

# 1 Properties of Sparse Matrix Hypergraphs

Table 1: Properties of the hypergraphs derived from the University of Florida Sparse Matrix Collection [1]. Our benchmark set contains 76 symmetric, 82 unsymmetric, 33 rectangular instances and 1 hermetian instance. The hypergraphs are sorted by number of pins.

Hypergraph	Structure	$ V $	$ H $	$ pins $	$d(v)$				$ e $			
					$\mu$	$\sigma$	min	max	$\mu$	$\sigma$	min	max
Pd_rhs	rectangular	12 406	4 371	6 323	0.51	0.85	0	30	1.45	0.94	1	14
poli3	unsymmetric	16 955	16 955	37 849	2.23	0.99	1	41	2.23	6.28	1	336
G67	symmetric	10 000	10 000	40 000	4.00	0.00	4	4	4.00	0.00	4	4
Oregon-1	symmetric	11 492	11 174	46 818	4.07	32.64	0	2 389	4.19	33.09	1	2 389
gemat1	rectangular	10 595	4 929	47 369	4.47	3.22	1	28	9.61	70.16	4	4 928
circuit_3	unsymmetric	12 127	12 127	48 137	3.97	51.65	1	5 682	3.97	21.05	1	2 305
PGPgiantcompo	symmetric	10 680	10 680	48 632	4.55	8.08	1	205	4.55	8.08	1	205
cryg10000	unsymmetric	10 000	10 000	49 699	4.97	0.22	3	6	4.97	0.17	3	5
p2p-Gnutella25	unsymmetric	22 687	6 221	54 705	2.41	2.29	0	36	8.79	3.30	1	64
bibd_49_3	rectangular	18 424	1 176	55 272	3.00	0.00	3	3	47.00	0.00	47	47
Chem97Zt	rectangular	31 022	2 541	62 044	2.00	0.00	2	2	24.42	69.64	1	969
bips07_1998	unsymmetric	15 066	15 066	62 198	4.13	3.40	1	191	4.13	2.99	1	27
fd18	unsymmetric	16 428	16 428	63 406	3.86	1.09	1	8	3.86	1.43	1	6
powersim	unsymmetric	15 838	15 838	67 562	4.27	3.42	1	41	4.27	2.70	2	40
nopoly	symmetric	10 774	10 774	70 842	6.58	1.10	3	11	6.58	1.10	3	11
pesa	unsymmetric	11 738	11 738	79 566	6.78	0.89	3	10	6.78	0.89	3	10
epb1	unsymmetric	14 734	14 734	95 053	6.45	2.48	3	9	6.45	0.58	3	7
as-22july06	symmetric	22 963	22 963	96 872	4.22	32.94	1	2 390	4.22	32.94	1	2 390
coupled	unsymmetric	11 341	11 341	98 523	8.69	30.09	1	3 090	8.69	30.09	1	3 090
as-caida	unsymmetric	31 379	26 475	106 762	3.40	30.69	0	2 628	4.03	33.37	1	2 628
g7jac040sc	unsymmetric	11 790	11 790	114 671	9.73	13.52	2	99	9.73	14.59	2	120
psse2	rectangular	11 028	28 634	115 262	10.45	6.71	2	76	4.03	1.17	1	28
graphics	rectangular	11 822	29 493	117 954	9.98	9.90	3	87	4.00	0.02	3	4
foldoc	unsymmetric	13 356	13 356	120 238	9.00	14.39	0	720	9.00	3.78	3	102
shock-9	symmetric	36 476	36 476	142 580	3.91	0.31	2	4	3.91	0.31	2	4
shermanACb	unsymmetric	18 510	18 510	145 149	7.84	99.38	1	10 405	7.84	99.95	1	10 405
ccc	symmetric	49 152	49 152	147 456	3.00	0.00	3	3	3.00	0.00	3	3
bloweya	symmetric	30 004	30 004	150 009	5.00	57.76	2	10 001	5.00	57.76	2	10 001
cage10	unsymmetric	11 397	11 397	150 645	13.22	3.98	5	25	13.22	3.98	5	25
192bit	rectangular	13 682	13 691	154 303	11.28	107.48	0	6 893	11.27	1.35	7	16
bayer04	unsymmetric	20 545	20 545	159 082	7.74	10.93	1	43	7.74	8.16	1	34
hvdcl	unsymmetric	24 842	24 842	159 981	6.44	2.94	2	40	6.44	3.62	2	181
Zhao2	unsymmetric	33 861	33 861	166 453	4.92	1.04	2	7	4.92	0.44	3	6

Hypergraph	Structure	$ V $	$ H $	$ pins $	$d(v)$				$ e $			
					$\mu$	$\sigma$	min	max	$\mu$	$\sigma$	min	max
wang4	unsymmetric	26 068	26 068	177 196	6.80	0.44	4	7	6.80	0.44	4	7
dictionary28	symmetric	52 652	39 327	178 076	3.38	4.47	0	38	4.53	4.65	1	38
ca-CondMat	symmetric	23 133	23 133	186 936	8.08	10.64	1	280	8.08	10.64	1	280
Ill_Stokes	unsymmetric	20 896	20 896	191 368	9.16	1.56	3	12	9.16	1.64	3	12
mult_dcop_01	unsymmetric	25 187	25 187	193 276	7.67	144.21	1	22 774	7.67	143.81	1	22 767
skirt	symmetric	12 598	12 598	196 520	15.60	6.31	1	33	15.60	6.31	1	33
obstclae	symmetric	40 000	40 000	197 608	4.94	0.42	1	5	4.94	0.42	1	5
flower_7_4	rectangular	67 593	27 693	202 218	2.99	0.09	2	3	7.30	2.19	1	15
copter1	symmetric	17 222	17 222	211 064	12.26	5.75	4	19	12.26	5.75	4	19
TF16	rectangular	19 321	15 437	216 173	11.19	2.15	0	15	14.00	6.62	2	63
ABACUS_shell_hd	unsymmetric	23 412	23 412	218 484	9.33	1.31	6	15	9.33	1.31	6	15
scfxm1-2r	rectangular	65 943	37 980	221 388	3.36	8.76	1	516	5.83	5.60	1	57
spmsrtls	symmetric	29 995	29 995	229 947	7.67	0.47	4	8	7.67	0.47	4	8
lp_pds_20	rectangular	108 175	33 798	232 647	2.15	0.42	1	3	6.88	6.16	1	96
astro-ph	symmetric	16 706	16 046	242 502	14.52	21.01	0	360	15.11	21.22	1	360
deltaX	rectangular	21 961	68 600	247 424	11.27	10.07	3	39	3.61	5.87	3	83
rajat26	unsymmetric	51 032	51 032	249 302	4.89	22.40	1	3 269	4.89	22.76	1	3 401
airfoil_2d	unsymmetric	14 214	14 214	259 688	18.27	2.92	4	23	18.27	3.95	1	23
ex19	unsymmetric	12 005	12 005	259 879	21.65	12.29	1	50	21.65	12.29	1	50
Reuters911	symmetric	13 332	13 314	296 076	22.21	66.74	0	2 265	22.24	66.78	1	2 265
us04	rectangular	28 016	163	297 538	10.62	2.42	2	18	1 825.39	2 302.85	2	11 625
waveguide3D	unsymmetric	21 036	21 036	303 468	14.43	3.49	5	28	14.43	3.49	5	28
lp_nug20	rectangular	72 600	15 240	304 800	4.20	2.66	4	40	20.00	0.00	20	20
lhr14	unsymmetric	14 270	14 270	307 858	21.57	15.98	1	36	21.57	26.27	1	63
c-61	symmetric	43 618	43 618	310 016	7.11	16.76	2	2 830	7.11	16.76	2	2 830
shallow_water2	symmetric	81 920	81 920	327 680	4.00	0.00	4	4	4.00	0.00	4	4
Franz11	rectangular	30 144	47 104	329 728	10.94	4.78	8	20	7.00	0.00	7	7
shyy161	unsymmetric	76 480	76 480	329 762	4.31	1.25	1	6	4.31	1.25	1	6
usroads	symmetric	129 164	129 164	330 870	2.56	0.78	1	7	2.56	0.78	1	7
ckt11752_dc.1	unsymmetric	49 702	49 702	333 029	6.70	23.53	1	2 921	6.70	23.22	1	2 921
HEP-th	unsymmetric	27 240	24 541	342 437	12.57	39.40	0	2 357	13.95	16.13	1	562
vibrobox	symmetric	12 328	12 328	342 828	27.81	16.09	9	121	27.81	16.09	9	121
RFdevice	unsymmetric	74 104	74 104	365 580	4.93	0.42	1	9	4.93	1.78	2	271
ecl32	unsymmetric	51 993	51 993	380 415	7.32	3.38	1	22	7.32	3.35	1	23
viscoplastic2	unsymmetric	32 769	32 769	381 326	11.64	14.44	4	93	11.64	13.96	5	73
garon2	unsymmetric	13 535	13 535	390 607	28.86	10.82	5	45	28.86	10.82	5	45
c-55	symmetric	32 780	32 780	403 450	12.31	24.50	2	2 920	12.31	24.50	2	2 920
light_in_tissue	unsymmetric	29 282	29 282	406 084	13.87	2.73	6	18	13.87	2.73	6	18
ted_A	unsymmetric	10 605	10 605	424 587	40.04	22.78	12	147	40.04	37.20	1	147
af23560	unsymmetric	23 560	23 560	484 256	20.55	1.46	10	21	20.55	1.27	11	21
lung2	unsymmetric	109 460	109 460	492 564	4.50	1.94	2	8	4.50	1.94	2	8
Maragal_6	rectangular	10 152	21 251	537 694	52.96	54.57	0	685	25.30	202.89	1	5 941

Hypergraph	Structure	$ V $	$ H $	$ pins $	$d(v)$				$ e $			
					$\mu$	$\sigma$	min	max	$\mu$	$\sigma$	min	max
Trefethen_20000	symmetric	20 000	20 000	554 466	27.72	1.17	16	29	27.72	1.17	16	29
stokes128	symmetric	49 666	49 666	558 594	11.25	2.39	5	13	11.25	2.39	5	13
wathen120	symmetric	36 441	36 441	565 761	15.53	3.82	8	21	15.53	3.82	8	21
thermall	symmetric	82 654	82 654	574 458	6.95	0.88	1	11	6.95	0.88	1	11
mri1	rectangular	147 456	65 536	589 824	4.00	3.14	0	240	9.00	0.00	9	9
finan512	symmetric	74 752	74 752	596 992	7.99	6.28	3	55	7.99	6.28	3	55
bcsstk29	symmetric	13 992	13 992	619 488	44.27	15.64	5	71	44.27	15.64	5	71
tomographic1	rectangular	59 498	45 908	647 495	10.88	1.69	0	15	14.10	15.02	1	155
thermomech_TC	symmetric	102 158	102 158	711 558	6.97	0.72	4	10	6.97	0.72	4	10
image_interp	rectangular	120 000	232 485	711 683	5.93	0.25	4	6	3.06	2.00	1	5
Pres_Poisson	symmetric	14 822	14 822	715 804	48.29	5.12	18	50	48.29	5.12	18	50
c-64	symmetric	51 035	51 035	717 841	14.07	153.47	2	9 474	14.07	153.47	2	9 474
G2_circuit	symmetric	150 102	150 102	726 674	4.84	0.64	2	6	4.84	0.64	2	6
Andrews	symmetric	60 000	60 000	760 154	12.67	3.41	9	36	12.67	3.41	9	36
Baumann	unsymmetric	112 211	112 211	760 631	6.78	0.43	4	7	6.78	0.43	4	7
trans4	unsymmetric	116 835	116 835	766 396	6.56	361.44	1	114 174	6.56	361.50	1	114 190
bundle1	symmetric	10 581	10 581	770 901	72.86	198.80	17	1 711	72.86	198.80	17	1 711
EternityII_A	rectangular	150 638	7 362	782 087	5.19	0.64	1	6	106.23	129.12	1	780
n4c6-b11	rectangular	132 402	69 235	830 820	6.27	1.60	5	10	12.00	0.00	12	12
soc-sign-epinions	unsymmetric	131 828	95 318	841 372	6.38	34.75	0	3 478	8.83	38.47	1	2 070
HTC_336_9129	symmetric	226 340	226 340	883 422	3.90	31.88	1	7 394	3.90	31.88	1	7 394
NotreDame_www	unsymmetric	325 729	137 941	929 849	2.85	35.71	0	10 717	6.74	6.87	1	60
kim1	unsymmetric	38 415	38 415	933 195	24.29	2.59	5	25	24.29	3.46	4	25
scircuit	unsymmetric	170 998	170 998	958 936	5.61	4.39	1	353	5.61	4.39	1	353
crystk02	symmetric	13 965	13 965	968 583	69.36	14.83	24	81	69.36	14.83	24	81
2D_54019_highK	unsymmetric	54 019	54 019	996 414	18.45	3.11	6	164	18.45	6.92	6	1 426
pds-90	rectangular	475 448	142 596	1 014 136	2.13	0.39	1	3	7.11	7.15	1	96
rim	unsymmetric	22 560	22 560	1 014 951	44.99	25.98	11	112	44.99	26.58	1	112
olafu	symmetric	16 146	16 146	1 015 156	62.87	12.41	24	89	62.87	12.41	24	89
gyro	symmetric	17 361	17 361	1 021 159	58.82	32.05	12	360	58.82	32.05	12	360
Dubcova2	symmetric	65 025	65 025	1 030 225	15.84	5.76	4	25	15.84	5.76	4	25
IG5-17	rectangular	27 944	30 162	1 035 008	37.04	85.01	0	1 216	34.31	30.81	1	120
case39	symmetric	40 216	40 216	1 042 160	25.91	316.23	1	20 024	25.91	316.23	1	20 024
denormal	symmetric	89 400	89 400	1 156 224	12.93	0.47	6	13	12.93	0.47	6	13
viscorocks	unsymmetric	37 762	37 762	1 162 244	30.78	7.74	16	42	30.78	7.74	16	42
language	unsymmetric	399 130	399 130	1 216 334	3.05	3.96	1	107	3.05	20.71	1	11 555
msc10848	symmetric	10 848	10 848	1 229 778	113.36	48.09	45	723	113.36	48.09	45	723
mac_econ_fwd500	unsymmetric	206 500	206 500	1 273 389	6.17	6.11	1	47	6.17	4.44	1	44
li	unsymmetric	22 695	22 695	1 350 309	59.50	29.21	11	108	59.50	29.21	11	108
std1_Jac3	unsymmetric	21 982	21 982	1 455 848	66.23	129.75	1	1 036	66.23	169.30	1	1 030
NotreDame_actors	rectangular	127 823	383 640	1 470 404	11.50	11.76	1	294	3.83	10.42	1	646
sparsine	symmetric	50 000	50 000	1 548 988	30.98	11.15	6	56	30.98	11.15	6	56

Hypergraph	Structure	$ V $	$ H $	$ pins $	$d(v)$				$ e $			
					$\mu$	$\sigma$	min	max	$\mu$	$\sigma$	min	max
d_pretok	symmetric	182 730	182 730	1 641 672	8.98	2.75	2	11	8.98	2.75	2	11
2cubes_sphere	symmetric	101 492	101 492	1 647 264	16.23	2.65	5	31	16.23	2.65	5	31
qa8fk	symmetric	66 127	66 127	1 660 579	25.11	4.18	8	27	25.11	4.18	8	27
av41092	unsymmetric	41 092	41 092	1 683 902	40.98	96.94	2	664	40.98	167.04	2	2 135
venkat01	unsymmetric	62 424	62 424	1 717 792	27.52	2.29	16	44	27.52	2.29	16	44
fem_filter	unsymmetric	74 062	74 062	1 731 206	23.38	66.31	5	565	23.38	66.31	5	565
crashbasis	unsymmetric	160 000	160 000	1 750 416	10.94	6.97	4	18	10.94	0.42	6	11
Lin	symmetric	256 000	256 000	1 766 400	6.90	0.31	4	7	6.90	0.31	4	7
bbmat	unsymmetric	38 744	38 744	1 771 722	45.73	39.11	8	132	45.73	38.40	6	126
TSOPF_FS_b162_c3	symmetric	30 798	30 798	1 801 300	58.49	428.06	1	15 054	58.49	428.06	1	15 054
cfdl	symmetric	70 656	70 656	1 828 364	25.88	2.97	12	33	25.88	2.97	12	33
appu	unsymmetric	14 000	14 000	1 853 104	132.37	36.49	12	294	132.37	36.49	12	294
conf5_4-8x8-05	unsymmetric	49 152	49 152	1 916 928	39.00	0.00	39	39	39.00	0.00	39	39
opt1	symmetric	15 449	15 449	1 930 655	124.97	42.49	44	243	124.97	42.49	44	243
mixtank_new	unsymmetric	29 957	29 957	1 995 041	66.60	38.34	11	154	66.60	38.34	11	154
net100	symmetric	29 920	29 920	2 033 200	67.95	57.82	3	181	67.95	57.82	3	181
water_tank	unsymmetric	60 740	60 740	2 035 281	33.51	10.92	13	54	33.51	12.60	8	63
sme3Db	unsymmetric	29 067	29 067	2 081 063	71.60	37.07	24	345	71.60	37.07	24	345
mc2depi	unsymmetric	525 825	525 825	2 100 225	3.99	0.08	2	4	3.99	0.08	2	4
H2O	symmetric	67 024	67 024	2 216 736	33.07	4.80	14	37	33.07	4.80	14	37
Stanford	unsymmetric	281 903	261 588	2 312 497	8.20	11.31	0	255	8.84	172.65	1	38 606
rma10	unsymmetric	46 835	46 835	2 374 001	50.69	27.78	4	145	50.69	27.78	4	145
poisson3Db	unsymmetric	85 623	85 623	2 374 949	27.74	14.71	6	145	27.74	14.71	6	145
nasasrb	symmetric	54 870	54 870	2 677 324	48.79	8.53	12	276	48.79	8.53	12	276
Trec14	rectangular	15 905	3 159	2 872 265	180.59	309.25	0	2 500	909.23	352.38	6	1 837
rgg_n_2_18_s0	symmetric	262 144	262 141	3 094 566	11.80	3.45	0	31	11.80	3.45	1	31
webbase-1M	unsymmetric	1 000 005	1 000 005	3 105 536	3.11	36.88	1	28 685	3.11	25.35	1	4 700
cnr-2000	unsymmetric	325 557	247 501	3 216 152	9.88	218.50	1	18 235	12.99	22.68	1	2 716
m14b	symmetric	214 765	214 765	3 358 036	15.64	3.13	4	40	15.64	3.13	4	40
parabolic_fem	symmetric	525 825	525 825	3 674 625	6.99	0.15	3	7	6.99	0.15	3	7
s4dkt3m2	symmetric	90 449	90 449	3 753 461	41.50	2.68	7	42	41.50	2.68	7	42
IMDB	rectangular	896 308	303 617	3 782 463	4.22	13.04	0	1 590	12.46	16.83	1	1 334
barrier2-1	unsymmetric	113 076	113 076	3 805 068	33.65	24.94	10	7 031	33.65	24.94	10	7 031
laminar_duct3D	unsymmetric	67 173	67 173	3 833 077	57.06	29.63	3	89	57.06	37.90	1	89
xenon2	unsymmetric	157 464	157 464	3 866 688	24.56	4.07	1	27	24.56	4.07	1	27
ASIC_680k	unsymmetric	682 862	682 862	3 871 773	5.67	659.81	1	395 259	5.67	659.81	1	395 259
pdb1HYS	symmetric	36 417	36 417	4 344 765	119.31	31.86	18	204	119.31	31.86	18	204
torso3	unsymmetric	259 156	259 156	4 429 042	17.09	3.50	6	21	17.09	4.39	7	22
tmt_unsym	unsymmetric	917 825	917 825	4 584 801	5.00	0.09	3	5	5.00	0.09	3	5
ship_001	symmetric	34 920	34 920	4 644 230	133.00	55.20	18	438	133.00	55.20	18	438
kron_g500-logn16	symmetric	65 536	55 321	4 912 469	74.96	312.50	0	17 998	88.80	338.32	1	17 998
LargeRegFile	rectangular	801 374	2 111 154	4 944 201	6.17	900.32	1	655 876	2.34	0.78	1	4

Hypergraph	Structure	$ V $	$ H $	$ pins $	$d(v)$				$ e $			
					$\mu$	$\sigma$	min	max	$\mu$	$\sigma$	min	max
ecology1	symmetric	1 000 000	1 000 000	4 996 000	5.00	0.06	3	5	5.00	0.06	3	5
mono_500Hz	unsymmetric	169 410	169 410	5 036 288	29.73	17.90	10	719	29.73	17.90	10	719
pkustk11	symmetric	87 804	87 804	5 217 912	59.43	25.03	18	132	59.43	25.03	18	132
F2	symmetric	71 505	71 505	5 294 285	74.04	37.55	22	345	74.04	37.55	22	345
para-4	unsymmetric	153 226	153 226	5 326 228	34.76	19.89	10	5 776	34.76	19.89	10	5 776
Chebyshev4	unsymmetric	68 121	68 121	5 377 761	78.94	7.41	9	81	78.94	1 061.44	9	68 121
Hamrle3	unsymmetric	1 447 360	1 447 360	5 514 242	3.81	2.08	2	9	3.81	1.55	2	6
pre2	unsymmetric	659 033	659 033	5 959 282	9.04	27.24	1	745	9.04	22.12	1	628
ESOC	rectangular	37 830	327 062	6 019 939	159.13	1 093.14	0	12 090	18.41	0.78	8	19
sls	rectangular	62 729	1 748 122	6 804 304	108.47	6 852.05	2	1 685 394	3.89	0.56	1	4
3Dspectralwave2	Hermetian	292 008	292 008	7 307 376	25.02	11.80	1	60	25.02	11.80	1	60
Rucci1	rectangular	109 900	1 977 885	7 791 168	70.89	11.39	30	108	3.94	0.34	1	4
GL7d22	rectangular	822 922	349 443	8 251 000	10.03	2.22	0	26	23.61	9.01	2	403
atmosmodj	unsymmetric	1 270 432	1 270 432	8 814 880	6.94	0.24	4	7	6.94	0.24	4	7
gearbox	symmetric	153 746	153 746	9 080 404	59.06	15.41	6	99	59.06	15.41	6	99
gupta3	symmetric	16 783	16 783	9 323 427	555.53	1 233.52	33	14 672	555.53	1 233.52	33	14 672
BenElechi1	symmetric	245 874	245 874	13 150 496	53.48	3.00	1	54	53.48	3.00	1	54
nd12k	symmetric	36 000	36 000	14 220 946	395.03	83.19	126	519	395.03	83.19	126	519
kkt_power	symmetric	2 063 494	2 063 494	14 612 663	7.08	7.40	1	96	7.08	7.40	1	96
af_4_k101	symmetric	503 625	503 625	17 550 675	34.85	1.26	15	35	34.85	1.26	15	35
af_shell1	symmetric	504 855	504 855	17 588 875	34.84	1.28	20	40	34.84	1.28	20	40
human_gene2	symmetric	14 340	14 340	18 068 388	1 260.00	1 375.14	1	7 229	1 260.00	1 375.14	1	7 229
msdoor	symmetric	415 863	415 863	20 240 935	48.67	11.71	28	77	48.67	11.71	28	77
StocF-1465	symmetric	1 465 137	1 465 137	21 005 389	14.34	2.57	1	189	14.34	2.57	1	189
12month1	rectangular	872 622	12 471	22 624 727	25.93	84.74	1	3 420	1 814.19	4 554.41	1	75 355
rel9	rectangular	274 669	5 921 786	23 667 183	86.17	14.86	0	163	4.00	0.06	2	4
dielFilterV2clx	symmetric	607 232	607 232	25 309 272	41.68	17.55	8	158	41.68	17.55	8	158
RM07R	unsymmetric	381 689	381 689	37 464 962	98.16	64.31	1	245	98.16	68.69	1	295
Emilia_923	symmetric	923 136	923 136	41 005 206	44.42	3.72	15	57	44.42	3.72	15	57
wb-edu	unsymmetric	9 845 725	6 920 306	57 156 537	5.81	45.34	0	25 762	8.26	23.78	1	3 841
circuit5M	unsymmetric	5 558 326	5 558 326	59 524 291	10.71	1 356.62	1	1 290 501	10.71	1 356.62	1	1 290 501
nlpkkt120	symmetric	3 542 400	3 542 400	96 845 792	27.34	3.09	5	28	27.34	3.09	5	28
hollywood-2009	symmetric	1 139 905	1 139 905	113 891 327	99.91	271.87	1	11 468	99.91	271.87	1	11 468

## References

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