Supplementary Materials for How Correlated are Community-aware and Classical Network Centrality Measures

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Abstract. Community structure has a tremendous effect on identifying influential nodes in complex networks. Unlike classical centrality measures, recently developed community-aware centrality measures make use of a network's community structure. This paper investigates the relationship between both types of measures on a set of fifty real-world networks originating from various domains. Results show that classical and community-aware centrality measures generally exhibit a medium to low correlation across the networks. Additionally, transitivity, efficiency are the most influential macroscopic features while the mixing parameter, modularity, and Max-ODF are the most influential mesoscopic features affecting the correlation between classical and community-aware centrality measures.

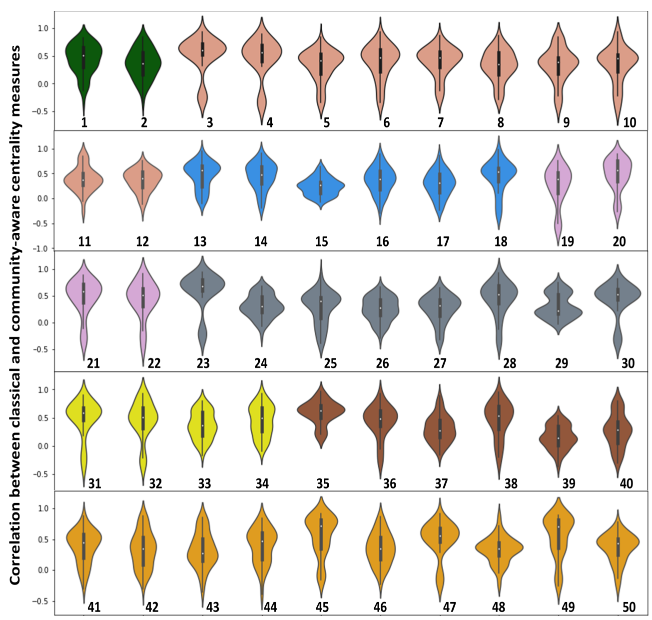

Fig. 1. Distributions of the Kendall's Tau correlation between classical and community-aware centrality measures for each network. Colors represent the network's domain. Green color refers to animal networks. Pink color refers to biological networks. Blue color refers to collaboration networks. Violet color refers to offline social networks. Grey color refers to infrastructural networks. Yellow color refers to actor networks. Brown color refers to miscellaneous networks. Orange color refers to online social networks.

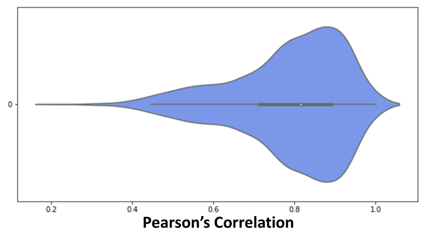

Fig. 2. Distribution of Pearson's correlation for the heatmaps of the Kendall's Tau correlation between classical and community-aware centrality of all networks.

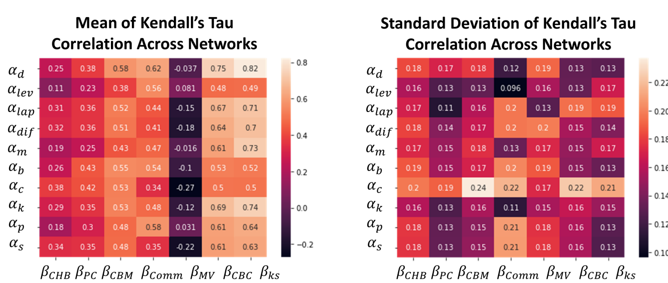

Fig. 3. Mean and standard deviation of the Kendall's Tau correlation for each classical and community-aware centrality measures pair (α_i, β_j) across the fifty networks.

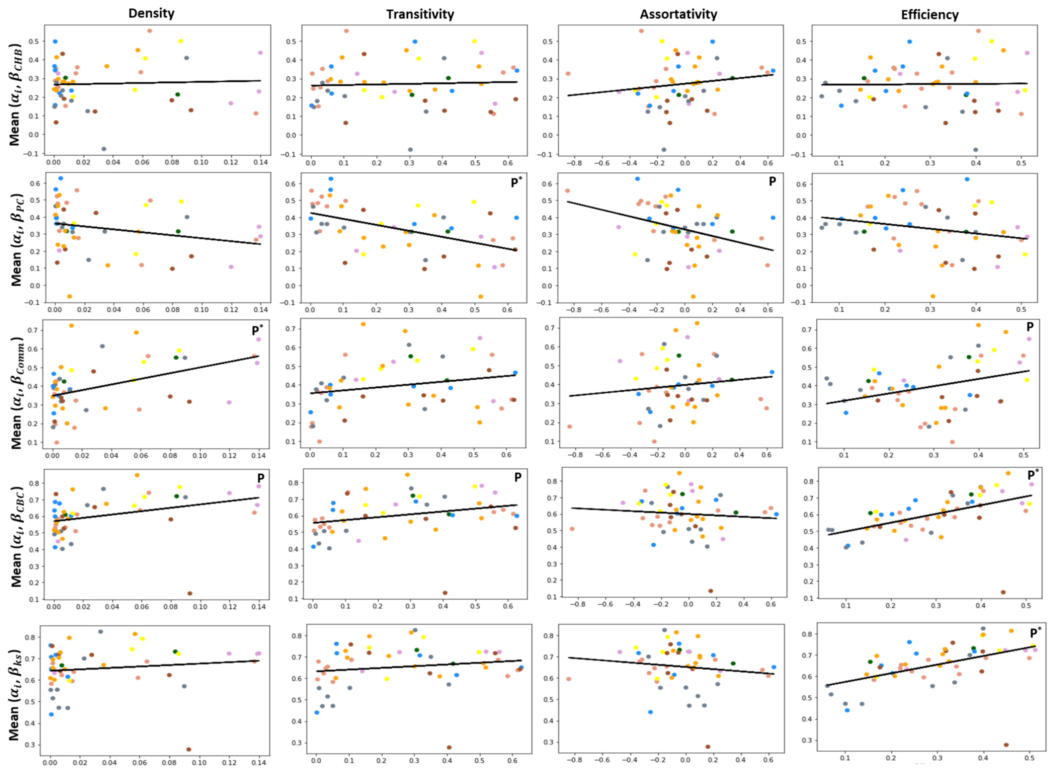

Fig. 4. Relationship of the mean of the correlation between each community-aware centrality measure combined with all classical centrality measures as a function of the topological properties of real-world networks. The line is fitted by linear regression using ordinary least squares. "P" indicates $p \leq 0.05$. "P" and * indicate $p \leq 0.01$. Colors represent the network's domain. Green color refers to animal networks. Pink color refers to biological networks. Blue color refers to collaboration networks. Violet color refers to human (offline) social networks. Grey color refers to infrastructural networks. Yellow color refers to actor networks. Brown colors refers to miscellaneous networks. Orange color refers to online social networks.

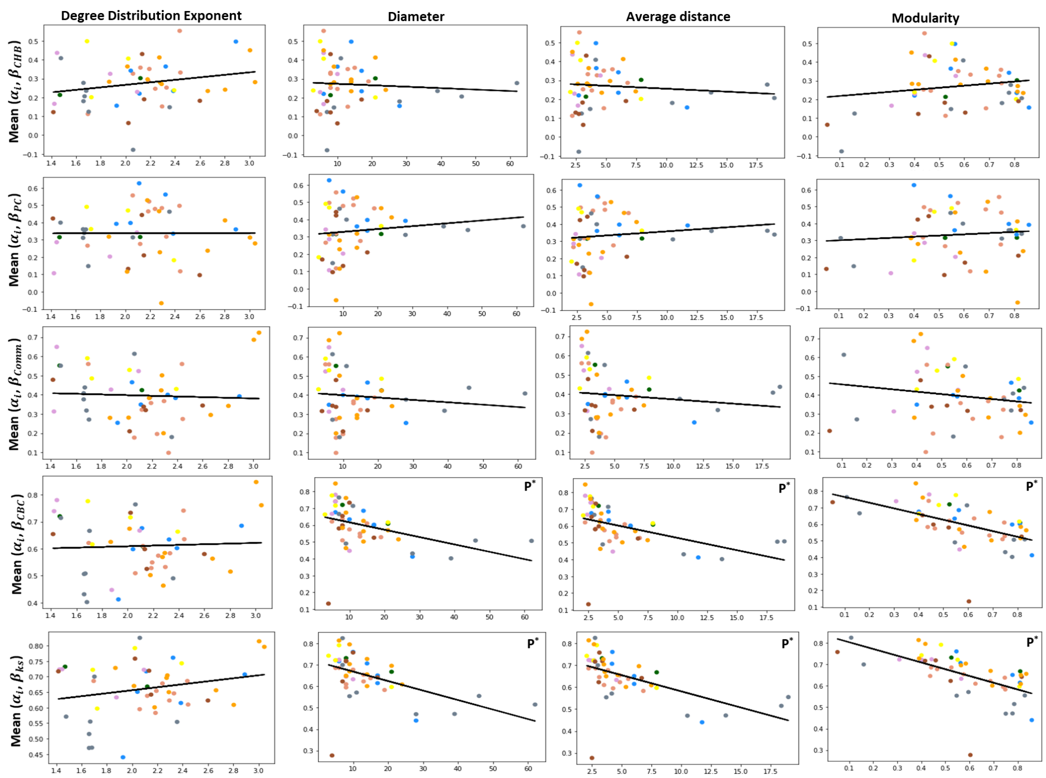

Fig. 5. Relationship of the mean of the correlation between each community-aware centrality measure combined with all classical centrality measures as a function of the topological properties of real-world networks. The line is fitted by linear regression using ordinary least squares. "P" indicates $p \leq 0.05$. "P" and * indicate $p \leq 0.01$. Colors represent the network's domain. Green color refers to animal networks. Pink color refers to biological networks. Blue color refers to collaboration networks. Violet color refers to human (offline) social networks. Grey color refers to infrastructural networks. Yellow color refers to actor networks. Brown colors refers to miscellaneous networks. Orange color refers to online social networks.

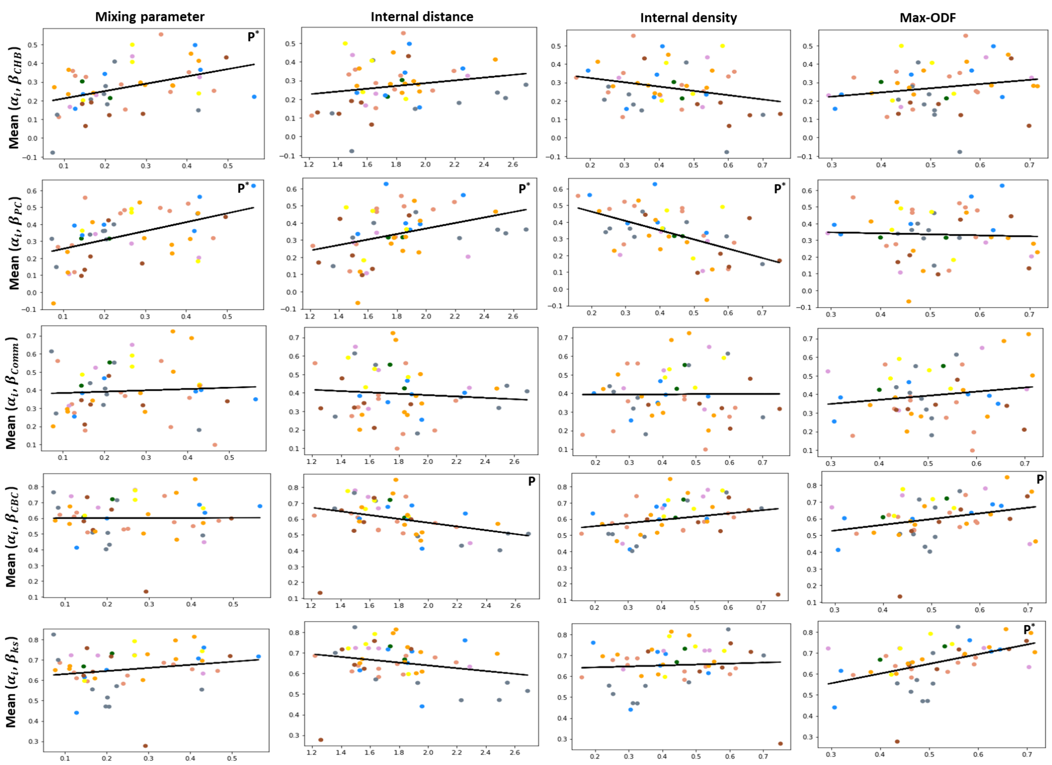

Fig. 6. Relationship of the mean of the correlation between each community-aware centrality measure combined with all classical centrality measures as a function of the topological properties of real-world networks. The line is fitted by linear regression using ordinary least squares. "P" indicates $p \leq 0.05$. "P" and * indicate $p \leq 0.01$. Colors represent the network's domain. Green color refers to animal networks. Pink color refers to biological networks. Blue color refers to collaboration networks. Violet color refers to human (offline) social networks. Grey color refers to infrastructural networks. Yellow color refers to actor networks. Brown colors refers to miscellaneous networks. Orange color refers to online social networks.

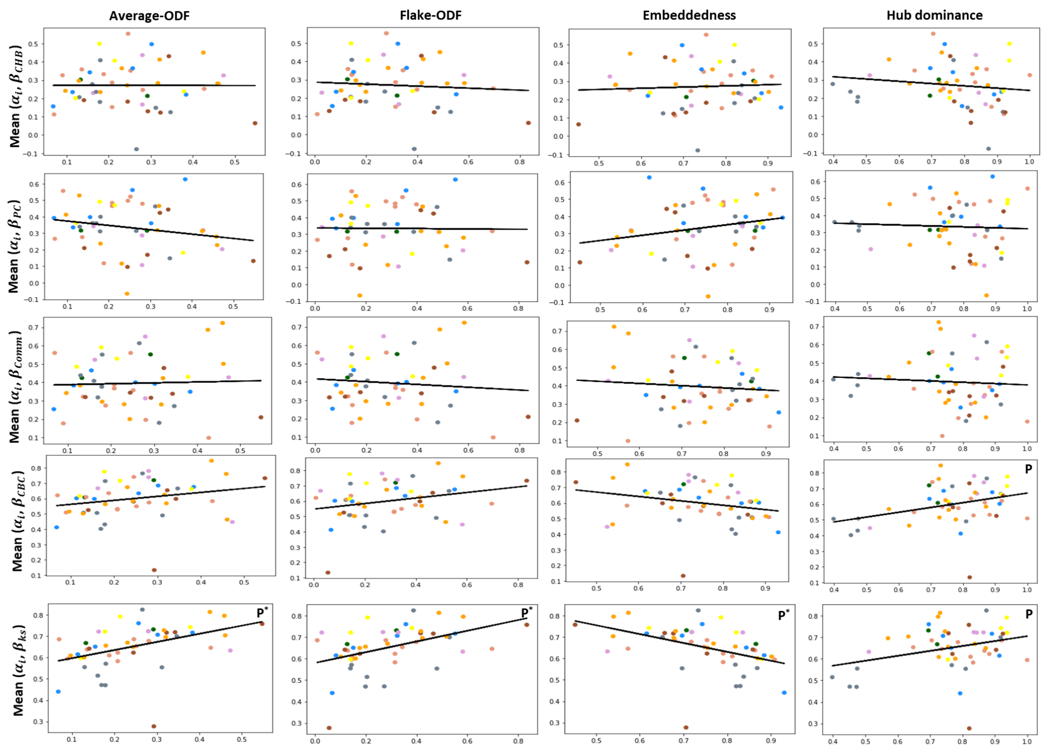

Fig. 7. Relationship of the mean of the correlation between each community-aware centrality measure combined with all classical centrality measures as a function of the topological properties of real-world networks. The line is fitted by linear regression using ordinary least squares. "P" indicates $p \leq 0.05$. "P" and * indicate $p \leq 0.01$. Colors represent the network's domain. Green color refers to animal networks. Pink color refers to biological networks. Blue color refers to collaboration networks. Violet color refers to human (offline) social networks. Grey color refers to infrastructural networks. Yellow color refers to actor networks. Brown colors refers to miscellaneous networks. Orange color refers to online social networks.

Table 1. Macroscopic topological properties of real-world networks. N is the total number of nodes. E is the number of edges. $< k >$ is the average degree. $< d >$ is the average distance. ν is the density. ζ is the transitivity. $k_{nn}(k)$ is the assortativity. D is the diameter. ϵ is the efficiency. γ_{pred} is the estimated exponent of the degree distribution. * indicates the largest connected component if the network is disconnected.

Network	N	E	$< k >$	$< d >$	ν	ζ	$k_{nn}(k)$	D	ϵ	γ_{pred}
Zachary Karate Club	34	78	4.58	2.40	0.139	0.255	-0.475	5	0.492	2.094
U.S. States	49	107	4.36	4.16	0.090	0.406	0.233	11	0.388	1.478
Dolphins	62	159	5.12	3.35	0.084	0.308	-0.043	8	0.379	1.470
Madrid Train Bombings	64	243	7.59	2.69	0.120	0.561	0.029	6	0.448	1.425
Blumenau Drug	75	181	4.83	2.81	0.065	0.108	-0.314	6	0.407	2.437
Les Misérables	77	254	6.59	2.64	0.086	0.498	-0.165	5	0.435	1.689
PolBooks	105	441	8.40	3.07	0.080	0.348	-0.127	7	0.397	2.600
Game of Thrones	107	352	6.58	2.90	0.062	0.328	-0.130	6	0.398	2.022
Movie Galaxies	109	326	5.98	2.06	0.055	0.162	-0.360	3	0.508	2.392
Football	115	613	10.66	2.50	0.093	0.407	0.162	4	0.450	1.327
Marvel Partnerships*	181	224	2.48	7.92	0.014	0.216	-0.207	21	0.166	1.724
Mouse Visual Cortex	193	214	2.21	4.27	0.015	0.004	-0.844	8	0.271	2.060
Internet Topology Cogentco	197	243	2.47	10.51	0.013	0.019	0.027	28	0.137	1.660
Jazz	198	2,742	27.69	2.23	0.140	0.520	0.020	6	0.513	1.477
Malaria Genes	307	2,812	18.32	3.52	0.060	0.587	0.599	8	0.349	2.443
E. coli Transcription*	329	456	2.77	4.84	0.008	0.023	-0.263	13	0.245	2.295
Facebook Friends*	329	1,954	11.88	3.58	0.036	0.512	0.074	9	0.326	2.015
London Transport	369	430	2.33	13.73	0.006	0.051	0.137	39	0.101	1.682
NetSci	379	914	4.83	6.04	0.012	0.430	-0.081	17	0.203	2.386
EU Airlines	417	2,953	14.16	2.76	0.034	0.304	-0.152	7	0.400	2.061
Reptiles*	496	984	3.96	7.93	0.008	0.419	0.345	21	0.155	2.120
U.S. Airports	500	2,980	11.92	2.99	0.023	0.351	-0.267	7	0.371	1.702
Retweets Copenhagen	761	1,029	2.70	5.35	0.003	0.060	-0.099	14	0.208	2.178
Caltech*	762	16,651	43.70	2.23	0.057	0.291	-0.066	6	0.461	3.005
DNC Emails*	849	10,384	24.46	2.76	0.029	0.548	-0.133	8	0.399	1.417
Board of Directors*	854	2,745	6.43	6.67	0.008	0.624	0.051	17	0.176	2.150
Yeast Collins*	1,004	8,319	16.57	5.55	0.016	0.617	0.556	15	0.220	2.120
Budapest Connectome	1,015	70,654	139.22	2.22	0.137	0.558	0.215	5	0.510	1.696
CS Ph.D.*	1,025	1,043	2.03	11.74	0.001	0.002	-0.253	28	0.105	1.928
EuroRoad*	1,039	1,305	2.51	18.39	0.002	0.035	0.090	62	0.077	1.660
Yeast Protein*	1,458	1,993	2.73	6.81	0.001	0.051	-0.207	19	0.163	2.185
New Zealand Collaboration*	1,463	4,246	5.80	2.75	0.003	0.063	-0.340	6	0.381	2.112
Bible Nouns*	1,707	9,059	10.61	3.38	0.006	0.162	-0.052	8	0.320	2.134
Hamsterster*	1,788	12,476	13.49	3.45	0.007	0.090	-0.088	14	0.317	1.868
Kegg Metabolic*	1,865	5,769	6.19	3.12	0.003	0.030	-0.224	8	0.342	2.331
Human Protein*	2,217	6,418	5.78	3.84	0.002	0.007	-0.331	10	0.281	2.240
Adolescent Health	2,539	10,455	8.23	4.55	0.003	0.141	0.251	10	0.234	1.876
Interactome Vidal*	2,783	6,007	4.32	4.84	0.002	0.035	-0.137	13	0.223	2.192
Ego Facebook	4,039	88,234	43.69	3.69	0.010	0.519	0.063	8	0.306	2.291
GrQc	4,158	13,422	6.45	6.04	0.001	0.628	0.639	17	0.179	2.042
U.S. Power Grid	4,941	6,594	2.66	18.98	0.005	0.103	0.003	46	0.062	1.669
Facebook Organizations	5,524	94,219	34.11	3.50	0.006	0.222	0.103	9	0.313	2.279
Facebook Politician Pages	5,908	41,729	14.12	4.66	0.002	0.301	0.018	14	0.231	2.664
Internet Autonomous Systems	6,474	12,572	3.88	3.70	0.0006	0.009	-0.181	9	0.290	2.356
Princeton*	6,575	293,307	89.21	2.67	0.013	0.163	0.090	9	0.400	3.046
PGP	10,680	24,316	4.55	7.48	0.0004	0.378	0.238	24	0.147	2.804
DBLP*	12,494	49,579	7.94	4.42	0.0006	0.062	-0.046	10	0.240	2.324
911AllWords	13,308	148,035	22.25	3.12	0.0016	0.106	-0.108	10	0.334	2.023
AstroPh*	17,903	196,972	22.00	4.19	0.001	0.317	0.201	14	0.255	2.891
DeezerEU	28,281	92,752	6.55	6.44	0.002	0.095	0.104	21	0.169	2.273

Table 2. Mesoscopic topological properties of real-world networks with community structure unveiled using Infomap. μ is the mixing parameter. Q is the modularity. χ is the internal degree. φ is the internal distance. ψ is the internal density. η is the Max-ODF. ι is the Average-ODF. κ is the Flake-ODF. $\backepsilon$ is the embeddedness. $\hbar$ is the hub dominance.

Network	μ	Q	χ	φ	ψ	η	ι	κ	$\backepsilon$	$\hbar$
EU Airlines	0.073	0.109	3.97	1.49	0.596	0.559	0.266	0.388	0.734	0.874
Ego Facebook	0.077	0.814	14.69	1.53	0.538	0.457	0.244	0.176	0.755	0.872
U.S. Airports	0.084	0.161	2.30	1.37	0.701	0.508	0.347	0.530	0.652	0.918
Budapest Connectome	0.088	0.525	90.75	1.22	0.295	0.412	0.070	0.009	0.680	0.921
Facebook Politician Pages	0.111	0.836	5.33	1.85	0.402	0.466	0.180	0.199	0.819	0.756
Facebook Friends	0.112	0.688	5.17	1.54	0.554	0.486	0.231	0.286	0.769	0.838
Madrid Train Bombings	0.115	0.309	4.25	1.59	0.526	0.440	0.280	0.328	0.719	0.865
Yeast Collins	0.122	0.747	6.99	1.52	0.618	0.431	0.136	0.129	0.864	0.868
Malaria Genes	0.128	0.625	10.42	1.47	0.601	0.538	0.188	0.146	0.812	0.825
CS Ph.D.	0.128	0.859	1.70	1.97	0.306	0.307	0.068	0.068	0.931	0.793
Reptiles	0.145	0.811	2.77	1.85	0.443	0.400	0.133	0.127	0.866	0.722
PolBooks	0.145	0.522	5.39	1.57	0.511	0.516	0.245	0.177	0.754	0.769
NetSci	0.147	0.810	3.69	1.53	0.537	0.320	0.114	0.083	0.885	0.914
Marvel Partnerships	0.147	0.808	2.01	1.86	0.408	0.423	0.121	0.141	0.879	0.755
911AllWords	0.153	0.052	1.72	1.63	0.603	0.699	0.548	0.834	0.452	0.820
Mouse Visual Cortex	0.154	0.740	1.84	1.84	0.161	0.345	0.090	0.144	0.909	1
U.S. Power Grid	0.166	0.830	2.08	2.56	0.242	0.435	0.130	0.140	0.869	0.475
Board of Directors	0.167	0.817	5.16	1.49	0.578	0.459	0.141	0.118	0.859	0.904
PGP	0.172	0.813	2.40	1.97	0.388	0.381	0.097	0.102	0.902	0.727
Zachary Karate Club	0.179	0.402	3.47	1.66	0.404	0.294	0.163	0.027	0.836	0.844
London Transport	0.198	0.779	1.83	2.49	0.313	0.497	0.170	0.273	0.830	0.452
GrQc	0.200	0.779	3.73	1.87	0.394	0.461	0.155	0.151	0.844	0.765
EuroRoad	0.202	0.786	1.94	2.70	0.254	0.463	0.161	0.205	0.838	0.398
Internet Topology Cogentco	0.206	0.751	1.91	2.23	0.326	0.487	0.179	0.199	0.821	0.473
DNC Emails	0.211	0.416	5.70	1.40	0.633	0.561	0.323	0.466	0.677	0.925
Dolphins	0.213	0.525	3.41	1.75	0.467	0.532	0.292	0.312	0.707	0.695
U.S. States	0.224	0.596	3.35	1.64	0.479	0.475	0.180	0.144	0.819	0.767
Yeast Protein	0.240	0.749	1.94	2.04	0.324	0.432	0.149	0.173	0.850	0.728
E. coli Transcription	0.250	0.687	1.69	1.66	0.466	0.464	0.208	0.315	0.791	0.883
Game of Thrones	0.267	0.482	3.80	1.63	0.421	0.503	0.214	0.207	0.786	0.937
Jazz	0.267	0.443	15.51	1.51	0.540	0.612	0.280	0.268	0.719	0.835
Les Misérables	0.267	0.551	4.30	1.45	0.584	0.441	0.178	0.141	0.821	0.938
Retweets Copenhagen	0.287	0.695	1.80	1.93	0.338	0.433	0.129	0.160	0.870	0.778
Football	0.293	0.604	7.58	1.27	0.751	0.435	0.293	0.056	0.293	0.821
Hamsterster	0.298	0.391	3.52	1.86	0.369	0.623	0.317	0.417	0.682	0.746
Blumenau Drug	0.337	0.441	2.58	1.845	0.326	0.571	0.246	0.279	0.754	0.705
Human Protein	0.360	0.466	2.03	2.06	0.253	0.595	0.281	0.399	0.718	0.786
Princeton	0.365	0.417	15.74	1.77	0.480	0.708	0.459	0.584	0.540	0.725
Facebook Organizations	0.366	0.585	15.09	1.95	0.267	0.716	0.461	0.517	0.539	0.633
Interactome Vidal	0.405	0.576	2.08	2.20	0.297	0.559	0.252	0.344	0.748	0.648
Caltech	0.410	0.389	13.35	1.79	0.427	0.657	0.425	0.488	0.574	0.731
AstroPh	0.420	0.563	6.62	1.89	0.410	0.627	0.302	0.324	0.697	0.740
Internet Autonomous Systems	0.428	0.547	1.78	1.94	0.350	0.508	0.312	0.480	0.687	0.810
DeezerEU	0.429	0.565	2.59	2.48	0.223	0.573	0.321	0.423	0.678	0.570
Movie Galaxies	0.429	0.401	2.89	1.57	0.498	0.547	0.379	0.382	0.621	0.919
Adolescent Health	0.431	0.566	3.47	2.29	0.284	0.704	0.473	0.582	0.526	0.511
DBLP	0.433	0.546	2.54	2.26	0.195	0.583	0.257	0.358	0.743	0.696
Kegg Metabolic	0.466	0.437	1.77	1.79	0.529	0.592	0.427	0.697	0.573	0.736
Bible Nouns	0.496	0.460	4.00	1.88	0.358	0.663	0.343	0.416	0.657	0.757
New Zealand Collaboration	0.564	0.401	2.28	1.73	0.386	0.645	0.384	0.552	0.616	0.891

Table 3. Simple linear regression estimates using ordinary least squares for Mean(α_i, β_{CHB}) as the dependent variable. Independent variables are the macroscopic and mesoscopic properties considered individually. ω is the estimated coefficient. ϵ is the standard error. The confidence interval is based on 95% likelihood. R^2 is the coefficient of determination. * indicates $p \leq 0.05$. A bold font and * indicate $p \leq 0.01$.

Independent Variable	ω	ϵ	T	$p > \|T\|$	Confidence Interval	R^2
Density	0.146	0.423	0.345	0.731	[-0.705; 0.997]	0.002
Transitivity	0.031	0.085	0.361	0.720	[-0.141; 0.202]	0.003
Assortativity	0.074	0.065	1.138	0.261	[-0.057; 0.206]	0.026
Average distance	-0.003	0.005	-0.660	0.512	[-0.013; 0.006]	0.009
Diameter	-0.001	0.002	-0.484	0.631	[-0.004; 0.002]	0.005
Efficiency	0.014	0.144	0.100	0.921	[-0.275; 0.303]	0.001
Degree distribution exponent	0.066	0.043	1.553	0.127	[-0.020; 0.152]	0.049
Modularity	0.110	0.088	1.250	0.218	[-0.067; 0.288]	0.032
Mixing parameter*	0.392	0.124	3.171	0.003	[0.144; 0.641]	0.173
Internal distance	0.074	0.052	1.43	0.159	[-0.030; 0.179]	0.041
Internal density	-0.233	0.124	-1.882	0.066	[-0.481; 0.016]	0.069
Max-ODF	0.228	0.164	1.390	0.171	[-0.102; 0.557]	0.039
Average-ODF	-0.003	0.153	-0.017	0.986	[-0.310; 0.305]	0.0001
Flake-ODF	-0.055	0.096	-0.571	0.571	[-0.247; 0.138]	0.007
Embeddedness	0.065	0.156	0.413	0.681	[-0.250; 0.379]	0.004
Hub dominance	-0.125	0.127	-0.985	0.330	[-0.381; 0.130]	0.020

Table 4. Simple linear regression estimates using ordinary least squares for Mean(α_i, β_{PC}) as the dependent variable. Independent variables are the macroscopic and mesoscopic properties considered individually. ω is the estimated coefficient. ϵ is the standard error. The confidence interval is based on 95% likelihood. R^2 is the coefficient of determination. * indicates $p \leq 0.05$. A bold font and * indicate $p \leq 0.01$.

Independent Variable	ω	ϵ	T	$p > \|T\|$	Confidence Interval	R^2
Density	-0.866	0.486	-1.780	0.081	[-1.844; 0.112]	0.062
Transitivity*	-0.351	0.088	-4.00	0.0001	[-0.527; -0.175]	0.250
Assortativity*	-0.193	0.073	-2.628	0.012	[-0.341; -0.045]	0.126
Average distance	0.005	0.006	0.857	0.395	[-0.006; 0.016]	0.015
Diameter	0.002	0.002	0.886	0.380	[-0.002; 0.005]	0.016
Efficiency	-0.282	0.165	-1.707	0.094	[-0.615; 0.050]	0.057
Degree distribution exponent	0.001	0.052	0.021	0.983	[-0.103; 0.105]	0.0001
Modularity	0.071	0.106	0.673	0.504	[-0.141; 0.284]	0.009
Mixing parameter*	0.523	0.142	3.67	0.001	[0.237; 0.809]	0.219
Internal distance*	0.160	0.058	2.733	0.009	[0.042; 0.277]	0.135
Internal density*	-0.554	0.129	-4.293	0.0001	[-0.813; -0.294]	0.277
Max-ODF	-0.060	0.198	-0.305	0.762	[-0.458; 0.337]	0.002
Average-ODF	-0.263	0.177	-1.486	0.144	[-0.619; 0.093]	0.044
Flake-ODF	-0.010	0.114	-0.086	0.932	[-0.238; 0.219]	0.0001
Embeddedness	0.306	0.180	1.697	0.096	[-0.057; 0.668]	0.057
Hub dominance	-0.054	0.152	-0.357	0.722	[-0.360; 0.251]	0.003

Table 5. Simple linear regression estimates using ordinary least squares for Mean(α_i, β_{CBM}) as the dependent variable. Independent variables are the macroscopic and mesoscopic properties considered individually. ω is the estimated coefficient. ϵ is the standard error. The confidence interval is based on 95% likelihood. R^2 is the coefficient of determination. * indicates $p \leq 0.05$. A bold font and * indicate $p \leq 0.01$.

Independent Variable	ω	ϵ	T	$p > \|T\|$	Confidence Interval	R^2
Density	-0.239	0.450	-0.531	0.598	[-1.145; 0.666]	0.006
Transitivity*	-0.264	0.083	-3.188	0.003	[-0.430; -0.097]	0.175
Assortativity*	-0.170	0.066	-2.570	0.013	[-0.303; -0.037]	0.121
Average distance	-0.008	0.005	-1.690	0.098	[-0.018; 0.002]	0.056
Diameter	-0.002	0.002	-1.413	0.164	[-0.006; 0.001]	0.040
Efficiency	0.245	0.149	1.640	0.108	[-0.055; 0.545]	0.053
Degree distribution exponent	0.086	0.045	1.898	0.064	[-0.005; 0.177]	0.071
Modularity*	-0.187	0.092	-2.043	0.047	[-0.371; -0.003]	0.080
Mixing parameter*	0.757	0.095	7.946	0.0001	[0.566; 0.949]	0.568
Internal distance	0.089	0.055	1.617	0.112	[-0.022; 0.200]	0.052
Internal density*	-0.309	0.129	-2.392	0.021	[-0.568; -0.049]	0.107
Max-ODF*	0.539	0.160	3.365	0.002	[0.217; 0.861]	0.191
Average-ODF*	0.444	0.150	2.960	0.005	[0.142; 0.745]	0.154
Flake-ODF*	0.268	0.095	2.835	0.007	[0.078; 0.458]	0.143
Embeddedness*	-0.405	0.156	-2.593	0.013	[-0.719; -0.091]	0.123
Hub dominance	-0.042	0.137	-0.309	0.759	[-0.317; 0.233]	0.002

Table 6. Simple linear regression estimates using ordinary least squares for Mean(α_i, β_{Comm}) as the dependent variable. Independent variables are the macroscopic and mesoscopic properties considered individually. ω is the estimated coefficient. ϵ is the standard error. The confidence interval is based on 95% likelihood. R^2 is the coefficient of determination. * indicates $p \leq 0.05$. A bold font and * indicate $p \leq 0.01$.

Independent Variable	ω	ϵ	T	$p > \|T\|$	Confidence Interval	R^2
Density*	1.516	0.430	3.524	0.001	[0.651; 2.381]	0.206
Transitivity	0.153	0.095	1.615	0.113	[-0.038; 0.344]	0.052
Assortativity	0.069	0.075	0.922	0.361	[-0.081; 0.219]	0.017
Average distance	-0.004	0.005	-0.826	0.413	[-0.015; 0.006]	0.014
Diameter	-0.001	0.002	-0.692	0.492	[-0.005; 0.002]	0.010
Efficiency*	0.389	0.154	2.529	0.015	[0.080; 0.698]	0.118
Degree distribution exponent	-0.017	0.050	-0.341	0.735	[-0.118; 0.084]	0.002
Modularity	-0.129	0.100	-1.284	0.205	[-0.331; 0.073]	0.033
Mixing parameter	0.073	0.155	0.474	0.638	[-0.237; 0.384]	0.005
Internal distance	-0.037	0.060	-0.609	0.546	[-0.158; 0.084]	0.008
Internal density	0.006	0.146	0.043	0.966	[-0.287; 0.299]	0.0001
Max-ODF	0.219	0.188	1.169	0.248	[-0.158; 0.597]	0.028
Average-ODF	0.048	0.174	0.274	0.785	[-0.302; 0.398]	0.002
Flake-ODF	-0.076	0.109	-0.704	0.485	[-0.295; 0.142]	0.010
Embeddedness	-0.121	0.177	-0.680	0.500	[-0.477; 0.236]	0.010
Hub dominance	-0.073	0.146	-0.498	0.620	[-0.366; 0.221]	0.005

Table 7. Simple linear regression estimates using ordinary least squares for Mean(α_i, β_{MV}) as the dependent variable. Independent variables are the macroscopic and mesoscopic properties considered individually. ω is the estimated coefficient. ϵ is the standard error. The confidence interval is based on 95% likelihood. R^2 is the coefficient of determination. * indicates $p \leq 0.05$. A bold font and * indicate $p \leq 0.01$.

Independent Variable	ω	ϵ	T	$p > \|T\|$	Confidence Interval	R^2
Density	-0.861	0.673	-1.280	0.207	[-2.214; 0.492]	0.033
Transitivity	0.074	0.138	0.539	0.592	[-0.203; 0.351]	0.052
Assortativity	0.124	0.106	1.172	0.247	[-0.089; 0.336]	0.028
Average distance	0.010	0.007	1.383	0.173	[-0.005; 0.025]	0.038
Diameter	0.004	0.002	1.474	0.147	[-0.001; 0.009]	0.043
Efficiency	-0.349	0.227	-1.541	0.130	[-0.805; 0.106]	0.047
Degree distribution exponent	0.072	0.071	1.018	0.314	[-0.070; 0.215]	0.022
Modularity	0.230	0.141	1.634	0.109	[-0.053; 0.513]	0.053
Mixing parameter	-0.238	0.217	-1.099	0.277	[-0.674; 0.198]	0.025
Internal distance	0.009	0.086	0.106	0.916	[-0.163; 0.181]	0.0001
Internal density	0.156	0.206	0.759	0.452	[-0.257; 0.569]	0.012
Max-ODF	-0.120	0.269	-0.447	0.657	[-0.662; 0.421]	0.004
Average-ODF	-0.005	0.247	-0.018	0.985	[-0.501; 0.492]	0.0001
Flake-ODF	-0.042	0.155	-0.270	0.788	[-0.353; 0.269]	0.002
Embeddedness	0.040	0.253	0.160	0.874	[-0.468; 0.549]	0.001
Hub dominance	-0.078	0.207	-0.378	0.707	[-0.495; 0.338]	0.003

Table 8. Simple linear regression estimates using ordinary least squares for Mean(α_i, β_{CBC}) as the dependent variable. Independent variables are the macroscopic and mesoscopic properties considered individually. ω is the estimated coefficient. ϵ is the standard error. The confidence interval is based on 95% likelihood. R^2 is the coefficient of determination. * indicates $p \leq 0.05$. A bold font and * indicate $p \leq 0.01$.

Independent Variable	ω	ϵ	T	$p > \|T\|$	Confidence Interval	R^2
Density*	1.016	0.406	2.502	0.016	[0.200; 1.833]	0.115
Transitivity*	0.173	0.083	2.070	0.044	[0.005; 0.341]	0.082
Assortativity	-0.042	0.067	-0.629	0.532	[-0.178; 0.093]	0.008
Average distance*	-0.015	0.004	-3.418	0.001	[-0.023; -0.006]	0.196
Diameter*	-0.004	0.001	-2.961	0.005	[-0.007; -0.001]	0.154
Efficiency*	0.524	0.126	4.173	0.0001	[0.271; 0.776]	0.266
Degree distribution exponent	0.013	0.038	0.328	0.744	[-0.064; 0.089]	0.002
Modularity*	-0.344	0.077	-4.486	0.0001	[-0.498; -0.190]	0.295
Mixing parameter	0.007	0.139	0.049	0.961	[-0.272; 0.285]	0.0001
Internal distance*	-0.120	0.051	-2.34	0.024	[-0.223; -0.017]	0.102
Internal density	0.196	0.127	1.543	0.129	[-0.060; 0.452]	0.047
Max-ODF*	0.342	0.163	2.100	0.041	[0.015; 0.670]	0.084
Average-ODF	0.259	0.151	1.713	0.093	[-0.045; 0.563]	0.058
Flake-ODF	0.181	0.094	1.922	0.061	[-0.008; 0.370]	0.071
Embeddedness	-0.281	0.154	-1.823	0.074	[-0.591; 0.029]	0.065
Hub dominance*	0.307	0.123	2.493	0.016	[0.059; 0.554]	0.115

Table 9. Simple linear regression estimates using ordinary least squares for Mean(α_i, β_{ks}) as the dependent variable. Independent variables are the macroscopic and mesoscopic properties considered individually. ω is the estimated coefficient. ϵ is the standard error. The confidence interval is based on 95% likelihood. R^2 is the coefficient of determination. * indicates $p \leq 0.05$. A bold font and * indicate $p \leq 0.01$.

Independent Variable	ω	ϵ	T	$p > \lvert T \rvert$	Confidence Interval	R^2
Density	0.333	0.350	0.952	0.346	[-0.370; 1.036]	0.019
Transitivity	0.081	0.070	1.145	0.258	[-0.061; 0.222]	0.027
Assortativity	-0.052	0.055	-0.942	0.351	[-0.162; 0.058]	0.018
Average distance*	-0.015	0.003	-4.490	0.0001	[-0.021; -0.008]	0.296
Diameter*	-0.004	0.001	-3.871	0.0001	[-0.007; -0.002]	0.238
Efficiency*	0.407	0.104	3.897	0.0001	[0.197; 0.617]	0.240
Degree distribution exponent	0.048	0.030	1.583	0.120	[-0.013; 0.109]	0.051
Modularity*	-0.316	0.059	-5.334	0.0001	[-0.435; -0.197]	0.372
Mixing parameter	0.152	0.111	1.369	0.177	[-0.071; 0.376]	0.038
Internal distance	-0.069	0.043	-1.593	0.118	[-0.155; 0.018]	0.050
Internal density	0.004	0.106	0.431	0.668	[-0.168; 0.260]	0.004
Max-ODF*	0.463	0.122	3.793	0.0001	[0.218; 0.709]	0.231
Average-ODF*	0.382	0.115	3.328	0.002	[0.151; 0.613]	0.187
Flake-ODF*	0.250	0.071	3.511	0.001	[0.107; 0.393]	0.204
Embeddedness*	-0.415	0.116	-3.580	0.001	[-0.648; -0.182]	0.211
Hub dominance*	0.229	0.102	2.248	0.029	[0.024; 0.433]	0.095