

# Project 2

## Advanced Database Systems

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### 1 Description

For classification and content summary construction we used the fixed classification tree of figure 1, given in the description of the project. The queries used for classification are in *queries* directory, included in our submission's compressed file. Our implementation has two main classes shown in diagram 2.

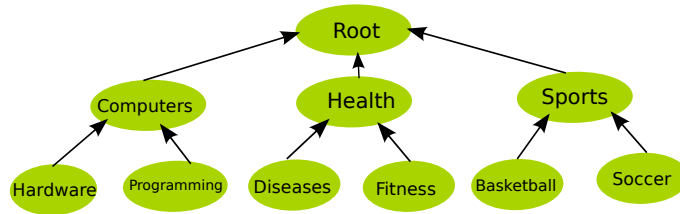


Figure 1: Category tree

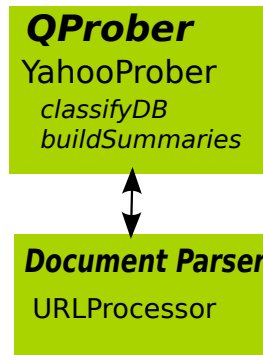


Figure 2: Implementation Classes

#### 1.1 Classification

To classify the given database we traverse each level of the category tree and compute the following metrics for each category-node:

$$ECoverage(D, C_i) = \sum_{q: \text{query probe for } C_i} f(q)$$

$$ESpecificity(D, C_i) = \frac{ESpecificity(D, Parent(C_i)) \times ECoverage(D, C_i)}{\sum_{C_j \text{ is a child of } Parent(C_i)} ECoverage(D, C_j)}$$

pruning the categories that do not meet the specificity and coverage criteria. We implemented an iterative version of QProber [3]. The high-level pseudocode is provided below.

```

Classify(Ts, Tc)
  Cat={Root}
  insert Root to L
  P=Root
  levels=1
  do{
    for each category P in L
      remove P from L
      add to L children of P
      read P query-file F
      for each query q in F
        pose-query(q)
        store top-4 results
        update coverage of P
        update coverage of q.child
      if(P.specificity>=Ts && P.coverage>=Tc)
        add P to Cat
    levels=levels+1
  }while(levels<=2)
  return Cat

```

## 1.2 Content Summary Construction

For this step we just parse the top-documents fetched during query-probes from the classification step, for each of the classified categories. We eliminate duplicates before constructing a content-summary, to avoid multiple fetches of the same document. We also decided not to include multiple-word entries to the content summaries. To space the requests to the web-sites we parse first the fetched document and then process the next url. To parse the documents we used a slight variation of the provided Java script. The format of a summary file is:

<word> # <frequency in the document sample>

## 1.3 Exception handling

There are two main types of exceptions:

- Connections timeouts when querying Yahoo (java.net.SocketTimeoutException)
- Http error (code 503)

In both cases, we retry getting the results from Yahoo, up to a maximum number of tries, set to 100 which seems to be more than enough from our tests. To avoid frequent timeouts we set time-out parameter equal to 3 seconds.

## 2 Examples

To test the classification results of QProber we used the provided examples in the project description and several of the examples from a list of Largest Deep Web Sites [1]. The results in Table 1 are for  $T_s=0.6$  and coverage  $T_c=100$  (computed on 20th of March). The specificity is  $>0.5$  so all web-pages were classified under no more than one category.

URL	Description	Classification
java.sun.com	Java@Sun	Root/Computers/Programming
yahoo.com	Yahoo SE	Root
diabetes.org	American Diabetes Assoc.	Root/Health
tomshardware.com	Tom's Hardware	Root/Computers/Hardware
hardwarecentral.com	PC Hardware Reviews	Root/Computers
espn.com	WorldWide Leader in Sports	Root/Sports/Basketball
portal.acm.org	ACM Digital Library	Root/Computer/Programming
hopkins-aids.edu	HIV guide	Root/Health/Diseases
agiweb.org	American Geological Institute	Root/Health
www.cancer.gov	National Cancer Institute	Root/Health/Diseases
www.ncbi.nlm.nih.gov/PubMed	PubMed	Root/Health/Diseases
www.ovid.com/site/index.jsp	Ovid Technologies	Root/Health/Diseases
soccernet.espn.go.com	Football News & Scores	Root/Sports/Soccer
www.jumbo.com	Free Computer Software	Root/Computers/Programming
www.webmd.com	Medical News & Information	Root/Health
www.fitnessmagazine.com	Fitness Magazine	Root/Health/Fitness
www.afa.com	Aerobic & Fitness Info of America	Root/Health/Fitness
processing.org	Processing Software	Root/Computer/Programming
www.telegraph.co.uk/sport	Telegraph Sport News	Root/Sports/Soccer
nba.com	National Basketball Association	Root/Sports/Basketball
www.sports.org.au	Australian Athletes with Disability	Root/Sports

Table 1: Classification for  $T_s=0.6$  and  $T_c=100$

We also tried our program for lower specificity:  $T_s=0.3$  so that a database can be classified under more than one categories. In Table 2 we show the classification for the web-sites where the classification was extended by decreasing the specificity.

## Appendix

### File Listing

We list below the files included in our submission. The compressed file contains the following folders: [src, lib, queries].

The files are:

URL	Classification
java.sun.com	{Root/Computers/Programming}
yahoo.com	{Root/Health/Fitness, Root/Sports}
diabetes.org	{Root/Health/Fitness, Root/Health/Diseases }
hardwarecentral.com	{Root/Computers/Hardware, Root/Computers/Programming}
www.webmd.com	{ Root/Health/Diseases, Root/Health/Fitness}

Table 2: Classification for Ts=0.3 and Tc=100

- README.pdf
- src/YahooProber.java
- src/URLProcessor.java
- src/Makefile
- lib/json.jar
- queries/Root.txt
- queries/Computers.txt
- queries/Health.txt
- queries/Sports.txt

## Compilation

- **Compile:** make
- **Clean-up:** make clean
- **Execute:** java -cp ../lib/json.jar two.YahooProber *< url >* *< t<sub>es</sub> >* *< t<sub>ep</sub> >* *< yahoo – app – id >* (from src directory)
- **Yahoo App Id:**  
BEWTNqTV34H1zojJNQ5MZB48A1vR2mJeNAhKRvk5.bLyZd6gYgQmsVVsqZ7vv32aW73O6VNyzTO

## References

- [1] *Largest Deep Web Sites*, [http://aip.completeplanet.com/aip-engines/help/largest\\_engines.jsp](http://aip.completeplanet.com/aip-engines/help/largest_engines.jsp)
- [2] *Java JSON Implementation*, <http://www.json.org/java/>
- [3] *QProber: A system for automatic classification of hidden-web databases*, Panagiotis G. Ipeirotis, Luis Gravano, Mehran Sahami, 2003