Information Retrieval

Assignment - 1

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Contents

1 Description

In this assignment, I have implemented a document retrieval system for simple boolean and wildcard queries by using the bigram indexing schema. I have used Reuters-21578 data set, which is provided.

2 Pre-processing

In pre-processing part, I have followed following steps:

- Extract text from Reuters-21578 data and get dictionary of id: text. Id is the "NEWID" attribute of <REUTERS> tag as described in project description, and texts are combination of contents of <TITLE> and <BODY> tag. I have concatenated contents of those tags by a space.

  {

  1: "text 1"

  2: "text 2"

  ⋮

  n: "text n"

  }

- Replace each punctuation by a space in texts
- Split by any white space to get tokens from texts
- Apply case-folding to any token in documents
- Remove stop-words from tokens for each document

At the end, I got a dictionary which consists of {id: tokens}.
{
1: [token1, token2, ...]

2: [token2, token3, ...]

⋮

n: [token343, token311, ...]

}

2.1 Answers to Some Questions

(a) How many tokens does the corpus contain before stopword removal?

"Number of tokens before stopword removal: 2902785"

(b) How many tokens does the corpus contain after stopword removal?

"Number of tokens after stopword removal: 2227436"

(c) How many terms (unique tokens) are there before stopword removal and case-folding?

"Number of terms before stopword removal and casefolding: 61462"

(d) How many terms (unique tokens) are there after stopword removal and case-folding?

"Number of terms after stopword removal and casefolding: 45346"

(e) List the top 20 most frequent terms before stopword removal and case-folding?

Top 20 terms before stopword removal and casefolding:

Term: the, Frequency: 120018

Term: of, Frequency: 72267

Term: to, Frequency: 68785

Term: and, Frequency: 53476

Term: said, Frequency: 52894

Term: in, Frequency: 50021

Term: a, Frequency: 48440

Term: 3, Frequency: 26814

Term: for, Frequency: 25595

Term: mln, Frequency: 25591

Term: The, Frequency: 24278

Term: s, Frequency: 20526

Term: dlrs, Frequency: 20306

Term: it, Frequency: 18098

Term: on, Frequency: 18032

Term: pct, Frequency: 17130

Term: is, Frequency: 16739

Term: lt, Frequency: 16666

Term: 1, Frequency: 15895

Term: that, Frequency: 15193

(f) List the top 20 most frequent terms after stopword removal and case-folding?

Top 20 terms after stopword removal and casefolding:

Term: to, Frequency: 73074

Term: said, Frequency: 53096

Term: s, Frequency: 32590

Term: 3, Frequency: 26814

Term: mln, Frequency: 26732

Term: dlrs, Frequency: 21273

Term: reuter, Frequency: 18964

Term: pct, Frequency: 18046

Term: lt, Frequency: 16680

Term: 1, Frequency: 15895

Term: from, Frequency: 15277

Term: vs, Frequency: 14836

Term: at, Frequency: 14517

Term: 000, Frequency: 13448

Term: year, Frequency: 13109

Term: u, Frequency: 11326

Term: billion, Frequency: 10726

Term: has, Frequency: 10185

Term: 2, Frequency: 9996

Term: company, Frequency: 9699

3 Conjunctive Queries

For conjunctive queries, first I have split the query string by " AND " to get each keyword. Then I applied pre-processing which is only case-folding, to each keyword. Then, I searched each keyword in inverted index, and return intersection of each postings of matched index. Screen shot of a running conjunctive query is:

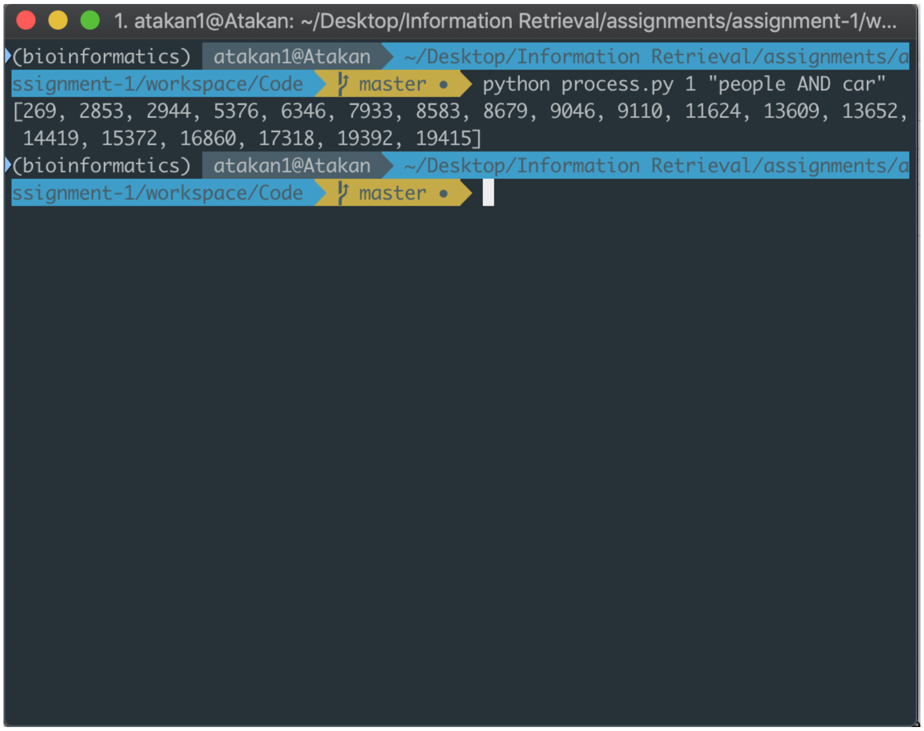


Figure 1: A Conjunctive Query Example

4 Disjunctive Queries

For disjunctive queries, first I have split the query string by " OR " to get each keyword. Then I applied pre-processing which is only case-folding, to each keyword. Then, I searched each keyword in inverted index, and return union of each postings of matched index. Screen shot of a running conjunctive query is:

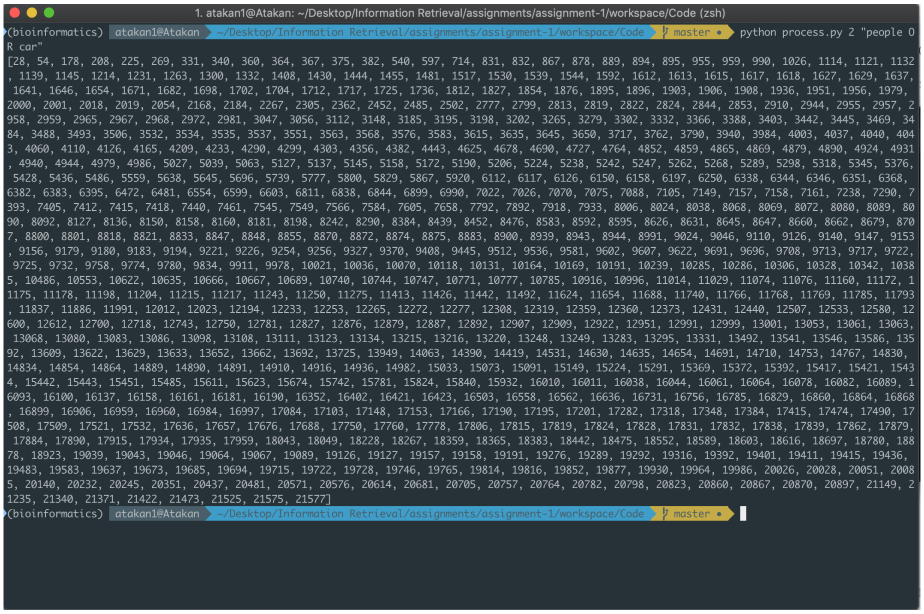


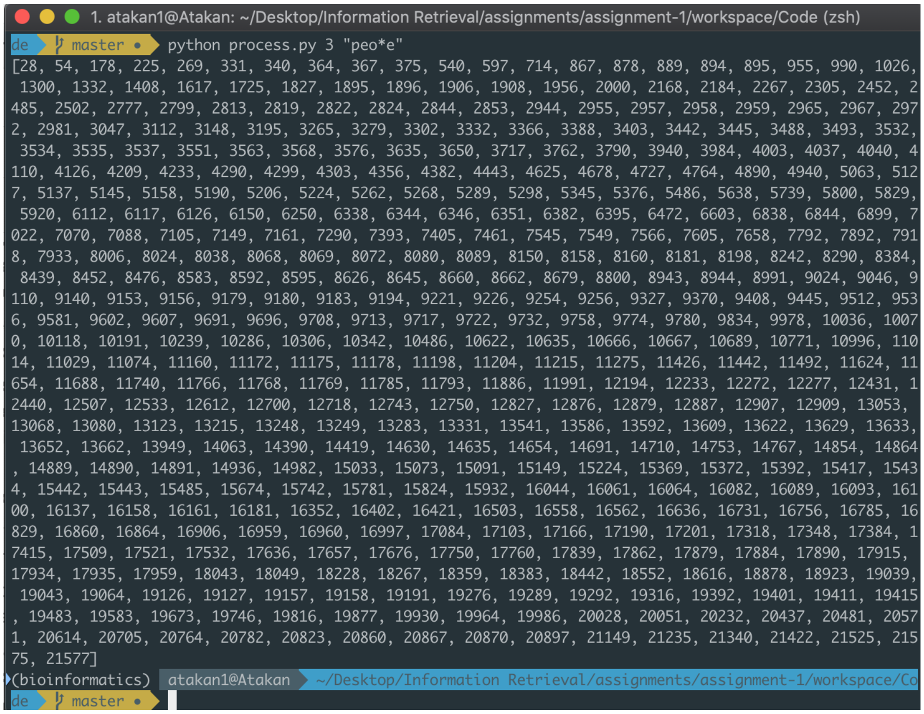
Figure 2: A Disjunctive Query Example

5 Wildcard Queries

For wildcard queries, first I split the query by "*" and get bi-grams for 2 parts of the query, if "*" appears in the query. Then, I have extracted bi-grams in the following way.

- For the first part of query the matched terms must start with that part, so I have constructed bi-grams for "$'first part'"
- For the second part of the query, the matched terms must end with this part, so I have constructed bi-grams for "'second part'$", then I took the intersection of each terms lists of bi-grams
- I applied post-filtering, i.e. I removed the words that are not beginning with the first part and ending with the second part

Here is the example program running on a wildcard query:



```
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de  master •  python process.py 3 "peo*e"
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75, 21577]
(bioinformatics)  atakan1@Atakan  ~/Desktop/Information Retrieval/assignments/assignment-1/workspace/Co
de  master •
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Figure 3: A Wildcard Query Example