CS 446 Project 2 Report

Ilmin Cho

April 17, 2023

1.

	Query	QL	BM25	QL~BM %	DPR	QL~DPR %
0	23849	0.0151	0.0186	23.2%	0.2391	1483.4%
1	42255	0.1987	0.2625	32.1%	0.4411	122.0%
2	47210	0.1997	0.2021	1.2%	0.3692	84.9%
3	67316	0.0080	0.0151	88.8%	0.0853	966.2%
4	118440	0.0041	0.0048	17.1%	0.0084	104.9%
5	121171	0.6916	0.6956	0.6%	0.2195	-68.3%
6	135802	0.1164	0.1176	1.0%	0.0546	-53.1%
7	141630	0.3959	0.4690	18.5%	0.4309	8.8%
8	156498	0.0564	0.0701	24.3%	0.1348	139.0%
9	169208	0.1319	0.1075	-18.5%	0.1028	-22.1%
10	174463	0.0041	0.0301	634.1%	0.1838	4382.9%
11	258062	0.0314	0.0317	1.0%	0.1640	422.3%
12	324585	0.0449	0.0369	-17.8%	0.3791	744.3%
13	330975	0.1675	0.2357	40.7%	0.5441	224.8%
14	332593	0.2522	0.2310	-8.4%	0.2221	-11.9%
15	336901	0.0634	0.0634	0.0%	0.1708	169.4%
16	390360	0.3275	0.2741	-16.3%	0.2375	-27.5%
17	405163	0.0787	0.0735	-6.6%	0.0013	-98.3%
18	555530	0.0084	0.0134	59.5%	0.2544	2928.6%
19	583468	0.6706	0.7267	8.4%	0.7084	5.6%
20	640502	0.1199	0.0878	-26.8%	0.1880	56.8%
21	673670	0.0324	0.0416	28.4%	0.0009	-97.2%
22	701453	0.5663	0.5531	-2.3%	0.3160	-44.2%
23	730539	0.2034	0.1356	-33.3%	0.1628	-20.0%
24	768208	0.2353	0.2433	3.4%	0.0623	-73.5%

25	877809	0.1914	0.2516	31.5%	0.2097	9.6%
26	911232	0.2038	0.1542	-24.3%	0.1592	-21.9%
27	914916	0.3638	0.2860	-21.4%	0.4061	11.6%
28	938400	0.1660	0.1043	-37.2%	0.3848	131.8%
29	940547	0.0868	0.0892	2.8%	0.3152	263.1%
30	940548	0.0000	0.0000	0.0%	0.0000	0.0%
31	997622	0.0748	0.0524	-29.9%	0.1313	75.5%
32	1030303	0.5014	0.5014	0.0%	0.1939	-61.3%
33	1037496	0.4259	0.3181	-25.3%	0.2945	-30.9%
34	1043135	0.1128	0.1031	-8.6%	0.1281	13.6%
35	1049519	0.0000	0.0000	0.0%	0.0000	0.0%
36	1051399	0.0201	0.0113	-43.8%	0.1348	570.6%
37	1056416	0.0000	0.0000	0.0%	0.0000	0.0%
38	1064670	0.2233	0.2312	3.5%	0.1521	-31.9%
39	1071750	0.2587	0.2685	3.8%	0.2944	13.8%
40	1103153	0.0000	0.0000	0.0%	0.0000	0.0%
41	1105792	0.3999	0.3840	-4.0%	0.1988	-50.3%
42	1106979	0.6340	0.5034	-20.6%	0.5401	-14.8%
43	1108651	0.0547	0.0250	-54.3%	0.2464	350.5%
44	1108729	0.0000	0.0000	0.0%	0.0000	0.0%
45	1109707	0.1502	0.1750	16.5%	0.1376	-8.4%
46	1110678	0.4205	0.3262	-22.4%	0.0201	-95.2%
47	1113256	0.4953	0.4969	0.3%	0.4651	-6.1%
48	1115210	0.0915	0.0887	-3.1%	0.0651	-28.9%
49	1116380	0.0396	0.0111	-72.0%	0.0587	48.2%
50	1119543	0.0000	0.0000	0.0%	0.0000	0.0%
51	1121353	0.2557	0.2349	-8.1%	0.1002	-60.8%
52	1122767	0.3460	0.3235	-6.5%	0.2052	-40.7%
53	1127540	0.2693	0.2764	2.6%	0.1705	-36.7%
54	1131069	0.0288	0.0856	197.2%	0.2143	644.1%

55	1132532	0.1666	0.1044	-37.3%	0.2442	46.6%
56	1133579	0.6677	0.6666	-0.2%	0.7530	12.8%
57	1136043	0.0976	0.1569	60.8%	0.3695	278.6%
58	1136047	0.0666	0.0464	-30.3%	0.0623	-6.5%
59	1136769	0.0000	0.0000	0.0%	0.0000	0.0%
60	1136962	0.4689	0.4879	4.1%	0.4199	-10.4%
61	all	0.1952	0.1886	-3.4%	0.2091	7.1%

2.

Looking at the data, we can find several results with a slightly higher value of BM25 than the value of QL and the highest value of DPR. In other words, the percentage tends to improve gradually. However, if you look at the ‘all’ part row, the values increase in the order of BM25 and Ql, DPR.

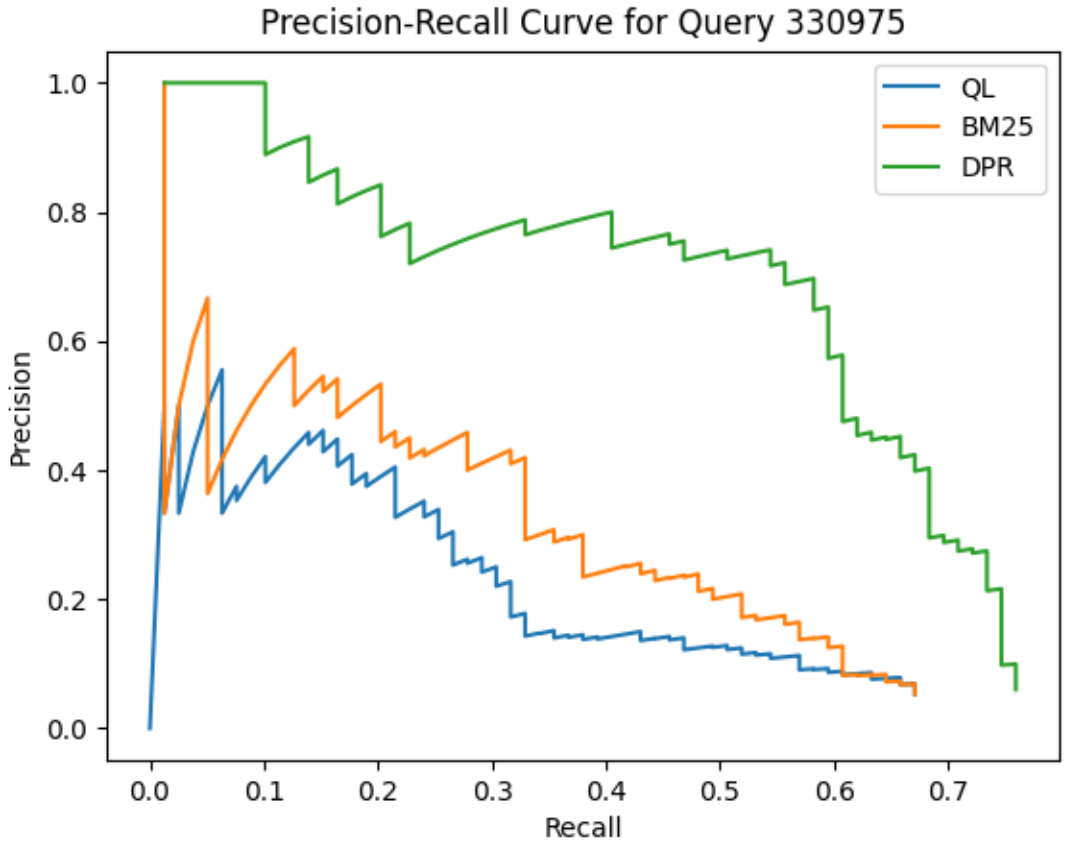
It depends on which query you look at, but while QL directly checks the probability of a term appearing in a document, BM25 relies on a more complex combination of features. In other words, QL may be better suited for situations where there is a clear semantic relationship between a query and related documents. However, for other data sets or other types of queries, bm25 may work better.

DPR is a model that uses vectors to encode queries and documents. DPR is more sophisticated than QL and BM25 because it takes advantage of similarities between queries and documents to handle complex queries and documents more effectively.

3.

The MAP is intended to evaluate the efficiency of the search system. Without a retrieved document, it is difficult to find the relevance of the document to the query. As a result, MAP calculation is not easy because precision and recall rate cannot be calculated. This also means that there is nothing to evaluate the efficiency of the system, and MAP calculations for these queries can lead to inaccurate results.

4.


Precision-Recall Curve for Query 330975
QL
BM25
DPR
Precision
Recall
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7