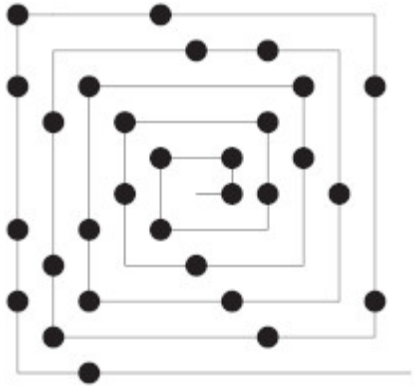
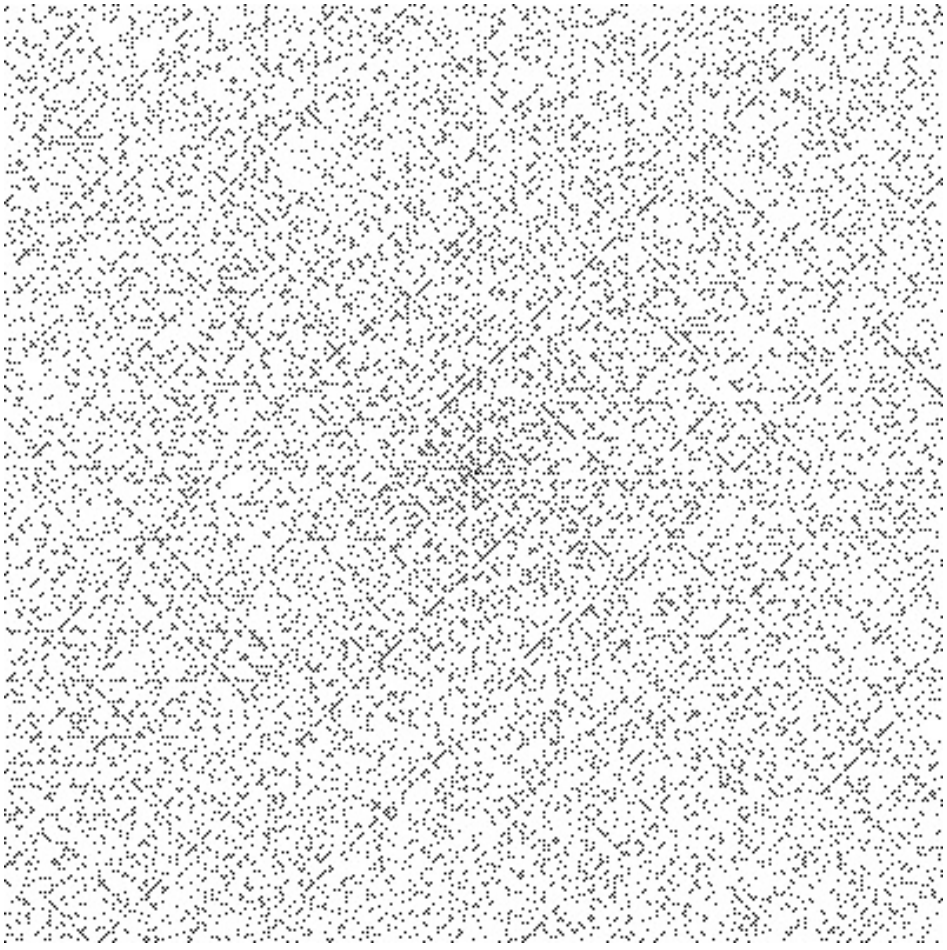
What are...random graphs?

Or: Random is maybe not so random...

A random example

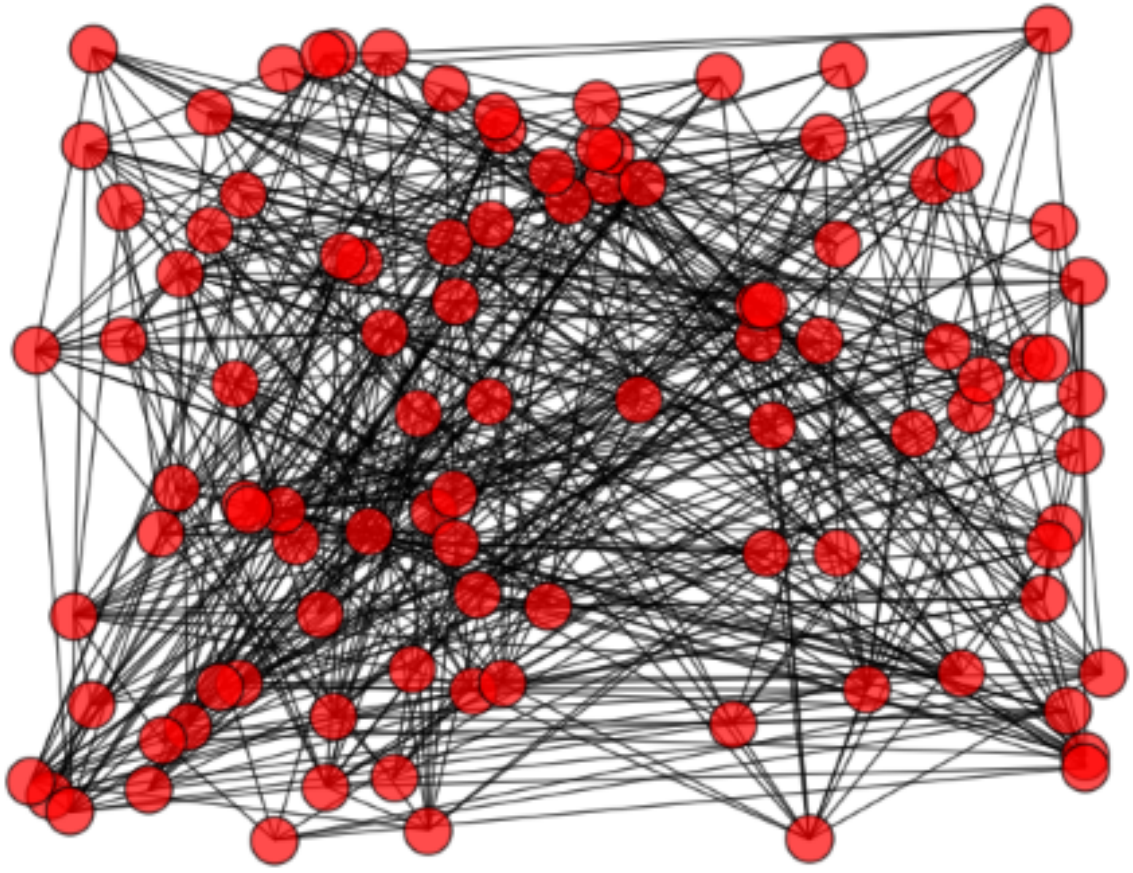


101	100	99	98	97	96	95	94	93	92	91
102	65	64	63	62	61	60	59	58	57	90
103	66	37	36	35	34	33	32	31	56	89
104	67	38	17	16	15	14	13	30	55	88
105	68	39	18	5	4	3	12	29	54	87
106	69	40	19	6	1	2	11	28	53	86
107	70	41	20	7	8	9	10	27	52	85
108	71	42	21	22	23	24	25	26	51	84
109	72	43	44	45	46	47	48	49	50	83
110	73	74	75	76	77	78	79	80	81	82
111	112	113	114	115	116	117	118	119	120	121



- Prime numbers appear essentially randomly
- Zooming out, they mostly look like noise
- However, also many patterns one can be observe

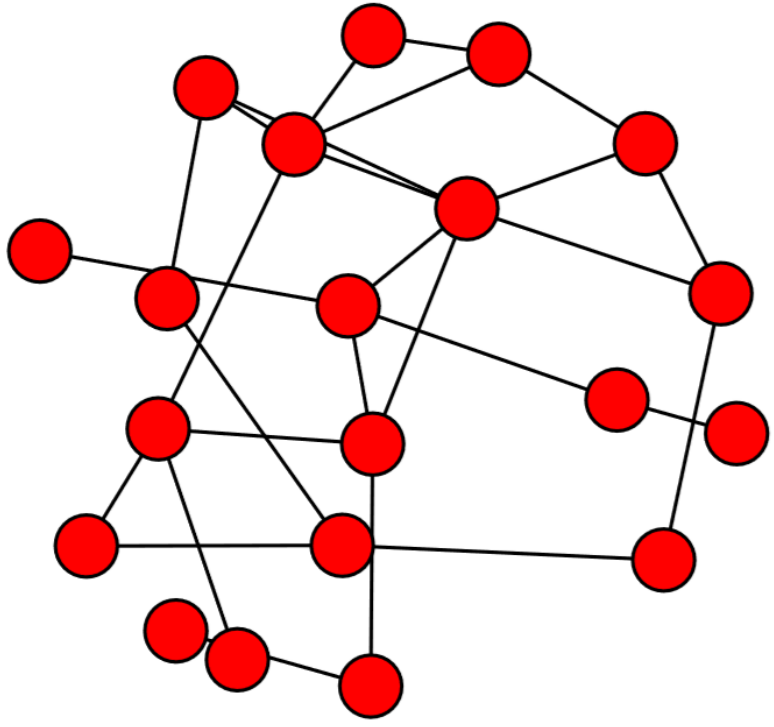
Random graphs



- Random graphs = choose edges randomly
- Zooming out, they mostly look like noise
- However, also many patterns one can be observe

Example: connectivity

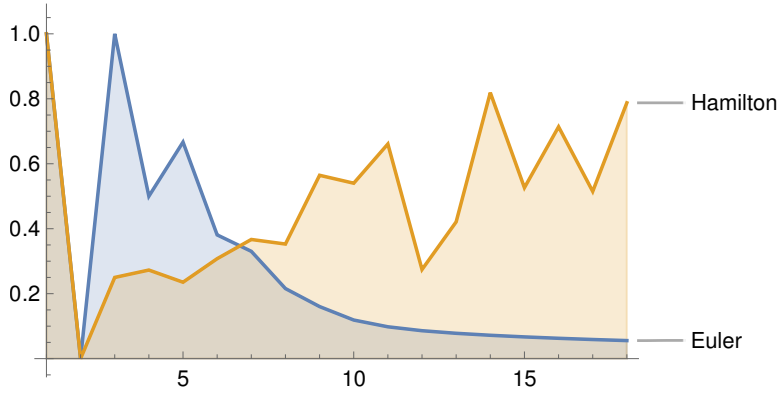
random graph with
20 nodes, 10% edge probability



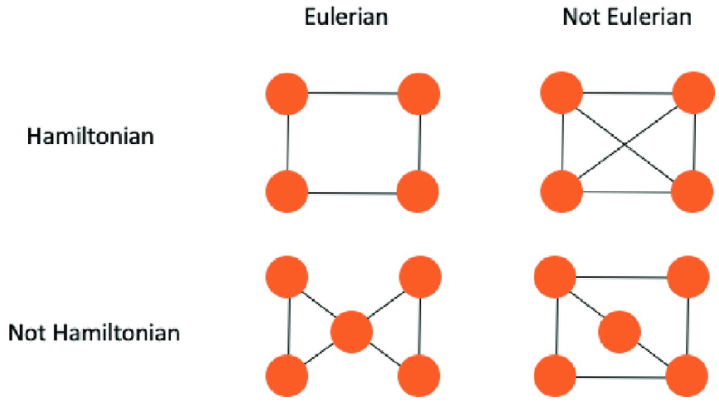
- We study random graphs for $n = |V| \gg 0$
- Asymptotically many patterns arise
- Example Almost all random graphs are connected

For completeness: A formal statement

Almost all (random) graphs are Hamiltonian; almost no (random) graph is Eulerian

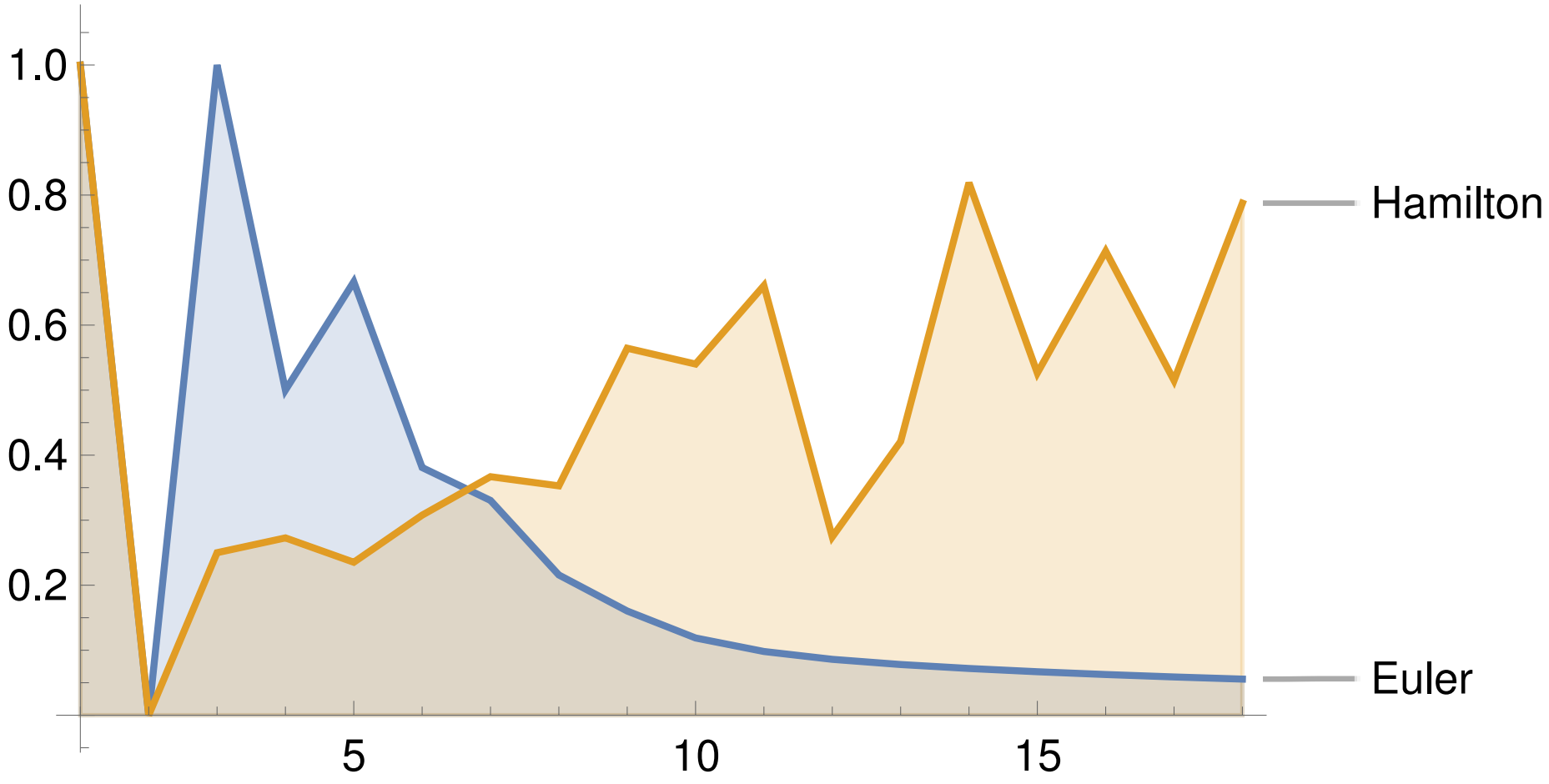


- Hamiltonian = has a cycles that visits all vertices; Eulerian = has a cycles that visits all edges; looks similar, but is different:



- Crucial (Almost all $\neq$ all) and (almost no $\neq$ no)!

Most properties are “almost” properties



- Above: The ratio Hamil/all and Euler/all
- Goal of the upcoming series Explain what random graphs are and give examples of “almost” properties

Thank you for your attention!

I hope that was of some help.