First Laboratory

Structural descriptors of complex networks

Complex Networks

Universitat Rovira i Virgili

Master in Artificial Inteligence

2^{nd} Semester

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1 Calculation of structural descriptors of complex networks

1.1 Numerical descriptors

Table 1: Table for the structural descriptors

Networks	Number of Nodes	Number of Edges	Average , maximum and minimum degree	Average clustering coefficient	Assortativity	Average path length	Diameter
20x2+5x2	50	404	16.16,22,4	0.9716	0.9186	3	5
circle9	9	9	2.0,2,2	0.0	nan	3	5
graph3+1+3	7	8	2.2857,3,2	0.6667	-0.6	3	5
graph3+2+3	8	13	3.25,4,3	0.875	-0.0833	2	4
grid-p-6x6	36	72	4.0,4,4	0.0	nan	4	7
rb25	25	66	5.28,20,4	0.9023	-0.1635	3	5
star	9	8	1.778,8,1	0.0	-1.0	2	3
wheel	9	16	3.5556,8,3	0.6243	-0.3333	2	3
256_4_4_2_15_18_p	256	4548	35.5313,46,30	0.7331	0.0286	3	6
256_4_4_4_15_18_p	256	4598	35.9219,50,20	0.5113	0.0007	3	5
BA1000	1000	3990	7.98,115,4	0.0354	-0.0542	4	6
ER1000k8	1000	3956	7.912,17,1	0.0080	-0.0168	4	7
ER5000-kmed8	5000	19980	7.992,17,4	0.0014	-0.0555	5	7
homorand_N1000_K4_0	1000	2000	4.0,4,4	0.002	nan	6	10
homorand_N1000_K4_0	1000	2994	5.988,6,5	0.0038	0.1919	5	7
rb125	125	426	6.816,100,4	0.8373	-0.1837	3	5
SF_1000_g2.5	1000	1905	3.81,30,2	0.009	0.0199	5	11
SF_1000_g2.7	1000	1668	3.336,24,2	0.0067	-0.0020	6	13
SF_1000_g3.0	1000	1517	3.034,26,2	0.0052	-0.0085	6	14
SF_500_g2.7	500	859	3.436,22,2	0.0078	-0.0256	5	13
ws1000	1000	3000	6.0,13,3	0.0044	-0.0100	5	7
ws2000	2000	6000	6.0,13,3	0.0033	-0.0762	5	8
airports_UW	3618	14142	7.8176,250,1	0.4957	0.0462	5	18
dolphins	62	159	5.1290,12,1	0.2590	-0.0436	4	9
PGP	10680	24340	4.5580,206,1	0.2659	0.2395	8	25
zachary_unwh	34	78	4.5882,17,1	0.5706	-0.4756	3	6

For some networks we get a *nan* in the assortativity value, this is because these are artificial networks with a standard deviation of 0 which makes the value of the assortativity infinite since is the Pearson correlation coefficient. This won't happen for real problems.

1.2 Plot of the degree distribution and the complementary cumulative degree distributions

For the networks ER1000k8 and ws100 the usual histogram has been used, with no rescaling, since the distribution can easily be look. For airports_UW and SF_1000_g2.7 networks the histogram has been rescaled to a logarithmic scale for a better representation of the PDF and the CCPDF, in the original version the high connected node can't barely be seen.

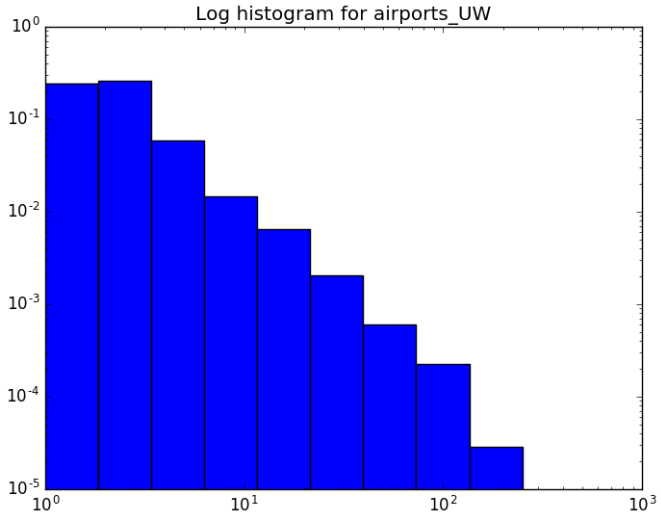

Figure 1: Log scaled histogram for the airports_UW network.

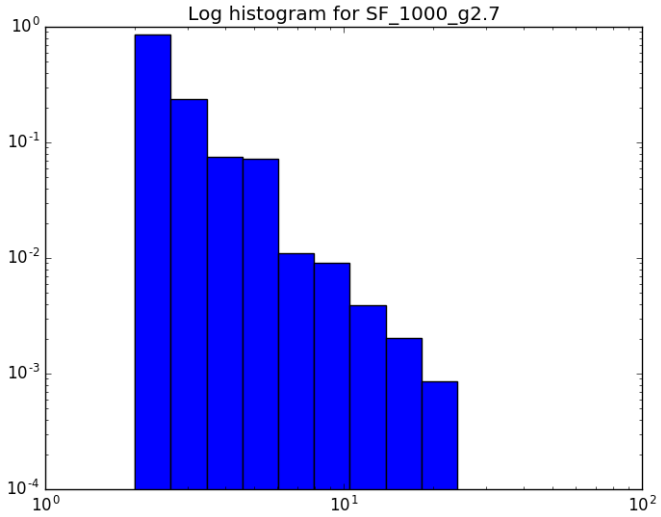

Figure 2: Log scaled histogram for the SF_1000_g2.7 network.

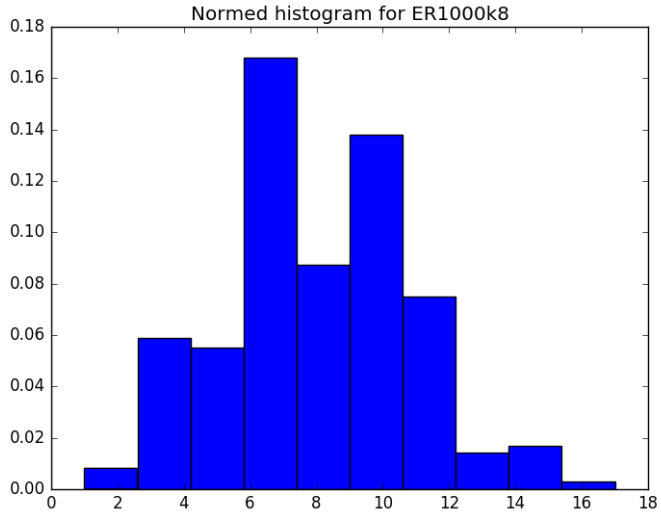

Figure 3: Histogram for the ER1000k8 network for probabilities.

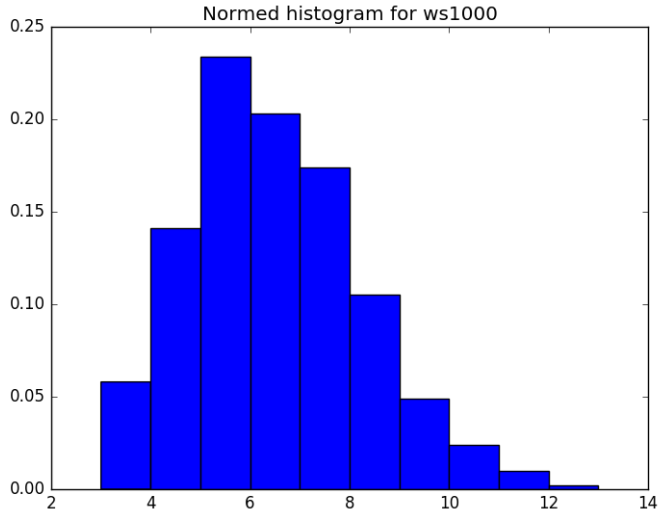

Figure 4: Histogram for the ws1000 network for the probabilies intead of the frecuencies.

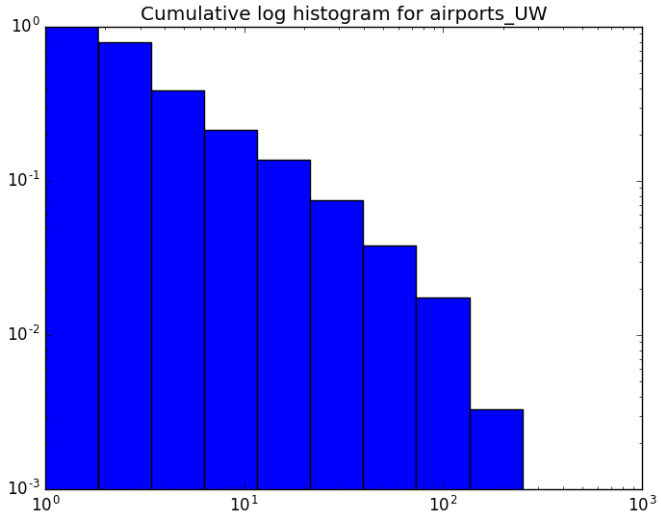

Figure 5: Cumulative log scaled histogram for the airports_UW network.

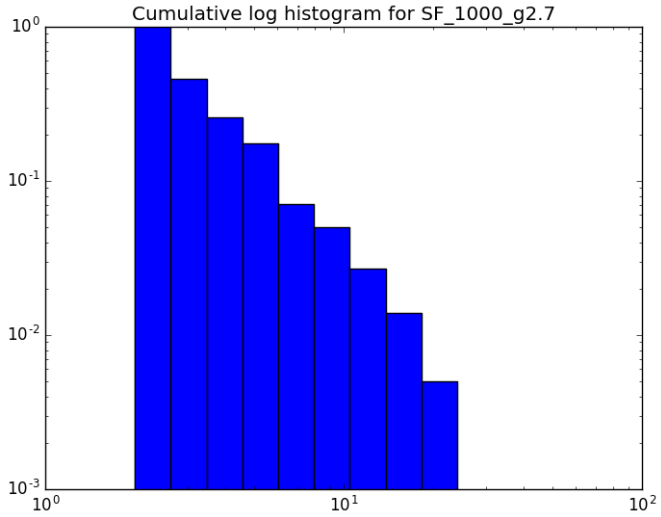

Figure 6: Cumulative log scaled histogram for the SF_1000_g2.7 network.

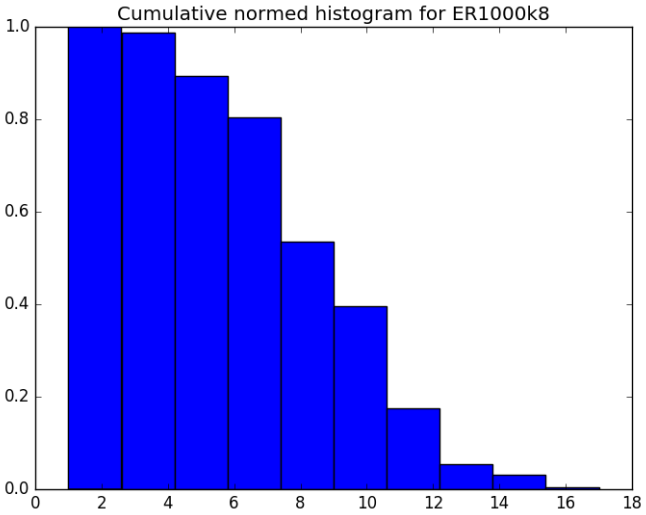

Figure 7: Cumulative histogram of the probability distribution for ER1000k8 network.

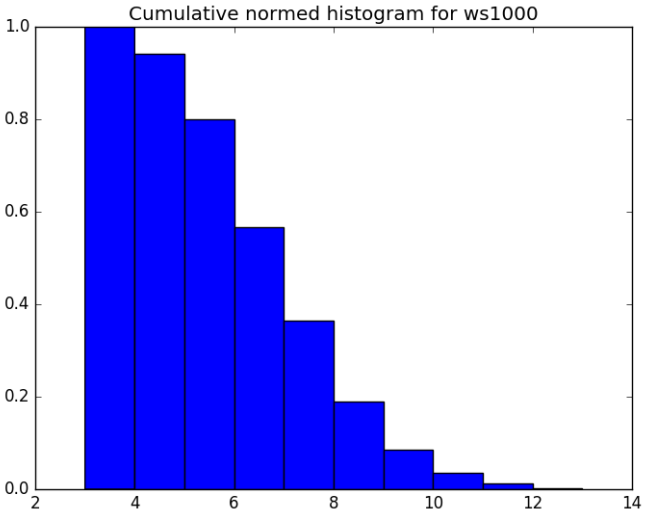

Figure 8: Cumulative histogram of the probability distribution for ws1000 network.