Supplementary materials

Table 1: Performance comparison of KNNs with different feature representations. (p-values are shown in the parentheses)

Method	MiP	MiR	MiF	EBP	EBR	EBF	MaP	MaR	MaF
KNN_{TFIDF}	0.4369	0.4455	0.4412	0.4362	0.4547	0.4317	**0.3274**	**0.2960**	**0.3109**
	(2.95E-39)	(2.09E-39)	(2.48E-39)	(9.30E-34)	(3.96E-29)	(1.59E-32)	-	-	-
KNN_{W2V}	0.4133	0.4215	0.4174	0.4083	0.4216	0.4027	0.1438	0.1230	0.1326
	(2.40E-70)	(1.30E-70)	(1.66E-70)	(1.05E-69)	(5.55E-73)	(1.92E-71)	(5.06E-92)	(6.25E-92)	(1.15E-93)
KNN_{WW2V}	**0.4477**	**0.4565**	**0.4521**	**0.4444**	**0.4616**	**0.4394**	0.2332	0.2126	0.2225
	-	-	-	-	-	-	(1.69E-76)	(6.87E-74)	(1.11E-76)
KNN_{W2P}	0.4027	0.4106	0.4066	0.3968	0.4098	0.3914	0.1201	0.1018	0.1102
	(6.11E-78)	(7.22E-78)	(5.82E-78)	(2.79E-76)	(7.88E-79)	(4.72E-78)	(1.59E-92)	(1.32E-92)	(8.53E-94)
KNN_{WW2P}	0.4392	0.4478	0.4435	0.4351	0.4515	0.4300	0.1970	0.1786	0.1873
	(5.47E-45)	(5.73E-45)	(5.57E-45)	(6.09E-44)	(3.74E-45)	(9.24E-45)	(6.05E-81)	(3.59E-80)	(1.28E-81)
KNN_{D2V}	0.4271	0.4355	0.4313	0.4207	0.4361	0.4156	0.1726	0.1450	0.1576
	(4.24E-59)	(1.82E-59)	(2.74E-59)	(4.10E-59)	(1.30E-59)	(6.20E-60)	(5.06E-86)	(1.80E-86)	(1.16E-87)

Table 2: Performance comparison of KNNs with the combination of different feature representations. (p-values are shown in the parentheses)

Method	MiP	MiR	MiF	EBP	EBR	EBF	MaP	MaR	MaF
$KNN_{W2V\text{-}TFIDF}$	0.4526	0.4615	0.4570	0.4516	0.4710	0.4472	0.3359	0.3027	0.3185
	(3.84E-72)	(7.60E-73)	(1.55E-72)	(3.21E-72)	(6.78E-72)	(3.26E-72)	(6.80E-42)	(1.12E-50)	(2.71E-49)
$KNN_{WW2V\text{-}TFIDF}$	0.4602	0.4693	0.4647	0.4593	0.4793	0.4549	0.3412	0.3091	0.3244
	(2.32E-64)	(1.63E-64)	(1.84E-64)	(2.24E-62)	(3.38E-61)	(3.94E-62)	(5.74E-25)	(1.63E-37)	(9.08E-34)
$KNN_{W2P\text{-}TFIDF}$	0.4750	0.4844	0.4797	0.4752	0.4951	0.4702	0.3371	0.3054	0.3205
	(1.30E-30)	(1.23E-30)	(1.26E-30)	(3.25E-27)	(1.26E-25)	(3.71E-27)	(1.36E-37)	(3.43E-45)	(2.33E-43)
$KNN_{WW2P\text{-}TFIDF}$	0.4768	0.4862	0.4814	0.4764	0.4963	0.4714	0.3398	0.3095	0.3239
	(1.30E-18)	(1.25E-18)	(1.27E-18)	(7.57E-20)	(1.99E-19)	(2.02E-20)	(5.73E-27)	(3.65E-33)	(2.52E-31)
$KNN_{D2V\text{-}TFIDF}$	**0.4784**	**0.4878**	**0.4831**	**0.4783**	**0.4983**	**0.4733**	**0.3468**	**0.3171**	**0.3313**

Table 3: Comparison of binary relevance approaches with different features. (p-values are shown in the parentheses)

Method	MiP	MiR	MiF	EBP	EBR	EBF	MaP	MaR	MaF
BC_{D2V}	0.4395	0.4482	0.4438	0.4339	0.4519	0.4294	0.1627	0.1706	0.1666
	(1.99E-101)	(1.51E-103)	(3.11E-103)	(1.00E-99)	(3.09E-100)	(1.06E-100)	(1.16E-101)	(4.48E-102	(8.15E-101)
BC_{TFIDF}	0.5584	0.5694	0.5638	0.5575	0.5892	0.5556	0.4662	**0.4970**	**0.4811**
	(2.68E-78)	(3.46E-78)	(2.52E-78)	(1.39E-77)	(1.68E-75)	(4.82E-77)	(2.52E-30)	-	-
$BCnorm_{TFIDF}$	0.5716	0.5829	0.5772	0.5704	0.5991	0.5667	0.4463	0.4402	0.4432
	(5.80E-71)	(1.69E-70)	(8.98E-71)	(9.55E-70)	(1.44E-69)	(1.06E-69)	(9.72E-56)	(1.98E-76)	(2.13E-66)
$BC_{D2V\text{-}TFIDF}$	**0.5974**	**0.6092**	**0.6033**	**0.5983**	**0.6280**	**0.5943**	**0.4741**	0.4633	0.4686
	-	-	-	-	-	-	-	(1.26E-60)	(4.44E-41)

Table 4: Performance improvement of MeSHRanker by incorporating deep semantic representation (p-values are shown in the parentheses)

Method	MiP	MiR	MiF	EBP	EBR	EBF	MaP	MaR	MaF
MTIDEF	0.5753	0.5526	0.5637	0.5838	0.5737	0.5566	0.4939	0.5140	0.5037
	(9.79E-65)	(1.21E-85)	(4.89E-80)	(1.89E-60)	(3.06E-86)	(5.74E-79)	(1.31E-63)	(6.01E-62)	(1.22E-64)
$BC_{D2V\text{-}TFIDF}$	0.5974	0.6092	0.6033	0.5983	0.6280	0.5943	0.4741	0.4633	0.4686
	(1.23E-67)	(1.94E-67)	(1.46E-67)	(2.73E-68)	(1.90E-68)	(9.79E-69)	(8.21E-74)	(5.35E-86)	(9.07E-82)
MeSHRanker	0.6067	0.6187	0.6126	0.6091	0.6400	0.6053	0.5249	0.5400	0.5323
	(4.56E-55)	(1.65E-55)	(2.73E-55)	(4.86E-50)	(6.68E-51)	(5.32E-51)	(6.30E-46)	(1.93E-46)	(1.02E-47)
+ Step 2 of DeepMeSH	0.6156	0.6278	0.6216	0.6180	0.6492	0.6141	0.5361	0.5476	0.5418
	(1.29E-17)	(1.28E-17)	(1.30E-17)	(3.21E-16)	(3.18E-18)	(2.84E-17)	(3.20E-19)	(1.38E-30)	(3.88E-27)
+ Steps 1 and 2 of DeepMeSH	**0.6164**	**0.6286**	**0.6224**	**0.6188**	**0.6501**	**0.6149**	**0.5380**	**0.5505**	**0.5442**