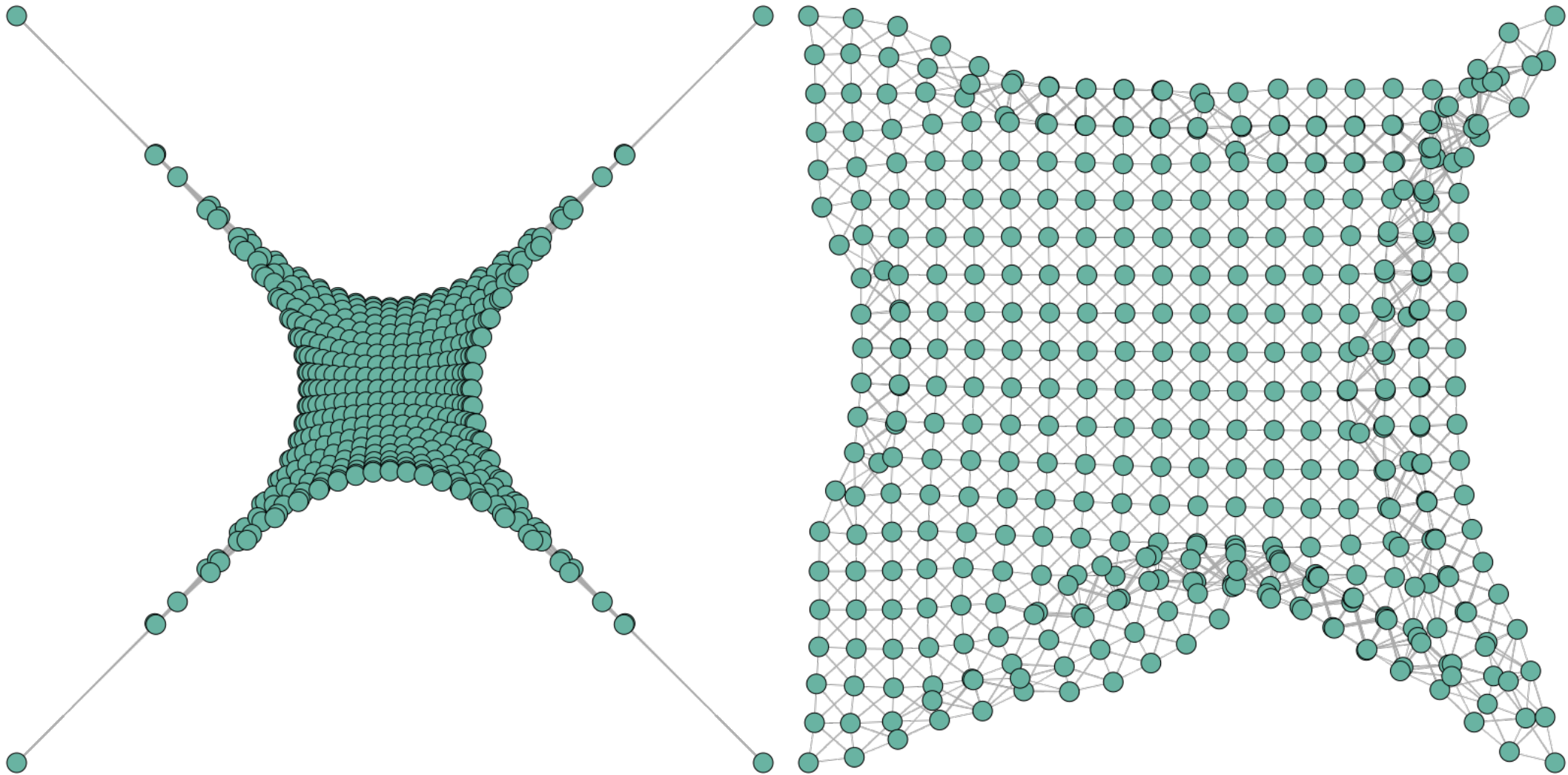


Figure 11: **Newton Method with projected hessian: 0: f without length & Grid size:** Figure 12: **Newton Method with projected hessian: 1: f with length & Grid size: 20**

method	Function index	function index description	Newton method	Constrained spring scenario	arg1	arg2	grid side	total time[s]	total time evaluation time[s]	total time evaluation percentage[%]	eval_f time[s]	eval_f evals	eval_f avg[s]	eval_grad time[s]	eval_grad evals	eval_grad avg[s]	eval_grad factor	eval_hess time[s]	eval_hess evals	eval_hess avg[s]	eval_hess factor
Gradient Descent	0	0: f without length		Corners	0	1	5	0.642575	0.446178	69.4359	0.43307	356582	0	0.01311	10000	0	1.07903	0	0	nan	nan
Newton Method with projected hessian	0	0: f without length	projected hessian		1	0	5	0.00039	0.000151	38.7179	0	3	0	0	2	0	1.5	0.00014	2	0.00007	53.625
Gradient Descent	1	1: f with length		Corners	1	1	5	0.44231	0.279225	63.1288	0.27168	221556	0	0.00755	6269	0	0.98189	0	0	nan	nan
Newton Method with projected hessian	1	1: f with length	projected hessian		1	1	5	0.006222	0.001453	23.3526	0.00023	224	0	0.00007	67	0	1.00151	0.00116	67	0.00002	17.05516
Gradient Descent	0	0: f without length		Corners	0	1	10	1.92696	1.72793	89.6711	1.67734	356660	0	0.05059	10000	0.00001	1.07576	0	0	nan	nan
Newton Method with projected hessian	0	0: f without length	projected hessian		1	0	10	0.001345	4.36E-04	32.4164	0.00003	7	0.00001	0.00002	3	0.00001	1.2	0.00038	3	0.00013	25.53333
Gradient Descent	1	1: f with length		Corners	1	1	10	2.28461	2.12735	93.1164	2.07993	356631	0.00001	0.04742	10000	0	0.81301	0	0	nan	nan
Newton Method with projected hessian	1	1: f with length	projected hessian		1	1	10	0.022427	0.004903	21.862	0.0011	189	0.00001	0.00021	48	0	0.76175	0.00359	48	0.00007	12.83532
Gradient Descent	0	0: f without length		Corners	0	1	20	7.06815	6.6395	93.9355	6.42999	355971	0.00002	0.20951	10000	0.00002	1.15988	0	0	nan	nan
Newton Method with projected hessian	0	0: f without length	projected hessian		1	0	20	0.021927	0.005825	26.5654	0.00086	44	0.00002	0.00026	12	0.00002	1.11966	0.0047	12	0.00039	20.10684
Gradient Descent	1	1: f with length		Corners	1	1	20	8.37444	7.96245	95.0803	7.79506	356763	0.00002	0.16739	10000	0.00002	0.7661	0	0	nan	nan
Newton Method with projected hessian	1	1: f with length	projected hessian		1	1	20	0.408186	0.057967	14.2011	0.01129	499	0.00002	0.00281	150	0.00002	0.82784	0.04387	150	0.00029	12.9228