Statistical Language Modeling for Information Access

Practical 2: Retrieval and evaluation

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Outline of the Course

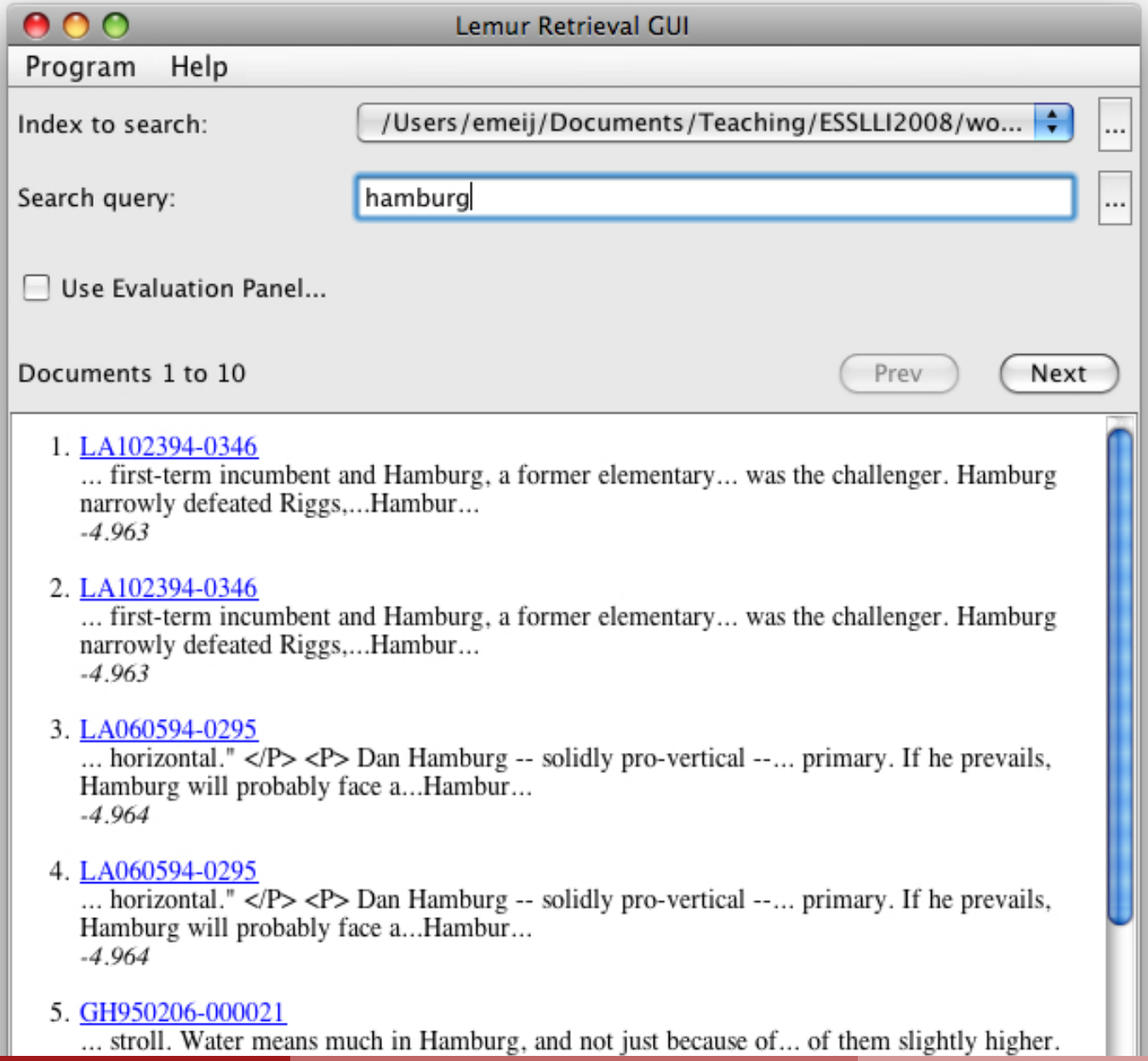
Practical

- Day 1: Installing and Indexing
- Day 2: Retrieval and Evaluation
- Day 3: Retrieval Parameters and Indri
- Day 4: Pseudo Relevance Feedback and Some More Evaluation; Additional bells, whistles and requests

Looking back

- Downloaded/Installed Lemur
- Downloaded the CLEF 2006 adhoc collection
- Created an IndriBuildIndex parameter file
- Ran the indexer
- Viewed the output using LemurRet.jar
- Questions?
- You can always e-mail me later: `emeij@science.uva.nl`

LemurRet.jar



Outline

1. **Retrieval**
   - Queries
   - Retrieval
   - Retrieval Models
2. **Evaluation**
   - qrels
   - trec_eval
3. **Exercises**
   - Exercises

Retrieval

- General pipeline, given a set of queries:
  - Preprocess/Transform queries
  - Perform a retrieval run, using some settings
  - Evaluate
- Queries aren't usually in the "proper" format...

Queries — original format

http://staff.science.uva.nl/~mdr/Teachin...2008/uploads/Main/ENtopicsC301-C325.txt

http://staff.science.uva.nl/~mdr/Teaching/ESSLLI20 Inquisitor

CiteULike Diigolet Devonthink

```
<top>
<num> C301 </num>
<EN-title> Nestle Brands </EN-title>
<EN-desc> What brands are marketed by Nestlé around the world? </EN-desc>
<EN-narr> Relevant articles will report the name of goods marketed globally by
Nestlé or by companies belonging to the Nestlé group. In the second case, the
document must make clear reference to the parent company. </EN-narr>
</top>

<top>
<num> C302 </num>
<EN-title> Consumer Boycotts </EN-title>
<EN-desc> Find documents that describe or discuss the impact of consumer
boycotts. </EN-desc>
<EN-narr> Relevant documents will report discussions or points of view on the
efficacy of consumer boycotts. The moral issues involved in such boycotts are
also of relevance. Only consumer boycotts are relevant, political boycotts must
be ignored. </EN-narr>
</top>

<top>
<num> C303 </num>
<EN-title> Italian paintings </EN-title>
<EN-desc> Find information on places where Italian paintings or drawings are
exhibited or on show to the public. </EN-desc>
```

Preprocessing

- Need to perform some kind of preprocessing to create TREC Text/Web format
- Use Perl/bash/awk/...
- Example topics and script on the wiki

Queries — TREC Web format

http://staff.science.uva.nl/~mdr/Teaching/ESSLLI2008/uploads/Main/ENtopicsC30

http://staff.science.uva.nl/~mdr/Teaching/ESSLLI2008/uploads/Main/ENtopicsC301-C325

CiteULike Diigolet Devonthink

```
<DOC><DOCNO>C301</DOCNO> Nestle Brands </DOC>
<DOC><DOCNO>C302</DOCNO> Consumer Boycotts </DOC>
<DOC><DOCNO>C303</DOCNO> Italian paintings </DOC>
<DOC><DOCNO>C304</DOCNO> World Heritage Sites </DOC>
<DOC><DOCNO>C305</DOCNO> Oil Prices </DOC>
<DOC><DOCNO>C306</DOCNO> ETA Activities in France </DOC>
<DOC><DOCNO>C307</DOCNO> Films Set in Scotland </DOC>
<DOC><DOCNO>C308</DOCNO> Solar Eclipse </DOC>
<DOC><DOCNO>C309</DOCNO> Hard Drugs </DOC>
<DOC><DOCNO>C310</DOCNO> Treatment of Industrial Waste </DOC>
<DOC><DOCNO>C311</DOCNO> Unemployment in Europe </DOC>
<DOC><DOCNO>C312</DOCNO> Dog Attacks </DOC>
<DOC><DOCNO>C313</DOCNO> Centenary Celebrations </DOC>
<DOC><DOCNO>C314</DOCNO> Endangered Species </DOC>
<DOC><DOCNO>C315</DOCNO> Doping in Sports </DOC>
<DOC><DOCNO>C316</DOCNO> Strikes </DOC>
<DOC><DOCNO>C317</DOCNO> Anti-cancer Drugs </DOC>
<DOC><DOCNO>C318</DOCNO> Sex Education </DOC>
<DOC><DOCNO>C319</DOCNO> Global Opium Production </DOC>
<DOC><DOCNO>C320</DOCNO> Energy Crises </DOC>
<DOC><DOCNO>C321</DOCNO> The Talibans in Afghanistan </DOC>
<DOC><DOCNO>C322</DOCNO> Atomic Energy </DOC>
<DOC><DOCNO>C323</DOCNO> Tightening Visa Requirements </DOC>
<DOC><DOCNO>C324</DOCNO> Supermodels </DOC>
<DOC><DOCNO>C325</DOCNO> Student Fees </DOC>
```

ParseToFile

- But then we're still not there yet
- Lemur only understands Basic Doc Format (LDF)
- Use ParseToFile to parse an inputfile containing queries (TREC Text/Web format) into LDF format
- Steps:
  - Create ParseToFile parameter file (similar to the indexer's config file), e.g.:
    ```
    <parameters>
    <docFormat>web</docFormat>
    <outputFile>path/to/outputfile.ldf</outputFile>
    </parameters>
    ```
  - Run: `ParseToFile [parse_param] [query_file]`

Queries — LDF format

http://staff.science.uva.nl/~mdr/Teachin...ploads/Main/ENtopicsC301-C325_lemur.txt

http://staff.science.uva.nl/~mdr/Teaching/ESSLLI20

Inquisitor

CiteULike Diigolet Devonthink

```
<DOC C301>
nestle
brands
</DOC>
<DOC C302>
consumer
boycotts
</DOC>
<DOC C303>
italian
paintings
</DOC>
<DOC C304>
world
heritage
sites
</DOC>
<DOC C305>
oil
prices
</DOC>
<DOC C306>
eta
activities
in
```

Retrieval

- Works in the same way as indexing
  - Create parameter file
  - Basic parameters:
    - index - the index to use
    - retModel - the model to use
    - textQuery - the query file to use
    - resultCount - number of results
    - resultFile - where to store the output
    - **TRECResultFormat** - to use TREC-style output
  - run `RetEval [param_file]`

Example RetEval parameter file

```
<parameters>
<index>/path/to/your/index</index>
<retModel>kl</retModel>
<textQuery>path/to/queries.ldf</textQuery>
<resultCount>1000</resultCount>
<resultFile>queries.res</resultFile>
<TRECResultFormat>1</TRECResultFormat>
</parameters>
```

Retrieval Models

- Lemur supports a number of retrieval models:
  - **kl** — KL-divergence (query-likelihood), with
    - Jelinek-Mercer smoothing
    - Dirichlet smoothing
    - Absolute discount
    - Two-stage smoothing
  - **tfidf** — TF.IDF
  - **cos** — Cosine
  - **okapi** — Okapi (BM25)
- You can (easily) implement your own!
- More on these tomorrow…

Small demo

qrels

A "qrel-file" contains the judgments on a document collection and set of queries

http://staff.science.uva.nl/~mdr/Teaching/ESSLLI2008/uploads/Main/AH-ENGLISH-CLEF2006.txt

http://staff.science.uva.nl/~mdr/Teaching/ESSLLI2008/uploads/Main/AH-ENGLISH-CLEF2006.txt

Inquisitor

CiteULike Diigolet Devonthink

```
301 0 GH950327-000029 0
301 0 GH950912-000033 0
301 0 LA033194-0349 0
301 0 GH950923-000103 0
301 0 LA020194-0245 0
301 0 LA050794-0274 0
301 0 LA051094-0272 0
301 0 LA092594-0096 0
301 0 LA112994-0258 0
301 0 GH951228-000065 0
301 0 GH950614-000065 0
301 0 LA060794-0257 0
301 0 LA111894-0213 0
301 0 GH950616-000029 0
301 0 LA030394-0119 0
301 0 LA031294-0015 0
301 0 GH950218-000191 0
301 0 GH950502-000012 0
301 0 GH951109-000046 0
301 0 GH950302-000058 0
301 0 GH950729-000084 0
301 0 LA091894-0222 0
301 0 GH950703-000097 0
301 0 LA090894-0276 0
301 0 GH950206-000106 0
301 0 LA092794-0172 1
301 0 GH950517-000049 0
301 0 GH950321-000073 0
301 0 LA062694-0100 0
```

trec_eval

- Written by Chris Buckley for the TREC evaluations
- Outputs evaluation measures
  - precision
  - recall
  - MRR
  - MAP
  - And many many more...
- Both for runs and individual topics (use the `-q` flag)
- Usage:
  `trec_eval [path/to/qrels/] [path/to/resultfile]`

output

Terminal — bash — 80×29

```
num_q           all     25
num_ret         all     23401
num_rel         all     834
num_rel_ret     all     509
map             all     0.2277
gm_ap           all     0.0797
R-prec          all     0.2597
bpref           all     0.2348
recip_rank      all     0.6096
ircl_prn.0.00   all     0.6319
ircl_prn.0.10   all     0.4936
ircl_prn.0.20   all     0.3641
ircl_prn.0.30   all     0.2810
ircl_prn.0.40   all     0.2366
ircl_prn.0.50   all     0.2036
ircl_prn.0.60   all     0.1678
ircl_prn.0.70   all     0.1429
ircl_prn.0.80   all     0.1006
ircl_prn.0.90   all     0.0657
ircl_prn.1.00   all     0.0441
P5              all     0.3600
P10             all     0.2960
P15             all     0.2667
P20             all     0.2400
P30             all     0.2080
P100            all     0.1212
P200            all     0.0706
```

Exercises

- Compare results of two or more different retrieval models on the CLEF collection
- Report on (interesting) differences
- Where does another model help? hurt? In terms of precision, recall or some average?
- Why?