VIRLab: A Web-based Virtual Lab for Learning and Studying Information Retrieval Models

Hui Fang, Hao Wu, Peilin Yang
University of Delaware
Newark, DE, USA

ChengXiang Zhai
University of Illinois at Urbana-Champaign
Urbana, IL, USA

Go and try our toolkit at http://infolab.ece.udel.edu:8008/

Motivation

- Developing optimal IR models is one of the most important research problems in information retrieval.
- Unfortunately, experimenting with any new retrieval model is inevitably time consuming and requires significant amount of resources available.
- Lots of things need to be done: implementation, evaluation and analysis of new retrieval models.

Our proposed web-based interactive toolkit facilitates the procedures.

System Components Explanation and Workflow

For Teaching | **For Research**

Start

function name: BM25

Content :

```
double okapiK1 = [1.0 1.2];
double okapiB =[ 0.2 0.3 0.4];
double okapiK3 = 1000;
for(occur)
{
        double idf = log((docN-DF[i]+0.5)/(DF[i]+0.5));
        double weight = ((okapiK1+1.0)*tf[i]) / (okapiK1*(1.0-okapiB+
        double tWeight = ((okapiK3+1)*qf[i])/(okapiK3+qf[i]);
        score+=idf*weight*tWeight;
}
```

Screenshot of implementing a retrieval function

Implementation of retrieval functions

Users only need to write a few lines of code through a Web form to combine statistics retrieved from the indexes without worrying about how to access the indexes. The code will be automatically checked for syntax errors and translated to an executable, which will be used for ranking documents, by a dynamic code generator.

Configuration of search engines

Users can configure a search engine by selecting a retrieval function and a test collection. Multiple search engines can be easily created at the same time. The users can either submit their own queries or select queries from a set of topics associated with the corresponding document collection. Moreover, the users can also compare the search results of two search engines side by side to figure out their ranking differences.

This is the place that you can create search engines.

Choose Index: doe
Choose retrieval function: Dirichlet_baseline | Show Function
Privacy Level:
Level 1: Only yourself can use the search engine
Search Engine Name: test_search_engine
Create

foreign minor germani — search

Official Query

MAP=0.39092505133255 P30=0.6
page 1 of 1000 results (1.2514300346375 s)

WT02-B15-1
10.3678 Relevant(1)
... by mail for domest and **foreign** make check payabl to ... illeg cuban ar the onli **foreign** grant such automat u ... the famili unif system spou **minor** children and parent of ... to be the spou and **minor** children of legal immigr ... report that it had detain **foreign** worker from countri at ... the u alien apprehend with **minor** children even though most ... prison natur the number of **foreign** appli to becom natur ... certif activ that conclud that **foreign** labor program that admit ... worker job or wage from **foreign** labor the audit recommend that the temporari **foreign** profess program the hb ... u permit

WT02-B14-9
10.3959 Relevant(1)
... by mail for domest and **foreign** make check payabl to ... germanu immigr immigr issu in **germani** and the u challeng ... the five program through which **germani** bring **foreign** worker and train into ... philip martin asylum issu in **germani** kai hailbronn univ of ... break guest worker program in **germani** elmar honekopp institut for ... of it usba employ ar **foreign** born usa todai analyz ... begin to hou unaccompani and **minor** illeg alien in tucson ... advoc reportedli care for undocu **minor** in up from in ... cannot be found for unaccompani **minor** thei ar sent to ... davidson in to shelter unaccompani **minor** arizona republ

endang speci mammal

Select a TREC query | BM25_baseline | test1 | robust04 | Compare

*For **RIGHT** side: number in the parenthesis is the rank of first function results. "NEW" means this document is not in the first function's results.

*For TREC queries:
- boost a relevant document
- boost a non-relevant document
- decrease a non-relevant document
- decrease a relevant document

*For non-TREC queries:
- boost a document
- decrease a document

MAP=0.11839 P30=0.26667	MAP=0.11446 P30=0.3
1. FR940617-0-00103	1. FR940617-0-00103 →(1)
27.6505 Non-relevant	Non-relevant 28.8409
2. FR940203-0-00059	2. FR940203-0-00059 →(2)
27.1059 Non-relevant	Non-relevant 28.1662
3. FR940419-2-00009	3. FR940419-2-00009 →(3)
26.8215 Non-relevant	Non-relevant 27.6083
4. FR940228-2-00026	4. FR940617-0-00104 ↑(6)
26.5742 Non-relevant	Relevant(1) 27.4436
5. FR941216-2-00020	5. FR940127-1-00058 ↑(8)
26.5547 Non-relevant	Relevant(1) 27.4307

Performance comparison through leader-boards

A leader board is created for each collection so that the most effective 10 retrieval functions are displayed. Users can see how their retrieval functions are compared with others, and they can also leverage the comparison functionality described earlier to figure out how to revise their retrieval functions to improve the performance.

The most effective function for each collection

Collection	Best Retrieval Function	User	MAP	P@30	Compare with yours
ap8889	BM25_fixed	guest	0.2189	0.2975	Per-query Overview 3/3
doe	Okapi_test	hfang	0.1841	0.2286	Per-query Overview 2/3
robust04	BM25_baseline+	peilin	0.2462	0.3041	Per-query Overview 1/3
wt2g	f2exp_test	hfang	0.3105	0.3253	Per-query Overview 3/3

* Rankings are first based on MAP and then P@30.
+ means it is your function.

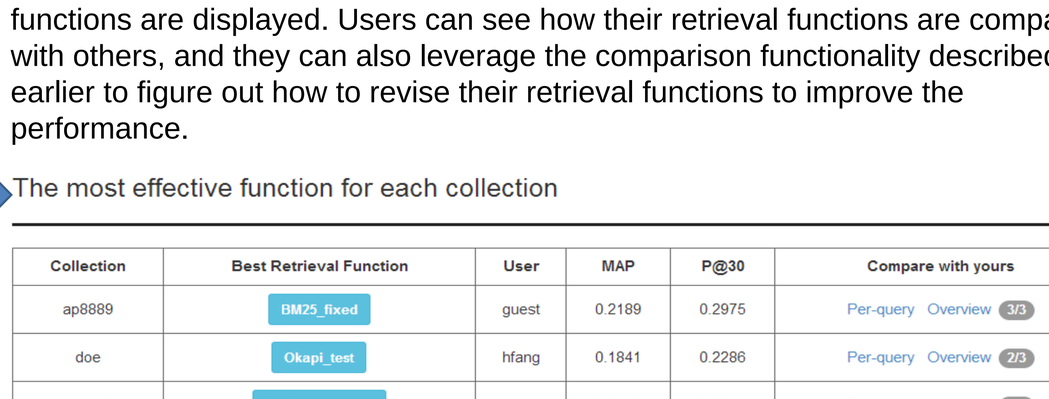
Not as good as expected?

LeaderBoard / Summary / compare with best for all officical TREC queries

Dirichlet_umich

Baseline Function: Okapi_test(hfang) Collection: doe | Compare

MAP(Okapi_test(hfang)):0.1841 MAP(Dirichlet_umich(peilin)):0.1804



Inspect the details of the not-so-good queries

Summary, Future work, Acknowledgement