

Superbubbles as an Empirical Characteristic of Directed Networks

SUPPLEMENTAL MATERIAL

Description

This document includes all the data analyzed in the main paper. It consists of twelve tables containing all computed graph descriptors and metrics for four different network datasets: the supergenome dataset (Tabs. 1–3), the Stanford dataset (Tabs. 4–6), the LDBC dataset (Tabs. 7–9), and the standard random dataset (Tabs. 10–12). The individual datasets are described in the paper. Each of the three tables per dataset contains the *undirected* graph descriptors, the directed graph descriptors, and the superbubble descriptors, respectively.

Table 1: Values of the *undirected* graph descriptors for the supragenome dataset.

Dataset	N	M	ME	deg	GD	CC	R	SS
canfam1_3	5028130	8959919	0.244154	6	3.54398e-07	1	0.414782	0.950578
canfam2_4	5072165	10021044	0.318041	8	3.89517e-07	1	0.342064	0.943163
felcat3_4	4545633	8025456	0.303981	8	3.88402e-07	1	0.123099	0.917051
geofor1_7	3783877	8343997	0.45908	14	5.82774e-07	1	0.252689	0.956434
hg38_20	26186512	68401246	0.82203	26	9.9749e-08	1	0.415601	0.961235
mm5_5	8567841	16623066	0.328366	10	2.26448e-07	1	0.319935	0.944865
mm9_30	16728118	45567276	0.732204	37	1.62839e-07	1	0.443042	0.907481
tarsyr2_20	30368906	78094418	0.774045	31	8.46763e-08	61	0.301218	0.922542

Table 2: Values of the *directed* graph descriptors for the supergenome dataset.

Dataset	$deg_{\leftarrow}$	$deg_{\rightarrow}$	SCC	BE	$R_{\leftarrow\leftarrow}$	$R_{\leftarrow\rightarrow}$	$R_{\rightarrow\leftarrow}$	$R_{\rightarrow\rightarrow}$	H
canfam1_3	3	3	10226	0.425673	0.285049	0.322407	0.414782	0.273798	0.0369015
canfam2_4	4	4	10825	0.486657	0.222815	0.277462	0.342064	0.216514	0.0455087
felcat3_4	4	4	42471	0.315417	0.0913772	0.265761	0.123099	0.0911115	0.0840392
geofor1_7	7	7	5328	0.617838	0.129412	0.218323	0.252689	0.12964	0.0473346
hg38_20	15	17	7268	0.752629	0.290293	0.350248	0.415601	0.292341	0.0293036
mm5_5	5	5	95229	0.374326	0.245333	0.341557	0.319935	0.228311	0.0544757
mm9_30	21	20	44122	0.60089	0.414032	0.45828	0.443042	0.40942	0.0751565
tarsyr2_20	17	16	154117	0.657013	0.233599	0.303633	0.301218	0.233787	0.0568008

Table 3: Values of the *superbubble* descriptors for the supergenome dataset.

Dataset	S	VS	ES	MS	mVS	mES	C	CS	depth	P	PL	aP	aPL	SD
canfam1.3	1328348	0.415181	0.485531	878184	61	62	1004658	58	2	34	60	2.28371	2.97535	0.817645
canfam2.4	900570	0.311271	0.346538	600039	49	65	726247	35	3	36869	48	3.16791	3.22902	0.817748
felcat3.4	864604	0.405645	0.509091	348187	340	505	678965	136	5	∞	318	∞	3.11772	0.860604
geofor1.7	248778	0.16144	0.213755	60969	326	487	171957	150	6	∞	325	∞	3.64778	0.81775
hg38.20	62939	0.00596719	0.00611032	25985	109	162	56492	33	6	291594320	108	8203.51	2.73751	0.909297
mm5_5	1202215	0.301006	0.353767	621905	176	264	911412	72	4	∞	175	∞	3.56192	0.783625
mm9_30	349966	0.0500894	0.0501826	125138	50	80	340786	18	4	381363	49	6.7438	2.16192	0.976006
tarsyr2.20	217149	0.0185623	0.0190412	58980	143	219	209543	40	5	153994257409	142	1.18295e+06	2.26843	0.964629

Table 4: Values of the *undirected* graph descriptors for the Stanford dataset.

Dataset	N	M	ME	deg	GD	CC	R	SS
CollegeMsg	1899	20296	0.660801	339	0.00563105	4	-0.137458	0.671347
amazon0302	262111	1234877	0	425	1.79744e-05	1	0.00267724	0.454878
amazon0312	400727	3200440	0	2757	1.93303e-05	1	-0.0445745	0.261221
amazon0505	410236	3356824	0	2770	1.99463e-05	1	-0.0435129	0.276952
amazon0601	403394	3387388	0	2761	2.08165e-05	7	-0.0435352	0.28163
cit-HepPh	34546	421578	0	846	0.00035326	61	-0.00262823	0.498742
cit-Patents	3774768	16518948	0	793	1.15932e-06	3627	0.133174	0.501186
email-Eu-core-temporal	986	24929	0.924988	544	0.025668	1	-0.0137082	0.896762
email-EuAll	265214	420045	0	7636	5.97179e-06	15836	-0.210412	0.177435
gplus.combined	107614	13673453	0.551615	22022	0.00118071	1	0.689601	0.677025
p2p-Gnutella04	10876	39994	0	103	0.00033814	1	-0.00829953	0.668368
p2p-Gnutella05	8846	31839	0	88	0.000406925	3	-0.00535846	0.563469
p2p-Gnutella06	8717	31525	0	115	0.000414926	1	-0.00317719	0.614129
p2p-Gnutella08	6301	20777	0	97	0.000523399	2	-0.028534	0.491797
p2p-Gnutella09	8114	26013	0	102	0.000395161	6	-0.0326591	0.496475
p2p-Gnutella24	26518	65369	0	355	9.29623e-05	11	-0.00558292	0.660619
p2p-Gnutella25	22687	54705	0	66	0.00010629	13	-0.0062193	0.687883
p2p-Gnutella30	36682	88328	0	55	6.56454e-05	12	-0.0214005	0.683563
p2p-Gnutella31	62586	147892	0	95	3.7757e-05	12	-0.00628506	0.653816
soc-Epinions1	75879	508837	0	3079	8.83774e-05	2	-0.0412863	0.574183
soc-LiveJournal1	4847571	68993773	0	22889	2.93604e-06	1876	0.0642377	0.40907
soc-Slashdot0811	77360	905468	0	5048	0.000151302	1	-0.0488503	0.476566
soc-Slashdot0902	82168	948464	0	5064	0.000140482	1	-0.0516366	0.470255
soc-pokec-relationships	1632803	30622564	0	20518	1.14861e-05	1	-0.000492779	0.477327
soc-sign-bitcoinalpha	3783	24186	0	888	0.00169047	5	-0.163484	0.659601
soc-sign-bitcoinotc	5881	35592	0	1298	0.00102926	4	-0.163954	0.631987
soc-sign-epinions	131828	841372	0	3622	4.84146e-05	5816	-0.0643017	0.544485
sx-askubuntu	159316	596933	0.381055	6486	2.35185e-05	4250	-0.102788	0.505169
sx-mathoverflow	24818	239978	0.52625	2760	0.000389633	104	-0.135359	0.727292
sx-superuser	194085	924886	0.359204	14504	2.45531e-05	3197	-0.0813261	0.532765
twitter.combined	81306	1768149	0.269591	3758	0.000267472	1	-0.0236148	0.481903
web-Google	875713	5105039	0	6353	6.65696e-06	2746	-0.0652002	0.0814377
web-NotreDame	325729	1497134	0	10721	1.41107e-05	1	-0.0616567	0.324627
web-Stanford	281903	2312497	0	38626	2.90994e-05	365	-0.122013	0.230393
wiki-talk	2394385	5021410	0	100032	8.75866e-07	2555	-0.0852645	0.228997
wiki-Vote	7115	103689	0	1167	0.00204854	24	-0.0832446	0.687712
wiki-talk-temporal	1140149	3309592	0.577488	142148	2.54596e-06	47207	-0.11657	0.328096

Table 5: Values of the *directed* graph descriptors for the Stanford dataset.

Dataset	$deg_{\leftarrow}$	$deg_{\rightarrow}$	SCC	BE	$R_{\leftarrow\leftarrow}$	$R_{\leftarrow\rightarrow}$	$R_{\rightarrow\leftarrow}$	$R_{\rightarrow\rightarrow}$	H
CollegeMsg	137	237	293	0.749754	-0.0977021	-0.0923532	-0.137458	-0.145423	0.605004
amazon0302	420	5	7566	0.542702	0.0771522	0.0278404	0.00267724	0.102709	0.170112
amazon0312	2747	10	11511	0.531534	0.0136628	0.0399033	-0.0445745	0.272131	0.259444
amazon0505	2760	10	11904	0.54658	0.0225778	0.0580517	-0.0435129	0.226217	0.255811
amazon0601	2751	10	1657	0.55735	0.0244154	0.0567056	-0.0435352	0.232733	0.253739
cit-HepPh	846	411	1399	0.00322123	0.0771375	-0.0398235	-0.00262823	0.111472	0.438023
cit-Patents	779	770	0	0	0.142261	-0.0471524	0.133174	0.104213	0.261908
email-Eu-core-temporal	211	333	123	0.71122	0.0247314	0.0150836	-0.0137082	-0.0199169	0.462205
email-EuAll	7631	930	9189	0.438141	-0.162543	-0.145922	-0.210412	-0.182863	0.871444
gplus.combined	17055	5056	13849	0.20992	-0.043031	0.0188671	-0.0742248	0.0573339	0.819481
p2p-Gnutella04	72	100	2210	0	0.0042255	-0.0116766	-0.00829953	-0.00366304	0.295528
p2p-Gnutella05	79	65	1714	0	0.0311929	-0.00017749	-0.00535846	-0.00167642	0.294215
p2p-Gnutella06	64	113	1661	0	0.0879897	0.0322133	-0.00317719	0.00817549	0.295178
p2p-Gnutella08	91	48	1178	0	0.107873	0.0315348	-0.028534	-0.0136803	0.328442
p2p-Gnutella09	92	61	1557	0	0.104187	0.0189707	-0.0326591	-0.00623989	0.331892
p2p-Gnutella24	355	79	4423	0	0.0116544	-0.00320436	-0.00558292	0.004415	0.327877
p2p-Gnutella25	36	64	3624	0	-0.0058195	-0.0024812	-0.0062193	0.000112338	0.325374
p2p-Gnutella30	54	54	5699	0	0.0440849	0.0237749	-0.0214005	-0.00855574	0.341343
p2p-Gnutella31	68	78	9581	0	0.0345039	0.00756586	-0.00628506	-0.00305984	0.349917
soc-Epinions1	3035	1801	8431	0.0176756	0.0424935	0.073024	-0.0412863	-0.0101631	0.638096
soc-LiveJournal1	13906	20293	461640	0.0276269	0.0636388	0.12009	0.0213629	0.0477492	0.544738
soc-Slashdot0811	2540	2508	3595	0.878296	-0.0476222	-0.0426242	-0.0488503	-0.0456693	0.554386
soc-Slashdot0902	2553	2511	6928	0.854186	-0.0495735	-0.0413662	-0.0516366	-0.0450336	0.548488
soc-pokec-relationships	13733	8763	154972	0.543429	0.000586022	0.00252156	-0.000492779	-0.000425007	0.468531
soc-sign-bitcoinalpha	398	490	342	1.41251	-0.161702	-0.154611	-0.163484	-0.15639	0.880293
soc-sign-bitcoinotc	535	763	602	0.792313	-0.161213	-0.148855	-0.163954	-0.151106	0.91547
soc-sign-epinions	3478	2070	13525	0.485062	0.00512147	0.0444978	-0.0643017	-0.0305167	0.606906
sx-askubuntu	1954	4966	25067	0.0953474	-0.0886782	-0.0867718	-0.102788	-0.0956014	0.681661
sx-mathoverflow	969	1849	4671	0.383356	-0.106931	-0.103006	-0.135359	-0.127363	0.859381
sx-superuser	2513	14255	28502	0.378558	-0.0743548	-0.0694729	-0.0813261	-0.0683881	0.724175
twitter.combined	3383	1205	7601	0.481686	0.000198925	0.0550662	-0.0236148	0.0641385	0.612801
web-Google	6326	456	60793	0.306751	-0.0137601	0.0331156	-0.0652002	0.0583786	0.506924
web-NotreDame	10721	3445	20015	0.428944	-0.0227764	0.256693	-0.0616567	-0.0135109	0.660539
web-Stanford	38606	255	5223	0.276637	-0.0119076	0.00854007	-0.122013	0.045759	0.677823
wiki-talk	3311	100022	53627	0.0233279	-0.0565771	-0.0481652	-0.0852645	-0.0572358	0.929567
wiki-Vote	457	893	421	0.0564573	0.00509101	0.0070958	-0.0832446	-0.0189092	0.543591
wiki-talk-temporal	3316	141884	74022	0.0341386	-0.0466978	-0.0245695	-0.111657	-0.0407581	0.882692

Table 6: Values of the *superbubble* descriptors for the Stanford dataset.

Dataset	S	VS	ES	MS	mVS	mES	C	CS	depth	P	PL	aP	aPL	SD
CollegeMsg	3	0.00315956	0.00157978	3	2	1	3	1	1	1	1	0	0	0
amazon0302	13	9.91946e-05	4.95973e-05	13	2	1	13	1	1	1	1	0	0	0
amazon0312	23	0.000114791	5.73957e-05	23	2	1	23	1	1	1	1	0	0	0
amazon0505	18	8.77544e-05	4.38772e-05	18	2	1	18	1	1	1	1	0	0	0
amazon0601	3	1.48738e-05	7.4369e-06	3	2	1	3	1	1	1	1	0	0	0
cit-HepPh	135	0.00787356	0.00439993	128	4	6	135	1	1	4	3	2.28571	2.14286	1
cit-Patents	9457	0.00499368	0.00253181	9415	7	13	9457	1	1	18	6	2.45238	2.09524	0.979819
email-Eu-core-temporal	1	0.0020284	0.0010142	1	2	1	1	1	1	1	1	0	0	0
email-EuAll	13285	0.100183	0.0500916	13285	2	1	13285	1	1	1	1	0	0	0
gplus-combined	0	0	0	0	0	0	0	0	0	0	0	0	0	0
p2p-Gnutella04	100	0.0183891	0.00919456	100	2	1	100	1	1	1	1	0	0	0
p2p-Gnutella05	62	0.0140176	0.00700882	62	2	1	62	1	1	1	1	0	0	0
p2p-Gnutella06	52	0.011816	0.00596536	52	2	1	52	1	1	1	1	0	0	0
p2p-Gnutella08	44	0.013966	0.00698302	44	2	1	44	1	1	1	1	0	0	0
p2p-Gnutella09	65	0.0158984	0.00801085	65	2	1	65	1	1	1	1	0	0	0
p2p-Gnutella24	117	0.00874877	0.0044121	117	2	1	117	1	1	1	1	0	0	0
p2p-Gnutella25	85	0.00749328	0.00374664	85	2	1	85	1	1	1	1	0	0	0
p2p-Gnutella30	108	0.00588845	0.00294422	108	2	1	108	1	1	1	1	0	0	0
p2p-Gnutella31	260	0.00829259	0.00415428	260	2	1	260	1	1	1	1	0	0	0
soc-Epinions1	824	0.021587	0.0108858	823	3	3	824	1	1	2	2	2	2	1
soc-LiveJournal1	5432	0.00223225	0.001135	5399	4	5	5432	1	1	3	3	2.06061	2.0303	0.989899
soc-Slashdot0811	0	0	0	0	0	0	0	0	0	0	0	0	0	0
soc-Slashdot0902	0	0	0	0	0	0	0	0	0	0	0	0	0	0
soc-pokec-relationships	1468	0.00179385	0.000901517	1466	3	3	1468	1	1	2	2	2	2	1
soc-sign-bitcoinalpha	5	0.0026434	0.0013217	5	2	1	5	1	1	1	1	0	0	0
soc-sign-bitcoinotc	4	0.00136031	0.000680156	4	2	1	4	1	1	1	1	0	0	0
soc-sign-epinions	5961	0.0897078	0.0453546	5952	3	3	5961	1	1	2	2	2	2	1
sx-asubuntu	2168	0.0271159	0.0136207	2167	3	3	2168	1	1	2	2	2	2	1
sx-mathoverflow	41	0.00330405	0.00165203	41	2	1	41	1	1	1	1	0	0	0
sx-superuser	1668	0.0171523	0.00859417	1668	2	1	1668	1	1	1	1	0	0	0
twitter-combined	0	0	0	0	0	0	0	0	0	0	0	0	0	0
web-Google	6477	0.015472	0.00923819	5766	15	27	6477	1	1	16	9	2.13783	2.05063	0.985761
web-NotreDame	1714	0.00959693	0.00580544	1691	16	120	1713	2	2	16384	15	714.652	2.73913	0.957971
web-Stanford	933	0.00615105	0.00345864	915	7	9	933	1	1	4	5	2.11111	2.16667	0.968254
wiki-talk	4737	0.00395049	0.00197921	4736	3	3	4737	1	1	2	2	2	2	1
wiki-Vote	23	0.00646521	0.00323261	23	2	1	23	1	1	1	1	0	0	0
wiki-talk-temporal	1253	0.00219533	0.00109898	1253	2	1	1253	1	1	1	1	0	0	0

Table 7: Values of the *undirected* graph descriptors for the LDBC dataset.

Dataset	N	M	ME	deg	GD	CC	R	SS
datagen-7_5-fb	633432	34185747	0	2772	8.52012e-05	1	0.194012	0.245852
datagen-7_6-fb	754147	42162988	0	2899	7.41344e-05	1	0.206316	0.248139
datagen-7_7-zf	13180508	32791267	0	2313	1.88753e-07	199019	-0.1256	0.0816684
datagen-7_8-zf	16521886	41025255	0	2354	1.50291e-07	253053	-0.119763	0.0806329
datagen-7_9-fb	1387587	85670523	0	3201	4.4495e-05	1	0.263505	0.251526
datagen-8_0-fb	1706561	107507376	0	3310	3.69143e-05	1	0.276152	0.255602
datagen-8_1-fb	2072117	134267822	0	3408	3.12711e-05	1	0.291181	0.257618
datagen-8_2-zf	43734497	106440188	0	2283	5.5649e-08	669856	0.038178	0.0839126
datagen-8_3-zf	53525014	130579909	0	2101	4.55788e-08	869190	0.0981702	0.0821893
datagen-8_4-fb	3809084	269479177	0	3750	1.85731e-05	1	0.324805	0.269613
dota-league	61170	50870313	0	17004	0.0135955	1	1.90665	0.782976
graph500-22	2396657	64155735	0	162768	1.11692e-05	734	0.0791385	0.543183
graph500-23	4610222	129333677	0	256708	6.0851e-06	1548	0.0680088	0.527994
graph500-24	8870942	260379520	0	406416	3.30878e-06	2901	0.0582805	0.511917

Table 8: Values of the *directed* graph descriptors for the LDBC dataset.

Dataset	$deg_{\leftarrow}$	$deg_{\rightarrow}$	SCC	BE	$R_{\leftarrow\leftarrow}$	$R_{\leftarrow\rightarrow}$	$R_{\rightarrow\leftarrow}$	$R_{\rightarrow\rightarrow}$	H
datagen-7_5-fb	2597	2706	0	0	-0.106357	-0.148265	-0.184433	-0.119919	0.820011
datagen-7_6-fb	2752	2850	0	0	-0.104827	-0.146698	-0.182034	-0.117996	0.821265
datagen-7_7-zf	1769	1941	0	0	-0.0708821	-0.065293	-0.1256	-0.103621	0.692345
datagen-7_8-zf	1388	1885	0	0	-0.0684085	-0.0611063	-0.119763	-0.0967497	0.689245
datagen-7_9-fb	3023	3089	0	0	-0.102425	-0.14036	-0.177541	-0.117966	0.80739
datagen-8_0-fb	3310	3241	0	0	-0.101964	-0.137096	-0.176413	-0.117985	0.805318
datagen-8_1-fb	3274	3232	0	0	-0.10209	-0.134706	-0.175564	-0.11954	0.801927
datagen-8_2-zf	1882	2252	0	0	-0.0574927	-0.0507436	-0.098467	-0.0819972	0.682754
datagen-8_3-zf	1391	1937	0	0	-0.055267	-0.048098	-0.0943121	-0.0781368	0.674608
datagen-8_4-fb	3593	3477	0	0	-0.0973633	-0.124215	-0.170645	-0.120632	0.778151
dota-league	10038	13584	0	0	0.0736484	-0.238497	-0.035109	0.09171	0.817055
graph500-22	50447	162768	0	0	-0.0391452	-0.0552265	-0.0670958	-0.0242196	1.05559
graph500-23	78915	256708	0	0	-0.0360313	-0.0494488	-0.0597288	-0.0219937	1.07196
graph500-24	123270	406416	0	0	-0.0329966	-0.0442583	-0.0530081	-0.0198466	1.08716

Table 9: Values of the *superbubble* descriptors for the LDBC dataset.

Dataset	S	VS	ES	MS	mVS	mES	C	CS	depth	P	PL	aP	aPL	SD
datagen-7_5-fb	0	0	0	0	0	0	0	0	0	0	0	0	0	0
datagen-7_6-fb	0	0	0	0	0	0	0	0	0	0	0	0	0	0
datagen-7_7-zf	393239	0.0571091	0.0298964	392841	4	5	393233	2	2	3	3	2.00503	2.0201	0.984925
datagen-7_8-zf	487448	0.0566572	0.0295588	487002	5	5	487434	3	2	3	4	2.00224	2.03363	0.971973
datagen-7_9-fb	0	0	0	0	0	0	0	0	0	0	0	0	0	0
datagen-8_0-fb	1	1.17195e-06	5.85974e-07	1	2	1	1	1	1	1	1	0	0	0
datagen-8_1-fb	4	3.86079e-06	1.93039e-06	4	2	1	4	1	1	1	1	0	0	0
datagen-8_2-zf	1274414	0.0558878	0.0291964	1273207	5	5	1274385	3	2	3	4	2.00331	2.02568	0.977216
datagen-8_3-zf	1691574	0.0603148	0.031671	1689810	6	6	1691528	4	2	3	5	2.0017	2.02664	0.976323
datagen-8_4-fb	6	3.15036e-06	1.57518e-06	6	2	1	6	1	1	1	1	0	0	0
dota-league	0	0	0	0	0	0	0	0	0	0	0	0	0	0
graph500-22	4473	0.00373145	0.00186635	4473	2	1	4473	1	1	1	1	0	0	0
graph500-23	8219	0.00356425	0.00178278	8219	2	1	8219	1	1	1	1	0	0	0
graph500-24	15288	0.00344597	0.00172338	15288	2	1	15288	1	1	1	1	0	0	0

Table 10: Values of the *undirected* graph descriptors for the standard random dataset.

Dataset	N	M	ME	deg	GD	CC	R	SS
BA1	100000	99999	0	469	1e-05	1	-nan	0.125639
BA2	100000	99999	0	523	1e-05	1	-nan	0.134829
BA3	100000	99999	0	736	1e-05	1	-nan	0.152272
ER_0.01_1	100000	100002684	0	2222	0.0100004	1	1014.73	0.999582
ER_0.01_2	100000	99993010	0	2184	0.0099994	1	1012	0.999565
ER_0.01_3	100000	99997576	0	2198	0.00999986	1	1011.55	0.999564
ER_0.05_1	100000	500017674	0	10442	0.0500023	1	5265.41	1.00013
ER_0.05_2	100000	499995047	0	10426	0.05	1	5258.51	1.00011
ER_0.05_3	100000	500012912	0	10398	0.0500018	1	5267.39	1.00012
ER_0.10_1	100000	1000000234	0	20540	0.100001	1	11162.4	1.00029
ER_0.10_2	100000	999987214	0	20591	0.0999997	1	11124.9	1.00028
ER_0.10_3	100000	999946928	0	20544	0.0999957	1	11163	1.00028
WS_0.01_1	100000	200000	0	6	2.00002e-05	1	-nan	0.997499
WS_0.01_2	100000	200000	0	6	2.00002e-05	1	-nan	0.99747
WS_0.01_3	100000	200000	0	6	2.00002e-05	1	-nan	0.997488
WS_0.05_1	100000	200000	0	7	2.00002e-05	1	-nan	0.987955
WS_0.05_2	100000	200000	0	7	2.00002e-05	1	-nan	0.987782
WS_0.05_3	100000	200000	0	9	2.00002e-05	1	-nan	0.987969
WS_0.10_1	100000	200000	0	8	2.00002e-05	1	-nan	0.977286
WS_0.10_2	100000	200000	0	8	2.00002e-05	1	-nan	0.977375
WS_0.10_3	100000	200000	0	8	2.00002e-05	1	-nan	0.977202

Table 11: Values of the *directed* graph descriptors for the standard random dataset.

Dataset	$deg_{\leftarrow}$	$deg_{\rightarrow}$	SCC	BE	$R_{\leftarrow\leftarrow}$	$R_{\leftarrow\rightarrow}$	$R_{\rightarrow\leftarrow}$	$R_{\rightarrow\rightarrow}$	H
BA1	468	1	0	0	0.141871	-0.0342209	-nan	-nan	0.330609
BA2	523	1	0	0	0.147098	-0.0848904	-nan	-nan	0.330121
BA3	736	1	0	0	0.136788	-0.0872301	-nan	-nan	0.32713
ER_0.01_1	1135	1131	1	0.00998951	0.0001122002	-0.000110503	-5.80301e-05	5.12891e-05	0.000495969
ER_0.01_2	1131	1149	1	0.00997998	3.49024e-05	0.000100475	-5.67775e-05	-0.000100906	0.000496543
ER_0.01_3	1170	1148	1	0.00999958	-3.64618e-06	6.49632e-05	-6.55851e-05	4.70956e-05	0.000497635
ER_0.05_1	5281	5312	1	0.0499833	-7.69055e-05	-5.50305e-05	-9.31675e-05	5.22855e-05	9.55933e-05
ER_0.05_2	5291	5282	1	0.0500012	3.50629e-05	-4.86547e-05	-4.60684e-05	-1.67444e-05	9.57124e-05
ER_0.05_3	5280	5278	1	0.0499931	6.53874e-05	8.85277e-05	-9.8679e-05	-3.50254e-05	9.55385e-05
ER_0.10_1	10370	10435	1	0.0999975	-1.59101e-05	-1.20243e-05	1.7856e-05	-2.9967e-05	4.50789e-05
ER_0.10_2	10412	10422	1	0.0999753	-2.03435e-05	6.91282e-06	-3.52972e-05	3.79245e-05	4.52354e-05
ER_0.10_3	10400	10396	1	0.0999938	-2.00339e-05	-2.39655e-05	1.0596e-05	-4.44829e-05	4.5077e-05
WS_0.01_1	4	2	515	0.98003	-0.000373468	-nan	-nan	-nan	0.00270612
WS_0.01_2	4	2	533	0.97966	0.00208708	-nan	-nan	-nan	0.00272828
WS_0.01_3	4	2	435	0.97992	0.00234856	-nan	-nan	-nan	0.00271359
WS_0.05_1	5	2	1936	0.90272	-0.00236275	-nan	-nan	-nan	0.0123803
WS_0.05_2	5	2	1943	0.90075	-0.00405744	-nan	-nan	-nan	0.012573
WS_0.05_3	7	2	1976	0.9027	-0.00028211	-nan	-nan	-nan	0.0123837
WS_0.10_1	6	2	3027	0.81154	-0.00364385	-nan	-nan	-nan	0.0222144
WS_0.10_2	6	2	3134	0.81122	-0.000499886	-nan	-nan	-nan	0.0221405
WS_0.10_3	6	2	3121	0.81051	0.00372439	-nan	-nan	-nan	0.0223861

Table 12: Values of the *superbubble* descriptors for the standard random dataset.

Dataset	S	VS	ES	MS	VCS	ECS	mVS	mES	C	CS	depth	P	PL	aP	aPL	SD
BA1	16538	0.30892	0.165382	16538	0	0	2	1	16538	1	1	1	1	0	0	0
BA2	16652	0.31112	0.166522	16652	0	0	2	1	16652	1	1	1	1	0	0	0
BA3	16630	0.31063	0.166302	16630	0	0	2	1	16630	1	1	1	1	0	0	0
ER_0.01_1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ER_0.01_2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ER_0.01_3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ER_0.05_1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ER_0.05_2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ER_0.05_3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ER_0.10_1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ER_0.10_2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ER_0.10_3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WS_0.01_1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WS_0.01_2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WS_0.01_3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WS_0.05_1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WS_0.05_2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WS_0.05_3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WS_0.10_1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WS_0.10_2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WS_0.10_3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0