	original	KPG
avg tree size	183.4	112.5
avg noise size	9.9	2.9
avg noisy ratio	5.90%	2.60%

Table 1: The analysis about noisy comments on Weibo22, where *original* denotes the input propagation graphs and *KPG* denotes the generated key graphs via our KPG.

	cascade size		max depth		max degree		number of nodes with degree>1	
	Non-rumor	Rumor	Non-rumor	Rumor	Non-rumor	Rumor	Non-rumor	Rumor
mean	311.74	149.19	2.89	3.22	249.93	66.1	16.83	20.72
min	1	1	1	1	0	0	0	0
median	5	9	2	3	3	6	1	1
max	30791	26535	17	29	22348	7805	1954	3705

Table 2: Statistics of Weibo22.

Figure 1: Topics of COVID-19 related rumors.

Figure 2: Publishers' verification reasons of COVID-19 related rumors.

Figure 3: Publishers' verification reasons of other rumors.

Figure 1 presents the word cloud results of COVID-19-related rumors, mainly focusing on epidemic prevention policies, supplies, and confirmed cases. Figures 2-3 display word cloud figures of reasons for misinformation. Notably, COVID-19 rumormongers exhibit similar content positioning to other topics and judgments made by users in different fields show little variation when faced with misinformation.

time delta (mins)	root	20	60	120	240	full
KPG	0.832	0.875	0 .878	0.881	0.881	0.889
BERT	0.747	0.750	0.758	0.760	0.748	0.753

Table 3: The results (in terms of accuracy) of KPG and BERT on Twitter16 under different stages of spread, where *root* represents using only root post for the veracity, and *full* means using full propagation graphs.

		Acc.	NR F_1	FR F_1	TR F_1	UR F_1
Twitter15	GPT-3.5	0.313	0.084	0.188	0.410	0.368
	GPT-4	0.419	0.535	0.376	0.261	0.431
	KPG	0.893	0.921	0.898	0.903	0.847
Twitter16	GPT-3.5	0.375	0.109	0.172	0.520	0.434
	GPT-4	0.394	0.498	0.369	0.266	0.397
	KPG	0.889	0.894	0.836	0.930	0.896

Table 4: The results of LLMs on Twitter15 and Twitter16.

		Acc.	R F_1	NR F_1
Pheme	GPT-3.5	0.599	0.484	0.672
	GPT-4	0.615	0.494	0.689
	KPG	0.859	0.863	0.854
Weibo22	GPT-3.5	0.670	0.704	0.627
	GPT-4	0.745	0.780	0.696
	KPG	0.949	0.949	0.948

Table 5: The results of LLMs on Pheme and Weibo22.