Ranking Categories for Faceted Search

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Outline

- Introduction
- Basic Concepts
- Rankings Algorithms considered
- Experimental Setup
- Results
- Conclusions

Introduction

- Search the Web: Ranked list or Categories based organization?
- Clustering Search vs Faceted Search
  - **Clustering**: Grouping documents according to some measure of similarity computed using associations among features (typically words and phrases)

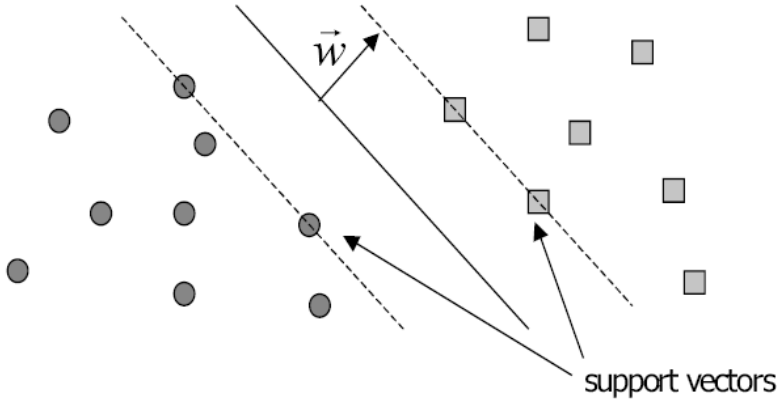
  Result - 1 big hierarchy

  - **Faceted**: Creating a set of category hierarchies each of which corresponds to a different facet (dimension or feature type) relevant to the collection to be navigated

  Result - a set of category hierarchies each of which corresponds to a different facet
- Supporting Vector Machines Classifiers

SVM text classification

- A linear SVM is a hyperplane that separates a set of positive examples from a set of negative examples with maximum margin



SVM text classification

- The formula for the output of a linear SVM is

$$u = \vec{w} \cdot \vec{x} - b,$$

- Where w is the normal vector to the hyperplane, and x is the input vector

- Given training examples labeled either "yes" or "no", a maximum-margin hyperplane is identified which splits the "yes" from the "no" training examples

Clustering Search Engines

- SVM better than Bayesian for Text Classification
- Many clustering algorithms proposed
- How to rank the resulting Categories?
  - Algorithm independent
- We analyze 9 different metrics used to order the clusters

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Category Ranking Algorithms

- 9 different ranking algorithms considered:
  - Rank based metrics
  - Text Similarity metrics
  - Other Metrics

Category Ranking Algorithms - Rank Based Metrics

- PageRank computation: $PRv = x^{-2.1}$ p at position x
- Average PageRank $$\mathrm{AvgPR}(C) = \frac{1}{n}\sum_{p=1}^{n} \mathrm{PRv}(p),\ \forall \text{ page } p \in C$$
- Total PageRank $$\mathrm{SumPR}(C) = \sum_{p=1}^{n} \mathrm{PRv}(p),\ \forall \text{ page } p \in C$$
- Average Rank $$\mathrm{AvgRank}(C) = \frac{1}{n}\sum_{p=1}^{n} \mathrm{Rank}(p),\ \forall \text{ page } p \in C$$
- Minimal Rank $$\mathrm{MinRank}(C) = \min_{p} \mathrm{Rank(p)},\ \forall \text{ page } p \in C$$

Category Ranking Algorithms - Text Similarity Metrics

- Similarity between pages and categories (title + description)
  - Values returned by the SVM classifiers
- Average Similarity Score (AvgValue)
  - Over all the pages that belong to a category
- Maximum Similarity Score (MaxValue)
  - Over all the pages that belong to a category

Category Ranking Algorithms - Other Metrics

- Order by Size: using the number of docs belonging to the category
  - Used by most of the Clustering Search Engines (Vivisimo)
- Alphabetical Order
  - Used in Faceted Search (Flamenco)
- Random Order
  - To compare the other metrics

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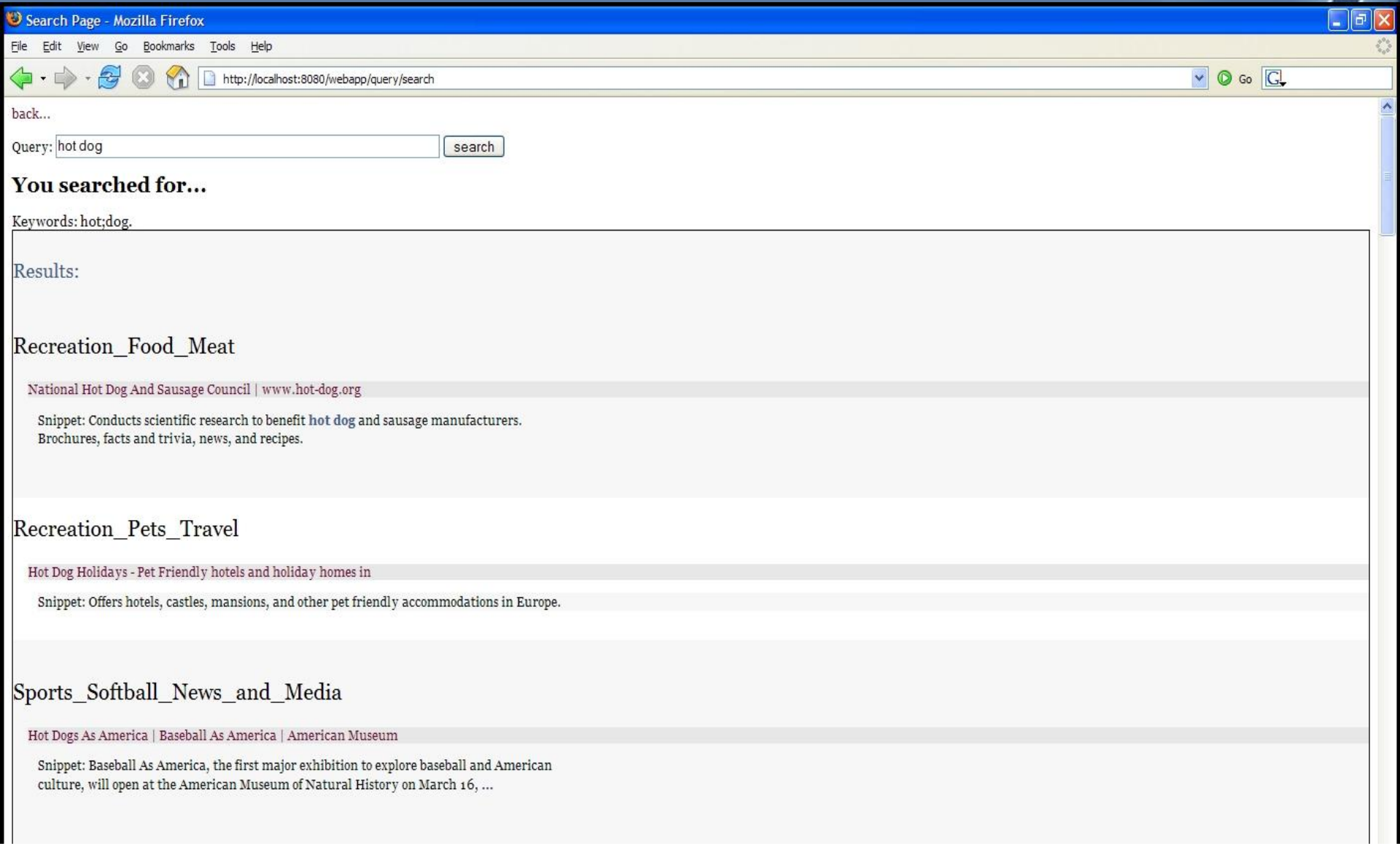
Experimental Setup

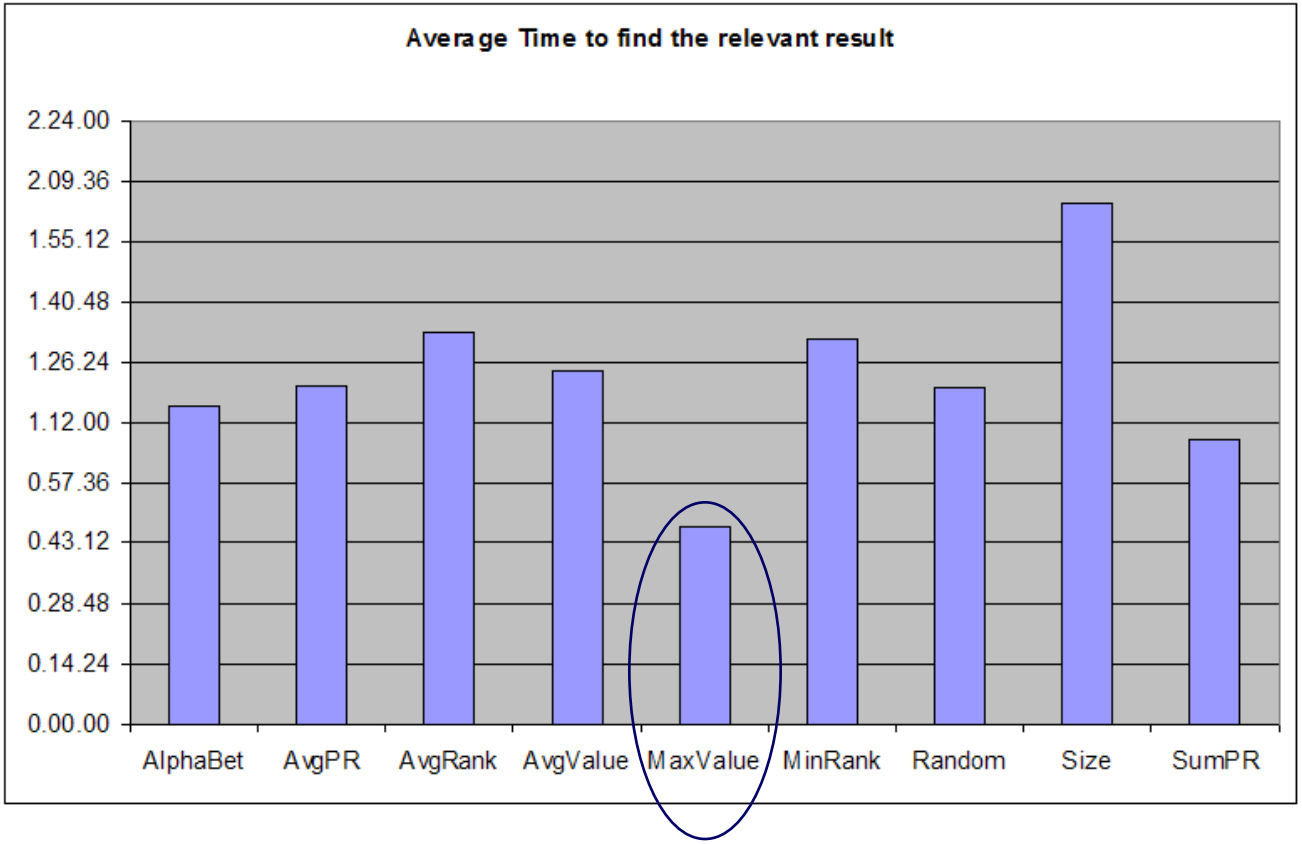
- 9 algorithms, 18 people
- Supporting Vector Machines (SVM) as Text Classifiers
- ODP categories (top 3 levels)
- 50 000 most frequent terms in DMOZ titles and descriptions of web pages
- 5 894 English categories

- Each user evaluated each algorithm once
- We measure the time spent for search the relevant result and the position of the results


Search Page - Mozilla Firefox
File Edit View Go Bookmarks Tools Help
http://localhost:8080/webapp/query/search
Go
back...
Query: hot dog
search
You searched for...
Keywords: hot;dog.
Results:
Recreation_Food_Meat
National Hot Dog And Sausage Council | www.hot-dog.org
Snippet: Conducts scientific research to benefit hot dog and sausage manufacturers.
Brochures, facts and trivia, news, and recipes.
Recreation_Pets_Travel
Hot Dog Holidays - Pet Friendly hotels and holiday homes in
Snippet: Offers hotels, castles, mansions, and other pet friendly accommodations in Europe.
Sports_Softball_News_and_Media
Hot Dogs As America | Baseball As America | American Museum
Snippet: Baseball As America, the first major exhibition to explore baseball and American
culture, will open at the American Museum of Natural History on March 16, ...

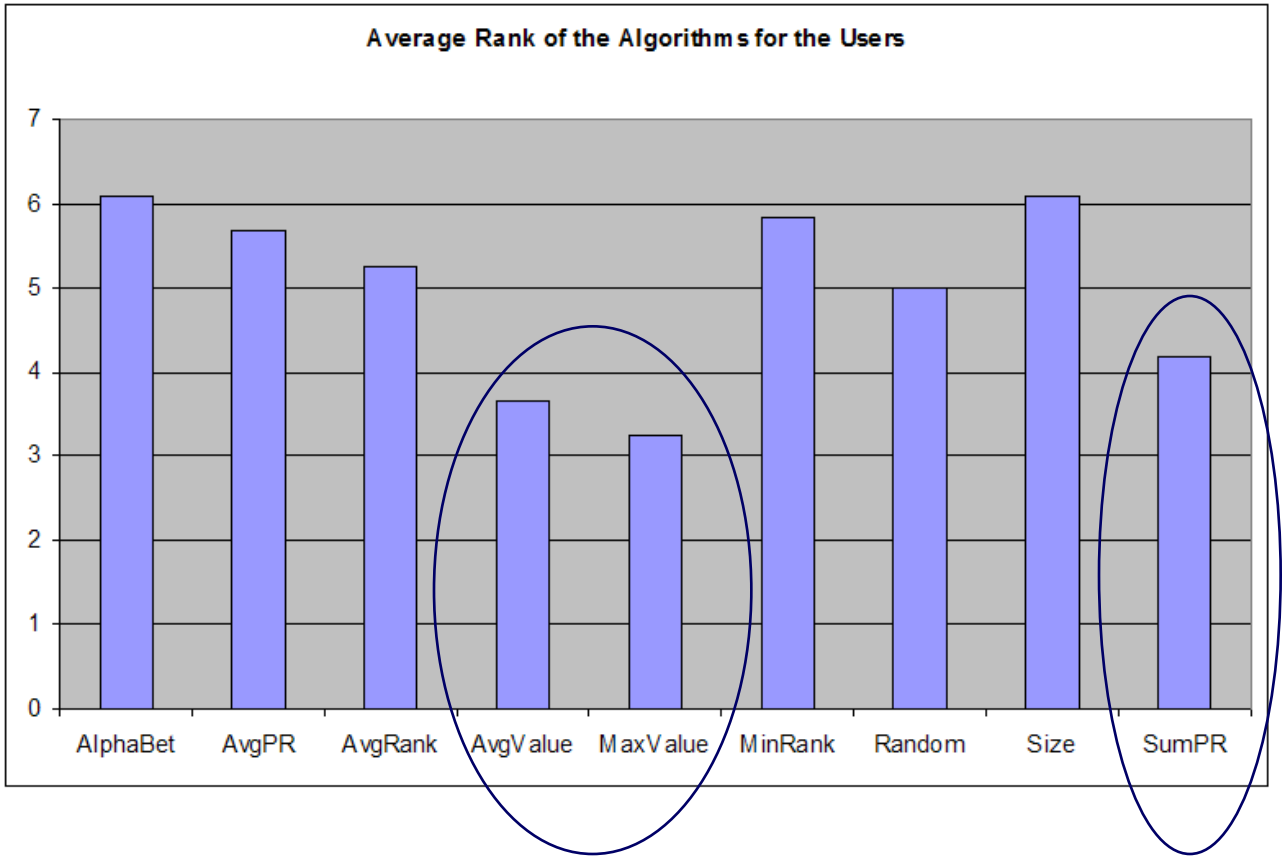
Experimental Results

- Time to find the relevant result:



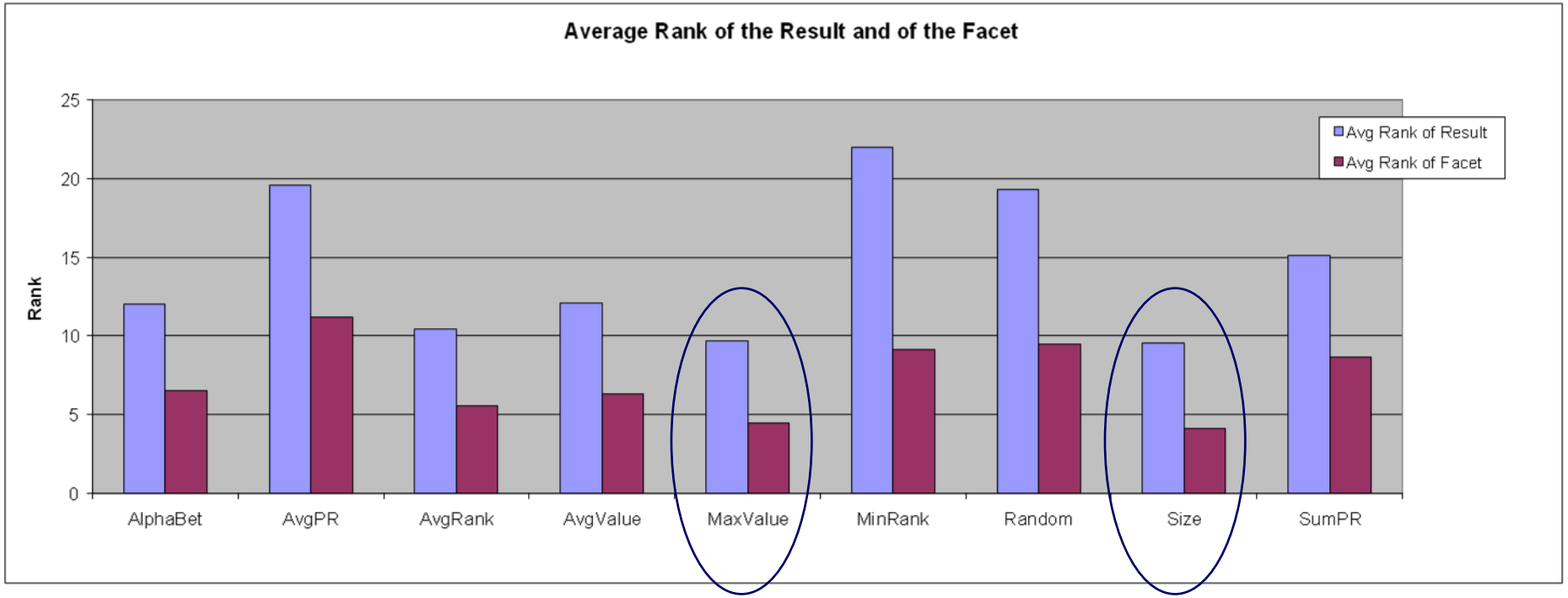
Experimental Results

- Average of the position of the algo for each user:



Experimental Results

- Average Rank of the Result and of the Cluster



Conclusions & Future Work

- MaxValue seems to be the best way to rank the clusters in a Clustering Search Engine
- Alphabetical and Size Ranking are not so good
- We want to test other algorithms
  - Using query-based metrics (similarity between q and p)
  - Click-thorought data

Thanks for your attention!

Q&A