

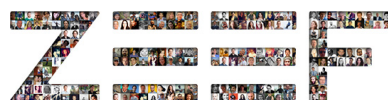
Begelman vs. FolkRank
The Comparison of Two Algorithms in
the Tag Recommendation Context:
An Exploratory Study

Master Software Engineering

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Find information through people

August 4, 2015

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Abstract

Collaborative tagging systems allow users to assign keywords, so called tags, to resources (anything with a URL¹) giving them a meaning based on their expertise or knowledge, this is what it's called a Folksonomy. However, these systems require of a means that help them interpreting this meaning and finding patterns, coming from the collaborative tagging process. Several recommendation algorithms have been proposed and implemented in order to solve this problem. Most of these algorithms use well-known techniques, mainly, from the Machine Learning (ML), Artificial Intelligence (AI) and Information Retrieval (IR) fields. Others are based on graph theory and co-occurrence counting, exploiting the structure of a Folksonomy.

This master thesis project was divided in two phases; an *acknowledgement and implementation phase* and an *experimental phase*. During the execution of the first phase, an analysis and interpretation of both FolkRank² and Begelman³ algorithms was done, along with the implementation process of the latter. The second phase of this project was composed by the execution and analysis of a blind experiment in order to evaluate and compare both algorithms, so the research questions could be answered.

This master thesis project tried to answer two research questions, stated as:

RQ1: For ZEEF curators, what is the relevance of the recommendations of each algorithm and which one predominates over the other?

RQ2: For the recommendations of each algorithm, what is the level of correlation between the relevance given by ZEEF curators and the weight assigned by each algorithm?

Experiment results showed that, for ZEEF curators, Begelman outperformed FolkRank with a percentage difference of 15,51%, meaning that Begelman is a lightweight implementation that suits ZEEF curators' needs and can perform consuming real-life data in a real-life environment. Additionally, for both algorithms, there is a **very weak** correlation between the relevance given by ZEEF curators and the weight assigned by each algorithm.

¹Stated by Thomas Vander Wal in his definition of Folksonomy.

²Proposed and implemented by A. Hotho et al. [3] as part of the NEPOMUK project.

³Implemented by the author of this document, based on G. Begelman et al. [4] approach to find strongly related tags.

Preface

This thesis is the result of four months of work at ZEEF, the host company of this project, whom I would like to thank for giving me the opportunity to be part of their team, especially the dev team.

I would also like to thank Tijs van der Storm for his guidance and constant advise during the execution of this project and the insightful knowledge shared during the Software Construction course, as well as to Magiel Bruntink and Hans Dekkers for their shared knowledge and interesting courses, Software Evolution and Software Process respectively.

Additionally, I would like to thank Thomas Vander Wal, for his valuable feedback and insights to this project. Finally, thanks to Prof. Andreas Hotho and Prof. Dr. Robert Jäschke for having provided the source code of FolkRank algorithm.

1 Introduction

Due to the continuous growth of the content available on the Internet⁴, web content consumers increasingly need tools that help them find the right information and content related to their particular interest. Search engines have been the solution for some time, but nowadays that is not enough. Web 2.0 brought social networking as its standard-bearer, but now, Web 3.0 introduces the concept of *Semantic Web*. Due to the vast amount of consumable online content, a means is required to filter and give meaning to valuable resources, reason why, collaborative tagging systems have emerged in order to add meaning to resources by assigning keywords that rapidly explains, or gives a hint, of what a resource is, or may be about. However, these systems require of tools that allow their users to get suggestions based on their interest by mining and exploiting the nature of these kind of systems, most of which comply with the structure of a Folksonomy, term introduced by Thomas Vander Wal in mid 2004 [1].

ZEEF.com, is an content curated online platform which aim to filter information through people. This online platform complies with the structure of a Folksonomy, owns a considerable amount of data and it's interested in extracting and interpreting the semantics behind their curators' tagging habits in order to filter and share the best-quality information to the world. This master thesis is a first step to achieve that goal, as it proposes a lightweight implementation of a tag-to-tag recommendation system [9] based on G. Begelman [4] approach to find strongly related tags, so it can be incorporated to a real time scenario, such as ZEEF's web environment.

Several recommendation algorithms have been proposed and implemented in order to solve this problem, most of which use well-known and established techniques, mainly, from the Machine Learning (ML), Artificial Intelligence (AI) and Information Retrieval (IR) fields. Others (like the two presented in this document) exploit the structure of a folksonomy and are based on graph theory and occurrence counting. This master thesis project was divided in two phases; an *acknowledgement and implementation phase* and an *experimental phase*. During the execution of the first phase, an in-depth analysis of FolkRank algorithm [3] was done, along with the process of interpretation and implementation of Begelman algorithm [4]. The second phase of this

⁴According to <http://www.worldwidewebsize.com>, the indexed web contains at least 4,74 billion pages and keeps growing.

project was composed by the execution and analysis of a blind experiment in order to evaluate and compare both algorithms, in terms of their relevance to ZEEF Curators⁵, so the research questions could be answered.

The two research questions this document tried to answer were stated as:

RQ1: For ZEEF curators, what is the relevance of the recommendations of each algorithm and which one predominates over the other?

RQ2: For the recommendations of each algorithm, what is the level of correlation between the relevance given by ZEEF curators and the weight assigned by each algorithm?

The next chapter of this document contains a description of the problem and motivation to carry out this research project. Chapter 3 presents the background and context where this master thesis took place, describes the concept of Folksonomy along with an overview of what ZEEF is and finally it cites different approaches in the tag recommendation context. In chapter 4, all the research matters are described; research question, research methodology and the description of the experiment carried out during the *experimental phase* of this master thesis project. Chapter 5 contains a description of the two selected algorithms. Chapter 6 explains the implementation process of Begelman algorithm and the experiment tool, as well as the adaptation process of FolkRank algorithm. Moreover in chapter 7, the results of the experiment next to a detailed analysis are given. Finally chapter 8 and chapter 9 contain the conclusions and future work and bibliography, respectively.

⁵See <http://zeef.org/join> for more information about content curation.

2 Problem statement and motivation

Web content consumers often deal with information overload, bad quality information and relative dissatisfaction on search engine results. Due to this, several recommendation algorithms exist nowadays, but they are, first, heavyweight implementations that were or are commonly developed for scientific purposes and second, algorithm implementations by companies that keep them under a know-how custody.

ZEEF.com lacks of a means to add and extract meaning from its users' tagging activity, though, they require a tag recommendation implementation in order to extract meaning from the already-placed tags on their ZEEF pages and from their users' tagging behavior in order to use it as an input to recommend and suggest related tags.

To do so, a simple tag-to-tag recommender was implemented following G. Begelman et al. [4] approach to find strongly related tags in order to be compared with a heavyweight algorithm based on the structured approach of A. Hotho et al. [3], FolkRank algorithm, which was proposed and implemented for scientific purposes, but serves as a point of comparison as it has been proven that it recommends relevant tags based on a query input.

R. Jäschke et al. [2] present a comparison of several recommendation approaches including the two selected for this master thesis project and concluded *"We show, how a simple recommender based on counting tags from users and resources can perform almost as good as the best recommender"*. This study motivated the author of this research project to carry out an experiment to prove such statement.

Besides of the desire to prove that the tag co-occurrence method can recommend relevant tags as FolkRank does, part of the motivation was to comply with ZEEF philosophy, "filter information through people", reason why techniques within the AI nor ML fields were not included in the scope of this project. In addition, to adhere to the theoretical background of this research project, which relies on recommendation approaches that exploit the structure of a Folksonomy.

3 Background and Context

3.1 Folksonomy

A folksonomy is a social web application that allows users to tag their resources in order to add a meaning that gives a quick idea about the content of a resource. By mid 2004 the term Folksonomy was introduced and defined by Thomas Wander Val [1] as:

“Folksonomy is the result of personal free tagging of information and objects (anything with a URL) for one’s own retrieval. The tagging is done in a social environment (usually shared and open to others). Folksonomy is created from the act of tagging by the person consuming the information.”

Here is another definition by R. Jäschke et al. [2]:

“Folksonomies are web-based systems that allow users to upload their resources, and to label them with arbitrary words, so-called tags.”

A formal model for folksonomies is presented by A. Hotho et al. [3]:

Definition 1. A folksonomy is a tuple:

$$F := (U, T, R, Y)$$

where,

- U, T, R are finite sets, whose elements are the users $u \in U$, tags $t \in T$ and resources $r \in R$ respectively.
- Y is a ternary relation between the previously mentioned finite sets $Y \subseteq (U \times T \times R)$. This relation is called *tag assignment* and it represents the action of a user having tagged a resource within the Folksonomy. Each *tag assignment* $y \in Y$ is formally represented as a triple $y = (u, t, r)$.

Thus a Folksonomy can be modeled as a hyper-graph with an adjacent 3D binary tensor $M = [f_{i,j,k}]|U| \times |T| \times |R|$ where each entry $f_{i,j,k} \in \{1, 0\}$ specifies whether or not user u_i tagged the resource r_k with tag t_j [7].

Since it was created, the term has been widely used to refer to these kinds of systems in several research projects. Folksonomies can be distinguished according to what kind of resources they support, e.g. *last.fm* share music habits, *flickr.com* allows the sharing of photos, *delicious.com* the sharing of bookmarks, *stackoverflow.com* programming questions, among others.

ZEEF.com is the targeted system by this research project. It is a content curated online platform that aim to filter information through people, it supports links. In essence, all these systems are very similar. Users are allowed to add their resources to the system and assign tags to it. The collection of these assignments is called a *personomy*⁶, the collection of all personomies forms a folksonomy [2].

There are two types of folksonomies, broad and narrow. The former is a folksonomy where the same resource is added to the system by multiple users who tag it with different keywords, these users are not the authors of the resource, examples of broad folksonomies are the ones mentioned above, *last.fm*, *flickr.com*, **ZEEF.com**, etc. The latter, is a folksonomy where, only the author of the resource adds it to the system and is the only person who tags the resource [5], blogs and forums are examples of this concept.

3.2 ZEEF.com - A Folksonomy-based content curated online platform

In order to evaluate both Begelman and FolkRank, detailed in chapter 5, ZEEF.com was analyzed. This tool is a user-friendly online platform that allow their curators to place, tag, rank and share links in lists or categories within a subject page, so visitors can search over hundreds of thousands of curated links. This online platform aims to filter information through people via the content curation. Their 1000+ curators share their knowledge through the creation of ranked list of links according to their expertise, knowledge and/or ownership on certain subject(s). Real people do the searching and filtering for you, so you can only consume meaningful and valuable content.

“It is time for human knowledge to advance where algorithms have reached their limitations.”

- Klaas Joosten, founder of ZEEF

On ZEEF, humans and algorithms work together to provide you the best information. Search engines filter out some information related to your interests or of your particular search topic, but nowadays it is limited, they do not give any information about the quality of the content, only humans can approve or disapprove the quality behind it. There is where ZEEF comes

⁶The concept personomy is formally described by A. Hotho et al. [3].

in, curators certify and share the best information for you.

Content curation is a process of sifting, sorting, arranging and sharing information on a specific topic and for a specific audience.

The following illustration depicts the content curation process:

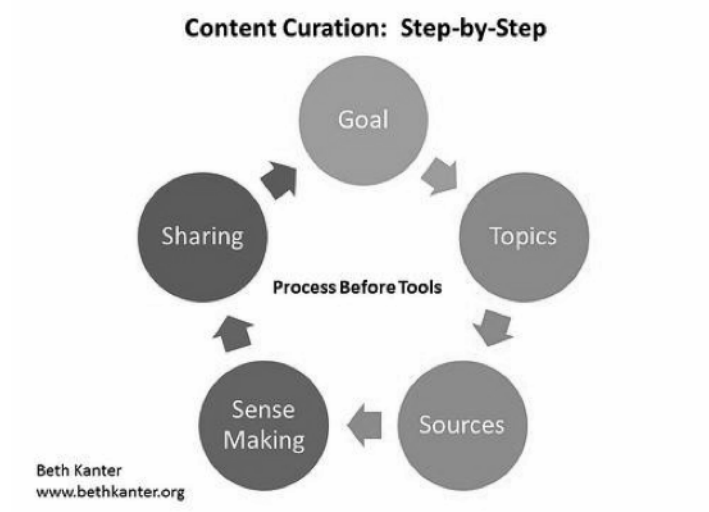


Figure 1: Content curation process.

ZEEF addresses and attempts to solve the following issues, nowadays online content consumers face:

- Information overload.
- Online trust.
- Overview of the expert.

Figure 2 shows how tagged a ZEEF page looks like⁷. Tags are currently placed on pages; hence all resources within it inherit all placed tags. There is an implicit hierarchy in a ZEEF page, as page titles and list titles are considered tags as well.

Resources, being the unit of a ZEEF page inherit three different type of keywords as tags: placed tags, list title and page title, though, the marked

⁷<https://folksonomy.zeef.com/santiago.valencia0>

resource *Last.fm* in figure 2 owns tags: *tag*, *bookmark*, *collaborative-system*, *share* (placed tags), *folksonomies* (list title) and *folksonomy* (page title).

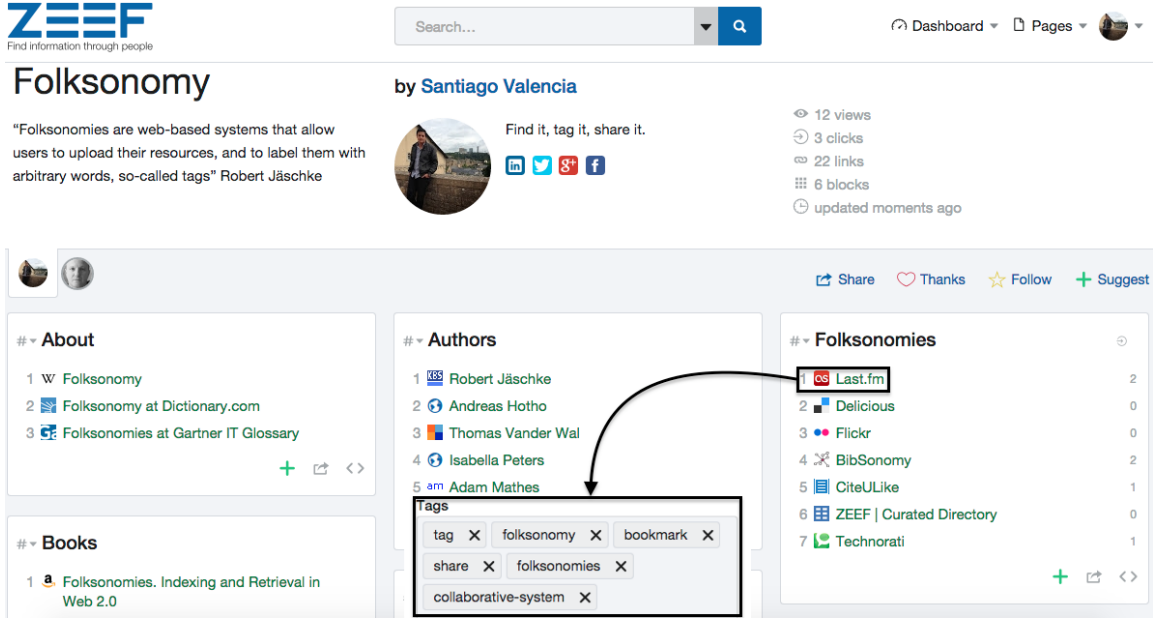


Figure 2: Folksonomy page in ZEEF.com with its tags.

Currently ZEEF own a set of resources of approximately 500.000 links published in their pages, sifted, ranked and shared by their curators, ready to be consumed by visitors in search of quality information related to their particular topic(s) of interest.

3.3 Related work

Throughout the literature, several recommendation solutions have been proposed and implemented by a variety of authors from different sources of knowledge. These solutions or approaches can be divided in three different groups, Folksonomy-based, Content-based and Hybrid. The first which models, analyses and exploits the structure of a folksonomy, the second where the content and/or metadata of the resource is considered and the third, a hybrid between the above mentioned approaches. Figure 3 depicts a diagram with all the documented contributions and contributors, grouped by the first two approaches.

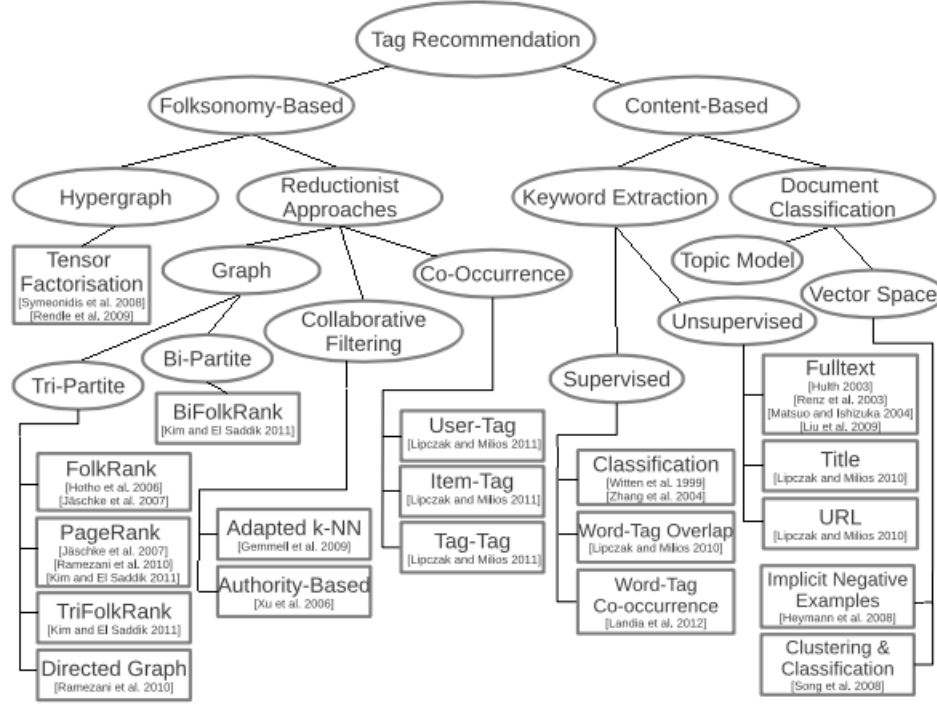


Figure 3: Overview of tag recommendation approaches [6].

3.3.1 Content-based

Recommendation solutions in the Content-based group of approaches relies (as the title suggest) on the content of the resource persé, on the extraction of a meaning out of the textual content of a resource or document. This approach can also be divided in different sub approaches depending on the technique used to obtain the level of importance, namely, by the usage of the textual content of resources for either tag extraction or tag expansion [9], word-tag pair co-occurrence [7] or by applying document classification techniques [10]. Important aspects of content-based approaches are the source of the content and its representation. Experiments carried out concluded that the most informative words generally appear in the title and in the URL of a resource [11]. This certainly is true, as a title must suggest in short and meaningful terms what the content of any resource is about.

Some experiments on HTML pages comparing the value of page text, anchor text and text of surroundings hosts [12] have been carried out, they deter-

mined that the document text was the most informative aspect of an HTML resources followed by the anchor text and last the text of surrounding hosts. Content-based approaches claim to determine the importances of a word for a complete text, this suggest the usage of a Tf-Idf⁸ score calculation. This is not the most effective method for tag recommendation as in some cases the keyword used to tag the resource has 0 occurrences in the text itself, though, the Tf-Idf will be 0 as the term occurrence is the foundation of this Information Retrieval metric, though, it can be used as an additional means combined with other approach in order to narrow the quality of the recommendations down to the best and more accurate.

3.3.2 Folksonomy-based

Folksonomy-based approaches are the ones that take advantage and exploits the structure of a folksonomy as presented in section 3.1 in order to extract and recommend tags based on the user’s collaborative tagging process. Folksonomy-based approaches include methodologies that rely on Hypergraphs [13, 14] which attempt to capture and analyse all the characteristics of the structure of a folksonomy, collaborative filtering [15, 16], graph-based [2, 17, 18] and co-occurrence methods [4, 9], being the last two the main approaches analyzed and implemented in this research project.

Graph-based approaches, along with collaborative filtering ones, are commonly described as reductionists methods, since they reduce the 3-dimensional folksonomy into one or more 2-dimensional projections. This methodology explores the graph in order to include information contained in the deep folksonomy into the recommendation process, i.e. graph-based approaches not only considers the top-N entries of the folksonomy, different from co-occurrence methods that consider the immediate neighbourhood of the query, which correspond to a fraction of the folksonomy. Graph-based and co-occurrence recommendation solutions will be further described in chapter 5.

3.3.3 Hybrid

There is a third classification of recommendation algorithms product of the work done by some authors in the literature, the hybrid ones [7, 8]. These two references in particular combine both approaches the following way: N. Landia et al. [7] extended FolkRank algorithm with content data. In

⁸Term frequency - Inverse document frequency metric, from Information Retrieval.

their approach they included Information Retrieval techniques such as the calculation of the Tf-Idf score in order to determine the importance of the content words to the resource (or document) as part of their weighting strategy, that included weight of edges connecting different type of nodes, namely user-word edges, word-tag edges, and user-tag edges as shown in figure 4. This resulted in what they named ContentFolkRank. They concluded that for content-based approaches that use word-tag co-occurrence data, it is recommended to include content-based word importance measure such as Tf-Idf in the recommendation process. M. Lipczak et al. [8] presented their hybrid recommendation solution, which is a combination of two tag recommendation sets: already placed tags by a user and tags related to the content of a document. The only source of content data in their approach is the document title, i.e. the words in the title of a document that was previously used as a tag before they are extracted (word-tag overlap). The tag recommendation set is then expanded based on tag-tag co-occurrence, which is the main method used in the implementation of Begelman.

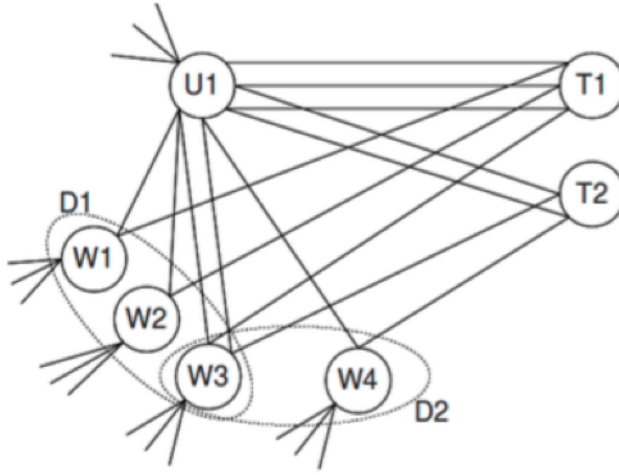


Figure 4: Plain FolkRank with word nodes [7].

4 Research approach

In this section all the matters related with the research approach are described. The research questions are presented along with the research methodology, which includes the literature research and the theoretical framework as the background of this research project, as well as an in-depth description of the experimental design done in order to carry out the experiment for the sake of answering the stated research questions. Finally the evaluation method is presented.

One of the purpose of this project was to measure ZEEF curators perceived relevance, about the recommendations of each of the selected algorithms for the sake of determining which one performs better than the other, in terms of the quality of their recommendations. To do so, the experiment gathered ZEEF curators' evaluation results of the recommendations given by each algorithm, in order to determine which one recommends more relevant tags to them, so RQ1 could be answered.

In order to have a better understanding of RQ2 and what it tries to answer, the two variables of the experiment must be explained upfront: *relevance* and *weight*. The former, is a data provided by the experiment participant (Section 4.2.2 describes how this data is obtained), it measures how relevant is a recommended tag for him/her in his/her domain or topic. The latter, is a value calculated by each algorithm, it represents the importance of a recommendation given a query tag, according to each's weighting schema (See chapter 5).

4.1 Research questions

RQ1: For ZEEF curators, what is the relevance of the recommendations of each algorithm and which one predominates over the other?

RQ2: For the recommendations of each algorithm, what is the level of correlation between the relevance given by ZEEF curators and the weight assigned by each algorithm?

4.2 Research methodology

This master thesis project, designed and carried out as an experiment, tried to find out which is the best recommendation algorithm for ZEEF cura-

tors (from the two selected, see chapter 5) and to determine the correlation between the relevance score given by ZEEF curators' evaluation to each recommendation of each algorithm and the assigned weight by each of them. It carried out a literature study in order to understand and realise FolkRank algorithm as well as a research work in order to find different types of recommendation approaches that have been proposed and documented throughout the literature, for the sake of selecting the one that best suited the requirements of this project (a simple tag-to-tag approach that counts tag co-occurrences) to be compared with FolkRank.

4.2.1 Literature research

A literature research work was done throughout the available literature in order to understand the context where these kinds of projects take place, the terminology, and the required expertise, as well as to have clear insights of the type of experiments one can carry out in order to determine certain facts and draw conclusions. As presented in section 3.3, related work on this field was also searched in order to determine the theoretical framework of this master thesis project. The first hypothesis (H1) was formulated based on the results of R. Jäschke et al. [2] in their work done in order to compare multiple recommendation algorithms, measuring both the quality of their recommendations and the computational cost, but the latter was beyond the scope of this project.

4.2.2 Experimental design

- Objective:
As an exploratory study, this project was intended to reveal the degree of relevance (for ZEEF curators) of the two selected recommendation algorithms within the tag recommendation context, each of which is based on a different approach, as well as to determine which one recommended more relevant tags and to conclude to what extent the relevance score and the weight of each of the recommended tags are correlated.
- Hypotheses:
 - H1. The relevance of the recommendations of Begelman algorithm will differ by approximately $\pm 5\%$ of the relevance of the recommendations of FolkRank.

- H2. For the recommendations of each algorithm, there is a strong correlation between the relevance given by ZEEF curators and the weight assigned by each algorithm.
- Theory:
The theoretical framework that supports this research project is described in chapter 3.
- Variables:
 - Relevance: Relevance score obtained by each of the recommended tags according to the evaluation done by ZEEF curators.
 - Weight: Weight score assigned by each of the algorithms to each of the recommended tags.
- Process:
This experiment was planned and carried out as a blind experiment, in which information about it was kept from the participant until after it was done. The purpose of a blind experiment is to avoid either intentional or unconscious biases.

Due to the nature of the environment where this Master Thesis project took place and due to the necessity of the participants to carry out this experiment in parallel, a web application was developed which from now on will be called *the program*.

1. The program will show the participant a list with tags placed in his/her ZEEF pages.

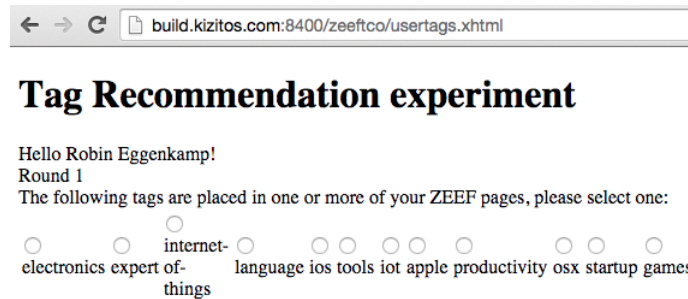


Figure 5: Already-placed tags by curator *Robin Eggenkamp*.

2. The participant will select one of the listed tags to become his/her query tag.

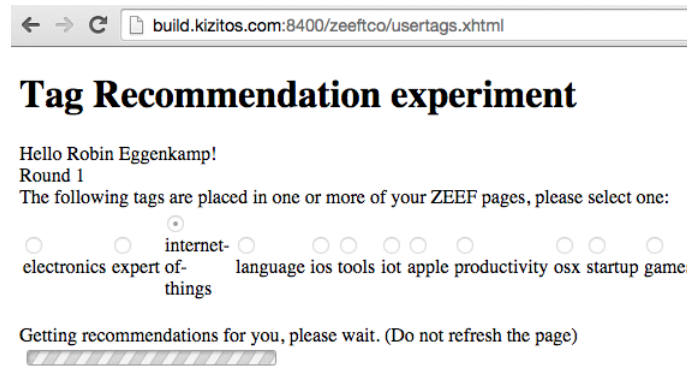


Figure 6: Query tag selection and recommendations retrieval.

3. Based on the selected query tag, the program will retrieve a list with approximately 30 recommended tags⁹ from the following data sources:
 - Begelman algorithm.
 - FolkRank algorithm.
 - Random words.
4. The participant will be asked to evaluate each of the recommended tags based on the following five-scale closed question:

How relevant is the recommended tag to the selected query tag?

1-Extremely irrelevant, 2-Irrelevant, 3-Neutral, 4-Relevant, 5-Extremely relevant.

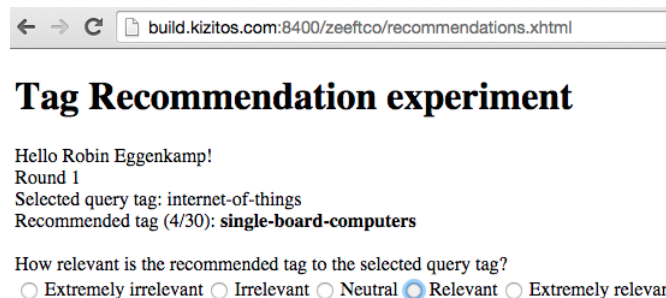


Figure 7: Participant's evaluation.

⁹The amount of recommended tags may vary depending on the amount of data available for certain topics. ZEEF.com focuses primarily in dev-tech resources, but they still have users tagging and sharing links in other domains, hence a significant difference can be detected in the amount and quality of data between dev-tech and non dev-tech topics.

5. The participant will repeat steps 2 - 4 five rounds, selecting a different query tag each round.

- Subjects:
ZEEF curators.
- Objects:
 - Begelman algorithm.
 - FolkRank algorithm.
- Instrumentation:
Questionnaire
- Data collection procedure:
A questionnaire with one closed question with a five-point scale response set was the instrument selected in order to collect the necessary data to be analyzed in this project.

4.2.3 The evaluation

An inferential statistical analysis was done in order to extract qualitative data that served either to confirm or refute the formulated hypotheses.

In order to determine the level of correlation between the two variables, the Spearman's correlation coefficient was calculated.

5 The selected algorithms

This section presents an analysis of the two selected algorithms. For each, a description of their specification is presented.

5.1 Begelman

Begelman is a simple graph-based tag recommendation approach based on G. Begelman et al. [4] method to find strongly related tags. It is a tag-to-tag recommender [9], which captures the relations between tags that frequently co-occur in the same post (ZEEF links). Tags are represented as nodes $n \in N$ in an undirected weighted graph $G = (N, E)$ where all co-occurrences of tag-tag are weighted edges $e \in E$ between the corresponding nodes. Each edge is a triple $e = (n_i, n_j, w)$ where $w \in \mathbb{R}$. Its principle is: *Frequently used pair of tags become important by the assignation of a high weight, based on their co-occurrence in the tag space.*

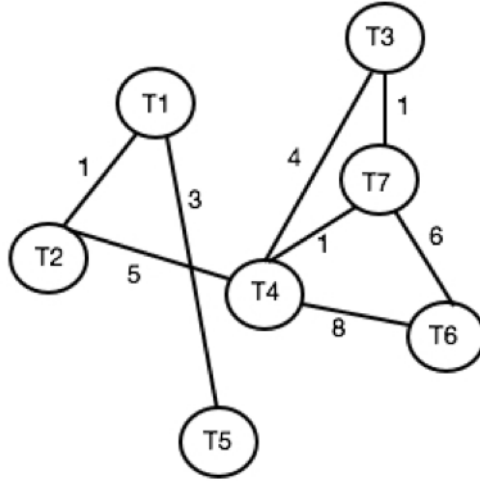


Figure 8: Tag graph in Begelman.

Graph G is built upon three different types of keywords: tags placed on ZEEF pages, page title and list titles. The ranking value, i.e. weight w , of each of the edges e of graph G is equals to the total amount of times the pair of tags occur together within the folksonomy.

Different from FolkRank, Begelman's graph contains only tags. Pairs of

tags that appear more frequently in the tag space are considered important, though, they will be on the top of the recommendations, based on a query tag. I.e. if tag T_4 (See figure 8) is selected as query tag, the top-3 recommendations will then be T_6 , T_2 and T_3 in that order.

After having the folksonomy graph been constructed, Begelman's process to generate relevant recommendations based on a query tags is the following:

1. An ETL process on the data, from ZEEF structure to a folksonomy-like structure, is performed (see section 3.1) considering all the different types of keywords as tags (placed tags, list titles and page title).
2. Pairs of tags are created upon their occurrence in the same post or ZEEF link, in two possible configurations $p_1 = (tag, list_title)$ and $p_2 = (tag, page_title)$ for each post.
3. The ternary relation representing tag assignments is modeled as a boolean 3D matrix T next to the tag graph, i.e. if a user u_i tagged a resource r_k with tag t_j then $T_{ijk} = 1$ otherwise $T_{ijk} = 0$. Normally the information in this data structure is sparse.
4. The weighting routine is executed in order to determine the co-occurrence of all edges within the tag graph.
5. The top-N most frequent pair of tags are selected as the top ranked recommendations given a query tag.

The following are the main procedures of Begelman algorithm:

```

1: function GENERATECOTAGGEDRESOURCES
2:    $rs \leftarrow$  Result set with retrieved data
3:    $coTaggedResources \leftarrow$  Empty map with pair of tags and tagged resources
4:   while  $resultSet$  has next value do
5:      $tag \leftarrow rs.tag$ 
6:      $list\_title \leftarrow rs.listTitle$ 
7:      $page\_title \leftarrow rs.pageTitle$ 
8:      $pair1 \leftarrow (tag, list\_title)$ 
9:      $pair2 \leftarrow (tag, page\_title)$ 
10:     $resources \leftarrow$  all tagged resources with the pair
11:    put  $(pair1, resources)$  and  $(pair2, resources)$  to  $coTaggedResources$ 
12:  return  $coTaggedResources$ 

```

```

1: function BUILDUNDIRECTEDGRAPH
2:    $coTaggedResources \leftarrow$  Map with pair of tags and tagged resources
3:    $undirectedGraph \leftarrow$  Empty undirected weighted graph
4:   for all pairs in  $coTaggedResources$  do
5:      $t1 \leftarrow pair.v1$ 
6:      $t2 \leftarrow pair.v2$ 
7:      $w \leftarrow$  size of resources set of pair  $(t1, t2)$   $\triangleright$  pair of tags
      co-occurrence
8:      $e \leftarrow (t1, t2, w)$ 
9:     add  $e$  to  $undirectedGraph$ 
10:  return  $undirectedGraph$ 

```

```

1: function GETMAINCO_TAGS(queryTag)
2:   undirectedGraph  $\leftarrow$  Undirected weighted graph
3:   listOfCoTags  $\leftarrow$  Empty list with top-10 recommendations
4:   eo  $\leftarrow$  edges of queryTag
5:   sort eo by weight DESC
6:   maxTags  $\leftarrow$  0
7:   for all edges in eo do
8:     if maxTags  $\leq$  10 then
9:       add tag to listOfCoTags
10:      maxTags  $\leftarrow$  maxTags + 1
11:  return listOfCoTags

```

5.2 FolkRank

FolkRank [2, 3, 7] is a topic-specific, graph-based ranking algorithm in Folksonomies, which is modeled based on Google's PageRank [19]. Its key idea is: *A resource tagged by an important user with important tags becomes important itself*. Same principle applies both for tags and users. Users, Resources and Tags are represented as nodes $n \in N$ in an undirected multi-edge tripartite graph $G = (N, E)$ where all co-occurrences of user-resources, user-tag and resource-tag are edges $e \in E$ between the corresponding nodes.

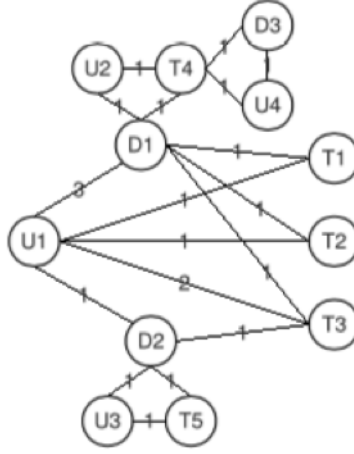


Figure 9: Folksonomy graph in FolkRank.

An iterative weight-spreading algorithm based on a preference vector cal-

culates the ranking value of each node. The vector w which contains the weight of all nodes, has one entry per node and is computed by the following weighting function, in a similar fashion to PageRank:

$$w \leftarrow (1 - d)Aw + dp \quad (1)$$

Where,

- w is the weight vector.
- d is the dampening factor which determines the balance between personal preference (specific topic based on a user query) and global importance when calculating the node weights. $0 < d \leq 1$.
- A is a row stochastic version of the adjacency matrix of graph G .
- p is the preference vector of the form (u, r, t) .

Once the graph containing the folksonomy is constructed (See figure 9) the following process is triggered in order to determine the tag ranking:

1. An ETL process on the data, from ZEEF structure to a folksonomy-like structure, is performed (see section 3.1) considering all the different types of keywords as tags (placed tags, list titles and page title).
2. Initialize the graph with the same random weight in each of the nodes so that their total sum is equal to the predefined parameter TW¹⁰.
3. Set the preference vector giving the query user and resource a higher weight than the rest of the nodes in the graph, so that the sum of all weights in the preference vector is equal to the total weight in TW.
4. Do an iterative weight spreading process until node weights converge. This process ends when the sum of absolute change in node weights during an iteration is smaller than a predefined fraction of TW.
5. Select all nodes containing tags and rank them by their weight. The node with the highest weight is given the best ranking. Select the top-N.

Setting the weights of the preference vector is a crucial task because the sum of preference weights must be equals to the total sum of node weights in the folksonomy graph, plus it determines the topic of the recommendations.

¹⁰Total Weight graph.

FolkRank can generate two types of recommendations for all nodes in the folksonomy graph, a global non-personalized ranking and a personalized one. The former having the preferences vector filled with uniform weight values and the latter with a higher weight assigned to both input parameters (user and resource), i.e. in order to generate personalized recommendations for a query input $p = (u_1, r_1, \emptyset)$, the preference vector p is set so that u_1 and r_1 get higher weights than the rest of the nodes.

6 Implementation and adaptation

This section details the implementation process of Begelman algorithm, based on the method proposed by G. Begelman et al. [4] to find strongly related tags, the development of the experiment tool, a JavaEE web application in order to carry out the experiment of this project and the adaptation process in order to set up and run FolkRank algorithm, whose source code was provided by their authors, A. Hotho and R. Jäschke. These three tasks took place in the *acknowledgement and implementation phase* of this master thesis project.

6.1 Begelman

The implementation that took approximately one month, resulted in what the author of this document named the *Begelman algorithm*. This lightweight application implemented in Java, consumes ZEEF's real-life data in order to determine the top-10 most related tags given a query tag.

Begelman algorithm process, consuming real-life data, takes less than 30 seconds. This is an approximate measure, as an official performance benchmark test on the server where the application was placed, was not possible to be done.

In order to successfully carry out the implementation process, the following considerations were taken upfront:

- The implementation must be done in Java.
- The implementation must be capable of efficiently operate in a real-life web environment.
- The implementation should be easily integrated to a JavaEE-based web application (ZEEF.com).
- The input/output core type of the implementation must be the same (input: tag, output: set of tags).
- The implementation must consume ZEEF real-life data.
- The maximum limit of the output, i.e. amount of recommended tags, is set to 10.

- The process shall be started and recommendations displayed in the experiment tool (See section 4.2.2), which is a web application developed in Java EE.

Total LOC = 924 approximately.

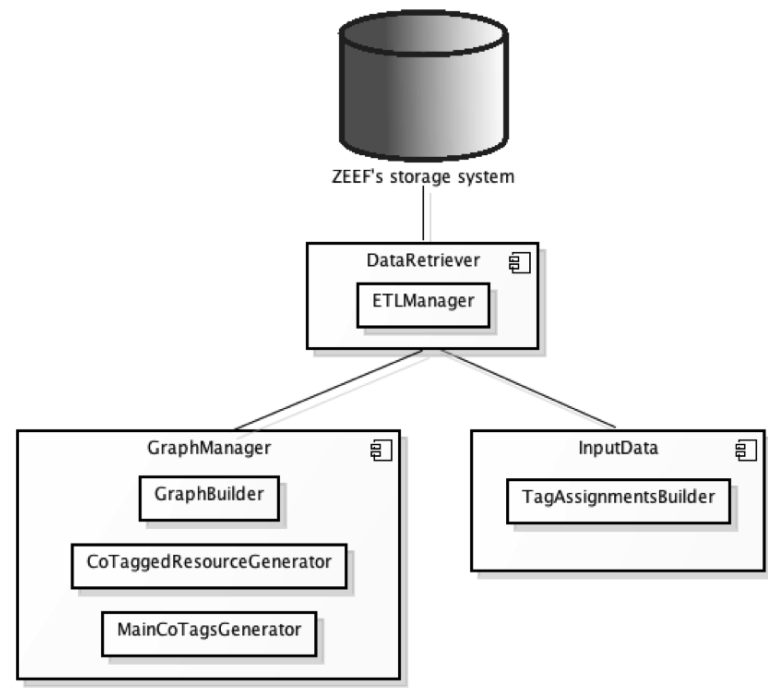


Figure 10: Begelman algorithm core architecture.

Begelman algorithm consumes ZEEF real-life data and transform it into a folksonomy-like structure through the *ETLManager*, in order to allow the *GraphManager* to perform its task in the following order:

- The *GraphBuilder* builds the undirected weighted graph with tags in its nodes.
- The *TagAssignmentBuilder* populates the 3D tensor representing the tag assignments.
- The *CoTaggedResourceGenerator* generates the pairs of related tags according to their co-occurrence in the post or ZEEF link.

- The *MainCoTagGenerator* performs the weighting schema of Begelman algorithm, which is the amount of times a pair of tags co-occurred in the graph, assigning this value to the edge between the related nodes.

Once these tasks are completed, the *GraphManager* returns the top-10 most relevant tags based on a given query tag.

6.2 FolkRank

The implementation of FolkRank algorithm, lead by A. Hotho and R. Jäschke as part of the NEPOMUK project¹¹ in 2007, was done in Java and its source code was provided by their authors. It is a heavyweight application that uses its own storage system, meaning that the real-life data must be first transformed into a folksonomy-like structure and stored in it in order to start the process.

As mentioned in chapter 5, its weighting schema is well structured, reason why the whole process took around 30 hours for the whole data set of ZEEF. As well as for Begelman, this is an approximate measure.

In order to setup and run FolkRank algorithm the following considerations where taken upfront:

- The implementation was developed in Java, so knowledge in that programming language is required for its understanding and interpretation.
- The implementation must use a PostgreSQL DB.
- The input of the implementation is a pair composed by a user and a resource $i = (u, r)$, the output is a set of tags.
- The maximum limit of the output, i.e. amount of recommended tags, is set to 10.
- The process shall be started and recommendations should be displayed in the experiment tool (See section 4.2.2), which is a web application developed in Java EE.

¹¹<http://nepomuk.semanticdesktop.org>

Total LOC: 3205 approximately.

Figure 11 depicts FolkRank algorithm core architecture. It is an interpretation of the author of this document based on the source code, as official documentation was not available.

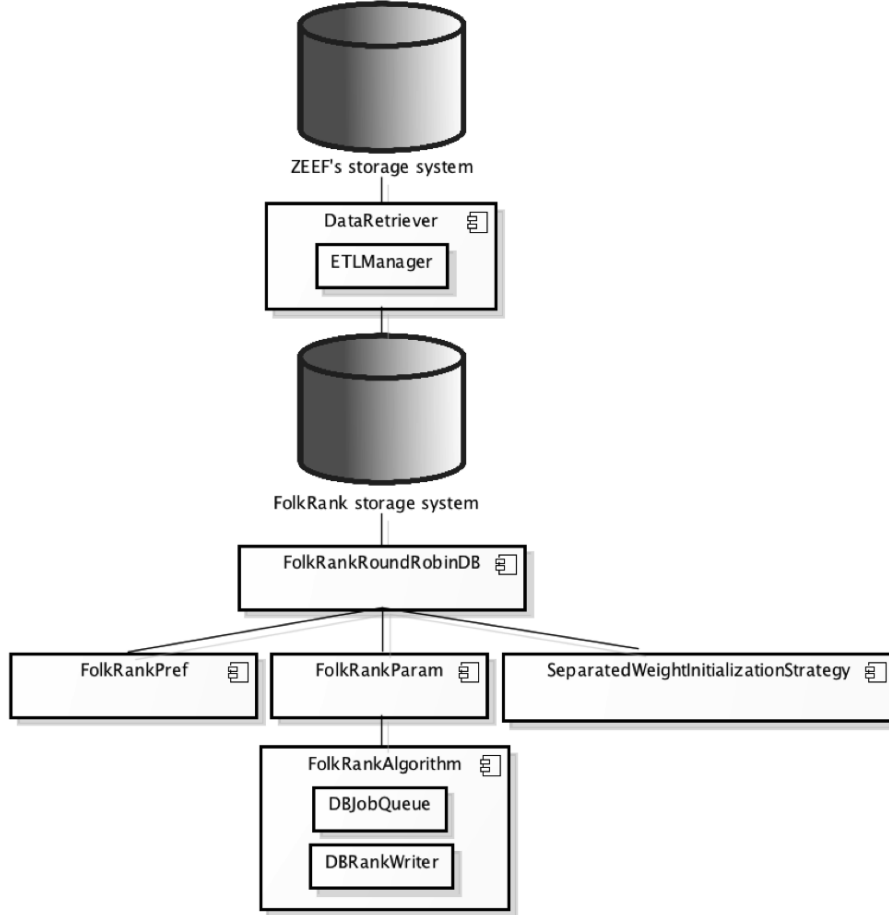


Figure 11: FolkRank algorithm core architecture.

- The *ETLManager* transforms ZEEF data into a folksonomy-like structure.
- The *FolkRankRoundRobinDB* component initializes the preference vector, the algorithm parameters, the weighting schema and set up a job queue to start the ranking process.

- The *FolkRankAlgorithm* component triggers the ranking process through the *DBJobQueue* per job in the queue. The *DBRankWriter* writes the output to FolkRank’s DB.

6.3 The experiment tool

The experiment tool is a web application developed in JavaEE, from which the output of both Begelman and FolkRank is retrieved along with the inclusion of the random words, in order to be shown through a basic UI, for the sake of allowing the participants to evaluate the recommendations of each algorithm.

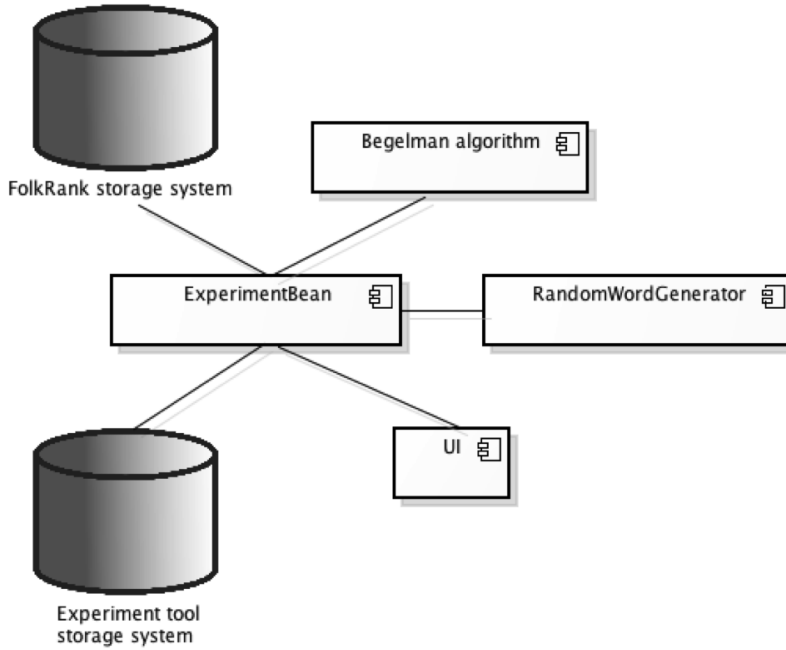


Figure 12: Experiment tool core architecture.

This JavaEE web application retrieves data from three different sources in order to show them as recommendations to the participant:

- FolkRank storage system. The weighted recommendations are stored in FolkRank’s DataBase. The experiment tool retrieves the top-10 most related ones, given a query tag.

- Begelman algorithm implementation. The experiment tool starts Begelman whole process in order to retrieve the top-10 most related tags, given a query tag.
- Generated random words.

The evaluation scores given by the participants to each recommendation of algorithm, is then stored in the Experiment's DataBase.

7 Results and analysis

In this section, the results of the experiment are presented and analyzed. To do so, the results will be exposed in a quantitative and qualitative manner, as the quantitative results suggest interesting facts and conclusions can be drawn.

There are three types of diagrams used in order to visualize the results obtained, first a pie chart (e.g. figure 13) depicting the percentage of relevance given by ZEEF curators to the recommendations of each algorithm (Begelman, FolkRank and RandomWords) for each of the items on the five-scale. The second (e.g. figure 16) a scatter plot representing the Spearman’s rank correlation coefficient, illustrating the correlation between the two variables identified while designing the experiment (relevance and weight) and finally a box plot representing the sparsity of both main distributions (Begelman and FolkRank), e.g. figure 18.

7.1 Results

For the experiment carried out during the *experimental phase* of this master thesis project, data from ZEEF was collected, obtaining a core folksonomy with $|U| = 1.078$ users, $|T| = 16.524$ tags and $|R| = 121.012$ resources or links, all of them unique, related by in total $|Y| = 850.486$ tag assignments. This constituted the input data set for each of the algorithms in order to recommend the top-10 tags based on a query input.

The sample of this experiment was randomly selected; ZEEF team members physically located at their HQ composed it. All of them are curators and have ZEEF pages from a variety of topics within the platform. In total 13 persons (each of them considered as an experimental unit or subject) participated in this experiment, leaving as a result, the data presented in table 1, table 2 and table 3 for Begelman, FolkRank and RandomWords respectively. The total amount of tags recommended was 1663.

Curator	Domain	Total recommendations	Evaluation scale				
			Extremely irrelevant	Irrelevant	Neutral	Relevant	Extremely relevant
Rob Thorpe	Lifestyle/Students	50	0	1	0	5	44
Klaas Joosten	Affiliate marketing	49	3	4	9	17	16
Yana Ledeneva	Teaching	47	0	6	8	17	16
Jan Beernink	Dev-tech/Java	49	4	0	0	17	28
Robin Eggenkamp	Dev-tech/Photography	50	2	8	2	22	16
Dennis Brouwer	Dev-tech/PostgreSQL	20	1	2	3	12	2
Bauke Scholtz	Dev-tech/JSF	37	0	0	8	18	11
Marina Polovinchuk	Design	49	0	8	4	7	30
Arjan Pronk	Affiliate marketing	46	7	1	1	14	23
Marina Astudillo	Design	50	1	4	6	20	19
Olivier Ozinga	Lifestyle/Sailing	20	8	0	0	4	8
Rick Boerebach	Marketing	49	7	6	2	16	18
Menno Kolkert	Marketing/Georeferencing	30	0	5	2	13	10

Table 1: Experiments results for Begelman algorithm.

Curator	Domain	Total recommendations	Evaluation scale				
			Extremely irrelevant	Irrelevant	Neutral	Relevant	Extremely relevant
Rob Thorpe	Lifestyle/Students	49	4	0	4	12	29
Klaas Joosten	Affiliate marketing	50	7	5	20	11	7
Yana Ledeneva	Teaching	49	3	8	16	16	6
Jan Beernink	Dev-tech/Java	50	5	2	5	21	17
Robin Eggenkamp	Dev-tech/Photography	50	8	11	11	13	7
Dennis Brouwer	Dev-tech/PostgreSQL	20	1	2	4	12	1
Bauke Scholtz	Dev-tech/JSF	41	0	0	6	24	11
Marina Polovinchuk	Design	50	3	6	10	7	24
Arjan Pronk	Affiliate marketing	51	8	3	4	13	23
Marina Astudillo	Design	50	0	7	12	26	5
Olivier Ozinga	Lifestyle/Sailing	20	10	0	0	5	5
Rick Boerebach	Marketing	50	11	10	2	15	12
Menno Kolkert	Marketing/Georeferencing	30	0	1	4	18	7

Table 2: Experiments results for FolkRank algorithm.

Curator	Domain	Total recommendations	Evaluation scale				
			Extremely irrelevant	Irrelevant	Neutral	Relevant	Extremely relevant
Rob Thorpe	Lifestyle/Students	50	10	17	13	8	2
Klaas Joosten	Affiliate marketing	50	22	24	1	2	1
Yana Ledeneva	Teaching	49	7	27	10	5	0
Jan Beernink	Dev-tech/Java	50	41	5	2	2	0
Robin Eggenkamp	Dev-tech/Photography	49	42	4	1	1	1
Dennis Brouwer	Dev-tech/PostgreSQL	20	19	0	1	0	0
Bauke Scholtz	Dev-tech/JSF	40	29	5	5	1	0
Marina Polovinchuk	Design	50	13	17	13	1	6
Arjan Pronk	Affiliate marketing	49	39	6	1	1	2
Marina Astudillo	Design	50	11	24	9	5	1
Olivier Ozinga	Lifestyle/Sailing	20	19	1	0	0	0
Rick Boerebach	Marketing	50	31	18	0	1	0
Menno Kolkert	Marketing/Georeferencing	30	4	19	5	1	7

Table 3: Experiments results for RandomWords.

7.2 Observation

During the computation of the results, two interesting phenomena were identified. On one hand, there were some tags recommended by Begelman and FolkRank that were evaluated as *Irrelevant* or *Extremely irrelevant*, on the other hand, some random words were with either *Relevant* or *Extremely relevant*. Some examples of these two phenomena are placed in tables 4 and 5 respectively.

Query tag	Recommended tag	Relevance	Algorithm
database	awesome-awesomeness	Extremely irrelevant	Begelman
bookmarking	movies-&-tv	Extremely irrelevant	Begelman
netherlands	dating	Extremely irrelevant	FolkRank
electronics	electrons	Irrelevant	Begelman
handmade	rabota	Extremely irrelevant	FolkRank
startup	rockstaronly	Irrelevant	

Table 4: Some recommendations by Begelman and FolkRank evaluated with either *Irrelevant* or *Extremely irrelevant*.

Both Begelman and FolkRank algorithms exploit the structure of the folksonomy, composed by the active tagging activity of its users, from which one can deduce that these ambiguities are due to personal tagging criteria. For example, the tag *electrons* was not necessarily related with tag *electronics* for the participant that evaluated it with an *Irrelevant* score, moreover, there is a not very strong semantic relation, but for Begelman, these co-occurred together a high amount of times together, though, the recommended tag *electrons* obtained a high weight. Additionally some random words were evaluated with a *Relevant* or *Extremely relevant*. Table 5 shows some examples of it:

Query tag	Recommended tag	Relevance
git	shell	Relevant
design	screen	Relevant
startup	work-hard	Extremely relevant
student	music	Extremely relevant

Table 5: Some random words evaluated with *Relevant* and *Extremely Relevant*.

From this case, one can conclude that there is a semantic relation between the query and the recommended tag. These random words were selected and recommended as so, but this was no guarantee of 100% of unrelatedness between them and the rest of the possible recommended tags in the folksonomy. A positive indicator is that the percentage of random words evaluated with those two scores was below the 10%, 7,54% to be exact for the whole data set.

The *Neutral* item of the five-scale is debatable, because it depends on the cri-

teria of the curator and of the person analyzing the results of the experiment. Manual inspection was done on the *Neutral* evaluated recommendations and some of the recommendations deserved a higher or a lower score than the one obtained, but again, it is a matter of the criteria of the person that is facing the recommendations.

7.3 Analysis

Table 6 shows a consolidate and a comparison of the algorithms, from which it is possible to conclude that Begelman’s degree of relevance is higher than FolkRank’s, according to ZEEF curators’ evaluation, but it is not possible to accurately conclude that Begelman is a better recommender approach than FolkRank. To do so, further experiments like the one carried out by this master thesis project, should be done with different data sets, different experiment configurations, different participants and in different contexts in order to draw such general conclusion. The conclusion that can be drawn is that Begelman’s recommendations are more relevant for ZEEF curators, than the ones from FolkRank, an algorithm that has been proven (with multiple datasets) recommends relevant tags, as demonstrated by A. Hotho et al. [3], this suggests that a simple approach based on counting tag co-occurrences performs even better than a structured approach such as FolkRank, though, the statement by R. Jäschke et al. [2] “*We show, how a simple recommender based on counting tags from users and resources can perform almost as good as the best recommender*” was proven, within ZEEF environment.

	Begelman		FolkRank		Random	
	Total recommendations	Percentage	Total recommendations	Percentage	Total recommendations	Percentage
Extremely irrelevant	33	6,04%	60	10,71%	287	51,53%
Irrelevant	45	8,24%	55	9,82%	167	29,98%
Neutral	45	8,24%	98	17,50%	61	10,95%
Relevant	182	33,33%	193	34,46%	28	5,03%
Extremely relevant	241	44,14%	154	27,50%	14	2,51%
Total	546	100,00%	560	100,00%	557	100,00%

Table 6: Experiment results consolidation and comparison.

As expected and as it can be visualized in table 6, the percentage peaks are located, both for Begelman and FolkRank, on the *Relevant* and *Extremely relevant* items of the five-scale and for RandomWords on the *Irrelevant* and *Extremely irrelevant*. This proved the impartiality of the participants and the good design of the blind experiment in order to avoid any bias, as all details were kept until after they finished the experiment. They were not aware that they were obtaining recommendations from three different re-

sources and even less that they were getting random words as recommendations.

An important remark is that ZEEF owns a vast amount of resources, but up to a high extent thees resources are mainly focused on the dev-tech domain, i.e. some participants that were curators of non dev-tech pages didn't have the same amount of data available as curators of dev-tech pages. This can be seen on the total recommendations per algorithm; Begelman 546, FolkRank 560 and RandomWords 557, respectively. Some participants were not able to complete the five rounds of the experiment due to the lack of data in their domains, though, the amount of recommendations was lower than expected.

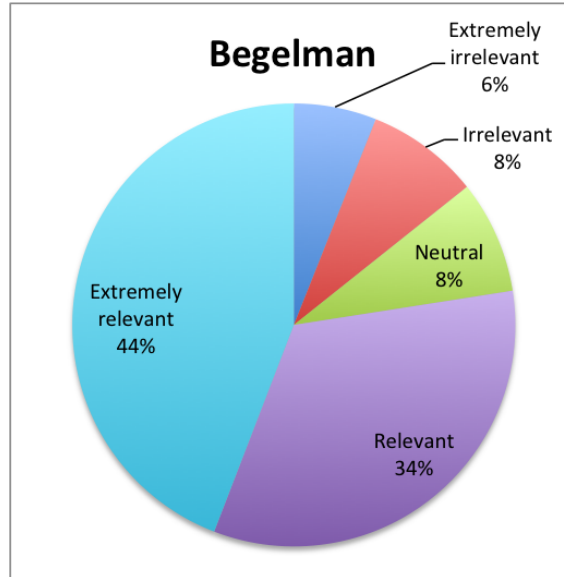


Figure 13: Relevance score results for Begelman algorithm.

From figure 13, figure 14 and table 6, one can conclude that, for ZEEF curators, Begelman outperformed FolkRank, in terms that the percentage of high relevance (*Relevant* and *Extremely relevant*) of the former (77,47%) was higher than the one obtained by the latter (61,96%). The difference between each other is of 15,51% in favor of Begelman, this answers RQ1, which was stated as *For ZEEF curators, what is the relevance of the recommendations of each algorithm and which one predominates over the other?*. The degree of high relevance for ZEEF curators of each of the algorithms

differed in 15,51%, 10,51% more than the expected approximate percentage calculated from the results obtained by R. Jäschke et al. [2]. Moreover and based on this result, H1, stated as *The relevance of the recommendations of Begelman algorithm will differ by approximately $\pm 5\%$ of the relevance of the recommendations of FolkRank* is **refuted**.

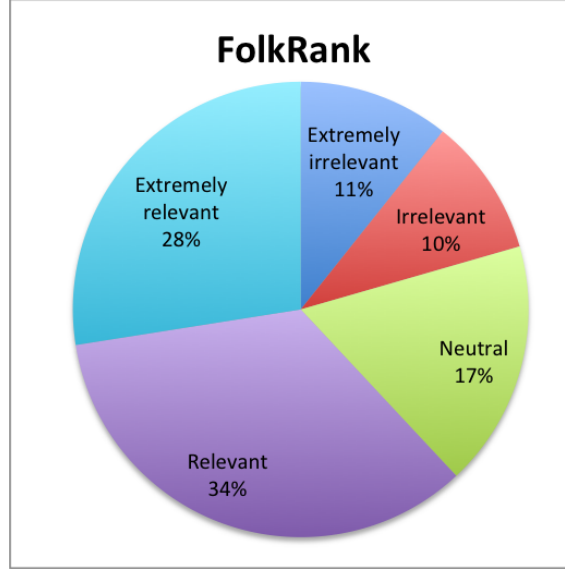


Figure 14: Relevance score results for FolkRank algorithm.

Figure 16 and figure 17 depict scatter plots representing the Spearman's rank correlation coefficient between the two variables of the experiment, relevance and weight for each of the recommendations. These two diagrams have on their x-axis the items on the five-scale, and on the y-axis the weight, normalized into a 0 - 1 scale because, as mentioned in chapter 5, the weighting schema is different for each of the two algorithms. This plots are very sparse.

The Spearman's rank correlation coefficient between the relevance and weight for Begelman and FolkRank are 0,034100969 and 0,047607081 respectively, i.e. according to the scale presented in table 7, there is a **very weak** correlation between the two variables for each of the algorithms, reason why H2, stated as *For the recommendations of each algorithm, there is a strong correlation between the relevance given by ZEEF curators and the weight assigned by each algorithm* is **refuted** as well, meaning that no matter the

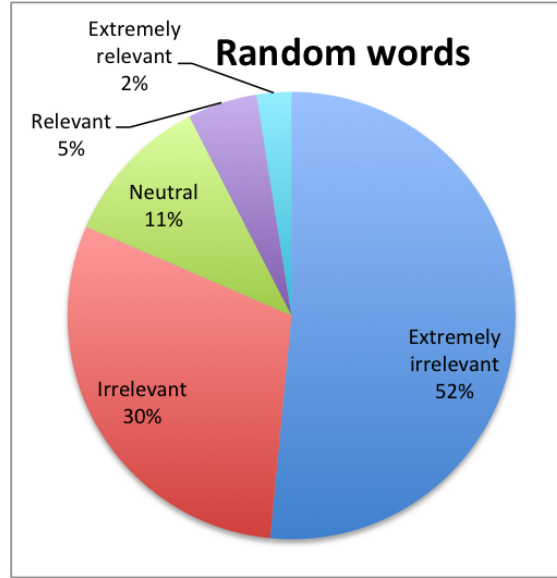


Figure 15: Relevance score results for RandomWords.

recommendations are the top-10 high ranked, some recommendations might not be relevant for a ZEEF curator according to his/her expertise in his/her domain.

Scale	
0,0 - 0,19	Very weak
0,20 - 0,39	Weak
0,40 - 0,59	Moderate
0,60 - 0,79	Strong
0,80 - 1,00	Very Strong

Table 7: Spearman's rank correlation coefficient scale.

This represented a low percentage of all the recommendations, 14,28% and 20,53% of the recommended tags where evaluated with an *Irrelevant* or *Extremely irrelevant* scale, for Begelman and FolkRank respectively. This result answers RQ2, which was stated as *For the recommendations of each algorithm, what is the level of correlation between the relevance given by ZEEF curators and the weight assigned by each algorithm?*

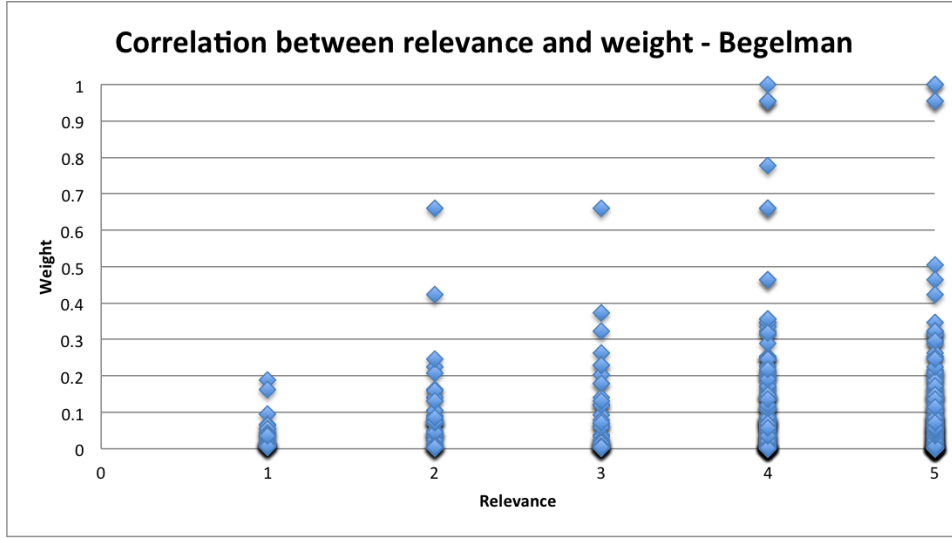


Figure 16: Scatter plot with Spearman's rank correlation coefficient of Begelman.

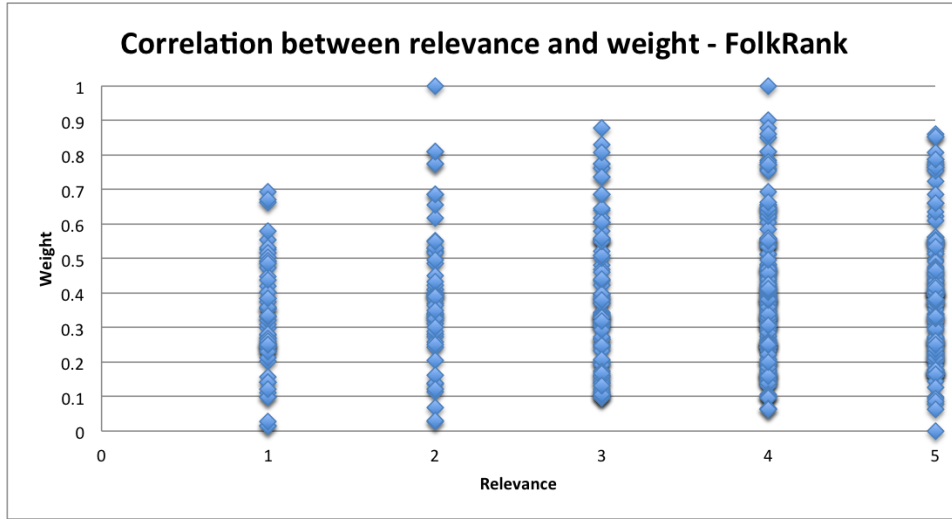


Figure 17: Scatter plot with Spearman's rank correlation coefficient of FolkRank.

Figure 17 proves that the weighting schema of FolkRank is more structured than the one of Begelman as it relies on a preference vector and has predefined limits. In a similar fashion to Begelman, FolkRank's recommen-

dations have a **very weak** correlation between the relevance score given by the participant and the assigned weight by each algorithm.

The box plot in figure 18 has a few but very pronounced outliers for Begelman algorithm, this is due to the weighting schema as it is based on counting co-occurrences of pairs of tags. There could be the case that one special pair of tags (or few of them) co-occur in a higher amount of times compared to the rest, e.g. the top outlier co-occurred 1927 times together, it represents the pair of tags (*startup*, *websummit-2014-startups*) being *startup* the query tag and *websummit-2014-startups* the recommended one. These pair was evaluated with the *Extremely relevant* item of the five-scale and it obtained the highest weight. In this particular case, there is a strong correlation between its relevance and its weight, but as mentioned before it is only one of the few visible outliers.

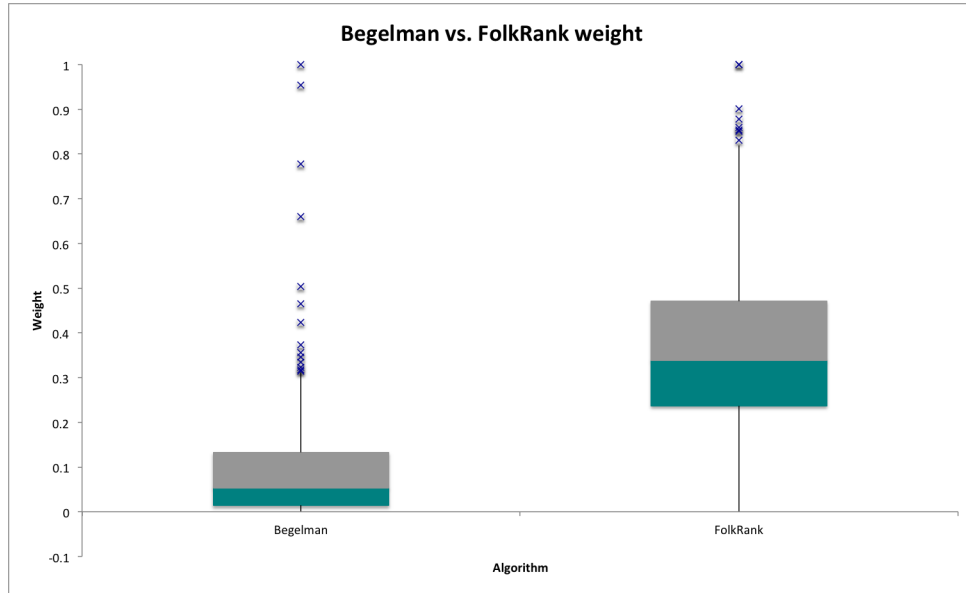


Figure 18: Weight box plot of both Begelman and FolkRank.

For FolkRank algorithm, it shows less and not very pronounced outliers, i.e. the structured weighting schema of FolkRank is more consistent than Begelman's, in terms that it is prone to produce less pronounced outliers.

7.4 Threats to validity

The main threat to validity identified during the execution of this master thesis project, was the correctness of the implementation of Begelman algorithm, although it was implemented following the method very carefully, it may not be 100% guarantee of a correct implementation. The experiment was the tool in order to validate so, though, it did. For ZEEF, Begelman algorithm recommends relevant tags, i.e. 77,44% of all recommendations were evaluated with a *Relevant* or *Extremely relevant*, meaning that for ZEEF curators, Begelman is a reliable implementation in order to obtain relevant tag recommendations, given a query tag.

8 Conclusions and future work

This master thesis project presented two different approaches on the tag recommendation context in folksonomies: Begelman and FolkRank. The former, a tag-to-tag recommender based on counting pairs of tags co-occurrences following G. Begelman et al. [4] method to find strongly related tags. The latter, a topic-specific, graph-based ranking algorithm in folksonomies, modeled based on Google’s PageRank and implemented as part of the NEPO-MUK project. These two approaches, both exploit the structure of the folksonomy and rely on graph theory.

An experiment conducted with ZEEF’s real-life dataset, concluded that, for ZEEF curators, Begelman recommends more relevant tags than FolkRank, meaning that a simple approach based on counting tag pairs co-occurrence outperformed a structured and heavyweight algorithm. FolkRank is an algorithm that was implemented for scientific purposes and it operates over post-core dataset, i.e. not with real-life dataset, a subset from the real-life dataset must be extracted and transformed in order to start the process. Approaches such as Begelman consumes real-life data in order to generate its recommendations.

FolkRank’s weighting schema based on a preference vector and with predefined limits is a more structured way compared to Begelman’s, as its weighting schema is based on the co-occurrence of the tag pair. This method is prone to produce pronounced outliers, as presented and mentioned in chapter 7.

Results of the experiment concluded, first, that FolkRank is a point of comparison for lightweight implementations such as Begelman. Second, that, for ZEEF curators, Begelman’s recommendations were more relevant than FolkRank’s, i.e. Begelman is an implementation suitable for ZEEF curators’ interests, but it doesn’t necessarily means it is a better approach than FolkRank. In order to state such conclusion, several experiments under different configurations should be carried out with different datasets, different environments and different participants.

Two possible paths can be taken as future work from this project, first, multiple experiments could be carried out in order to draw a more narrow conclusion around if there exists a correlation between the relevance and weight of the recommendations of each of the evaluated algorithms, as well

as to determine with stronger arguments, which one performs better than the other. Second, Begelman can be further complemented with a semantic analyzer, relying on content-based approaches, such as the ones described in section 3.3.1.

Multiple use cases were presented to ZEEF, explaining the advantages of including Begelman to their platform as part of their tagging strategy for the future in order to aid search, overview, navigation, automated list creation and filtering features on the three possible levels, page, list and link.

As a recommendation from the experience working at ZEEF and for the sake of implementing tagging within the platform, it should be done in a more in-depth level, currently tags are placed on pages, i.e. their unit is the page. In order to take better advantage of the structure of a folksonomy and to extract and share more precise information, ZEEF should start placing tags on the link level.

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Appendix A

Raw experiment results.

Remark: The column *Relevance* contains values from 1 to 5. These are the values of the five-scale question asked to the participants to evaluate the recommendations through the experiment tool, being 1 *Extremely irrelevant* and 5 *Extremely relevant*.

No.	Algorithm	Query tag	Recommended tag	Relevance	Weight	Participant
1	Begelman	cro	usability-&-user-experience-content	5	24	Arjan Pronk
2	Begelman	cro	conversionrateoptimization	5	219	Arjan Pronk
3	Begelman	cro	cro-blogs-and-resources	4	31	Arjan Pronk
4	Begelman	cro	usability-&-user-experience-tools	4	19	Arjan Pronk
5	Begelman	cro	conversion-copywriting-resources	5	36	Arjan Pronk
6	Begelman	cro	tools-(that-will-make-you-live-easier)	2	15	Arjan Pronk
7	Begelman	cro	articles-i-have-just-read	1	50	Arjan Pronk
8	Begelman	cro	people-to-follow	1	20	Arjan Pronk
9	Begelman	cro	cro-experts-(on-twitter)	5	33	Arjan Pronk
10	Begelman	cro	conversion-rate-optimization	5	362	Arjan Pronk
11	Begelman	poker	online-poker-for-playmoney	4	5	Arjan Pronk
12	Begelman	poker	gambling	5	5	Arjan Pronk
13	Begelman	tnw	zeef	4	7	Arjan Pronk
14	Begelman	tnw	tnw-hackbattle	3	136	Arjan Pronk
15	Begelman	tnw	restful-api-clients	5	7	Arjan Pronk
16	Begelman	tnw	braintree	5	21	Arjan Pronk
17	Begelman	tnw	hackathon-survival	5	7	Arjan Pronk
18	Begelman	tnw	verisign	5	7	Arjan Pronk
19	Begelman	event	techcrunchdisrupt	4	413	Arjan Pronk
20	Begelman	event	kpmg-newhorizons	4	146	Arjan Pronk
21	Begelman	event	websummit	4	116	Arjan Pronk
22	Begelman	event	tnw-hackbattle	4	136	Arjan Pronk
23	Begelman	event	dutchstartupevents	4	154	Arjan Pronk
24	Begelman	event	websummit-2014-startups	4	1927	Arjan Pronk
25	Begelman	event	ecommerce—day-2	4	161	Arjan Pronk
26	Begelman	event	red-herring	4	273	Arjan Pronk
27	Begelman	event	ecommerce—day-1	4	176	Arjan Pronk
28	Begelman	event	ecommerce—day-3	5	151	Arjan Pronk
29	Begelman	kids	winkels	1	19	Arjan Pronk
30	Begelman	kids	kinderneubelen	5	144	Arjan Pronk
31	Begelman	kids	lego	4	73	Arjan Pronk
32	Begelman	kids	opvoeden	5	33	Arjan Pronk
33	Begelman	kids	reading-apps-(elementary)	5	22	Arjan Pronk
34	Begelman	kids	education-apps-for-kids	5	323	Arjan Pronk
35	Begelman	kids	opvoeding-en-ontwikkeling-kinderen	5	20	Arjan Pronk
36	Begelman	kids	speelgoed	5	27	Arjan Pronk
37	Begelman	kids	toys	5	57	Arjan Pronk
38	Begelman	training	la-formation-a-distance	1	126	Arjan Pronk
39	Begelman	training	plateforme	1	43	Arjan Pronk
40	Begelman	training	online-gambling	5	19	Arjan Pronk
41	Begelman	training	outils-20-en-francais	5	167	Arjan Pronk
42	Begelman	training	processus-creatif	1	31	Arjan Pronk
43	Begelman	training	vj-tools	5	16	Arjan Pronk
44	Begelman	training	vj-software-list-	5	28	Arjan Pronk
45	Begelman	training	awara	1	87	Arjan Pronk
46	Begelman	training	video-mapping-software	5	123	Arjan Pronk
47	Begelman	javaee	servlets	5	100	Bauke Scholtz
48	Begelman	javaee	general-java-ee-articles	4	30	Bauke Scholtz
49	Begelman	javaee	jsf	4	350	Bauke Scholtz
50	Begelman	javaee	troubleshooting	3	28	Bauke Scholtz
51	Begelman	javaee	articles	3	34	Bauke Scholtz
52	Begelman	javaee	javaee7	5	272	Bauke Scholtz
53	Begelman	javaee	jaspic	4	81	Bauke Scholtz
54	Begelman	javaee	gof-design-patterns	4	102	Bauke Scholtz
55	Begelman	javaee	glassfish	4	63	Bauke Scholtz
56	Begelman	javaee	javaee8	5	160	Bauke Scholtz
57	Begelman	java	javaee7	4	491	Bauke Scholtz
58	Begelman	java	jsf	4	482	Bauke Scholtz
59	Begelman	java	j2ee	4	281	Bauke Scholtz
60	Begelman	java	language	3	393	Bauke Scholtz

61	Begelman	java	junit	4	281	Bauke Scholtz
62	Begelman	java	springframework	4	385	Bauke Scholtz
63	Begelman	java	spring	4	281	Bauke Scholtz
64	Begelman	java	webapp	4	281	Bauke Scholtz
65	Begelman	java	jvm	5	295	Bauke Scholtz
66	Begelman	java	development	4	670	Bauke Scholtz
67	Begelman	caribbean	hotels	4	16	Bauke Scholtz
68	Begelman	caribbean	malls/supermarkets/stores	3	16	Bauke Scholtz
69	Begelman	caribbean	san-pedro-hostel	3	15	Bauke Scholtz
70	Begelman	caribbean	bonaire	5	35	Bauke Scholtz
71	Begelman	caribbean	culture/nature/entertainment	3	18	Bauke Scholtz
72	Begelman	caribbean	scuba-diving	5	13	Bauke Scholtz
73	Begelman	caribbean	belize	5	32	Bauke Scholtz
74	Begelman	caribbean	curacao	5	271	Bauke Scholtz
75	Begelman	caribbean	aruba	5	116	Bauke Scholtz
76	Begelman	caribbean	restaurants	4	15	Bauke Scholtz
77	Begelman	martial-arts	schools-(amsterdam-area)	3	6	Bauke Scholtz
78	Begelman	martial-arts	movie-actors	4	5	Bauke Scholtz
79	Begelman	martial-arts	karate-kid-movies	5	5	Bauke Scholtz
80	Begelman	martial-arts	styles	4	16	Bauke Scholtz
81	Begelman	martial-arts	terms	4	8	Bauke Scholtz
82	Begelman	martial-arts	youtube	3	6	Bauke Scholtz
83	Begelman	martial-arts	karate	5	59	Bauke Scholtz
84	Begelman	development	react	3	720	Dennis Brouwer
85	Begelman	development	game-development	4	1498	Dennis Brouwer
86	Begelman	development	springframework	4	385	Dennis Brouwer
87	Begelman	development	scala	4	646	Dennis Brouwer
88	Begelman	development	javascript	4	440	Dennis Brouwer
89	Begelman	development	jsf	4	482	Dennis Brouwer
90	Begelman	development	java	4	670	Dennis Brouwer
91	Begelman	development	javaee7	4	491	Dennis Brouwer
92	Begelman	development	web-development	4	434	Dennis Brouwer
93	Begelman	development	free-programming-books	4	897	Dennis Brouwer
94	Begelman	database	postgresql	5	96	Dennis Brouwer
95	Begelman	database	mongodb	5	40	Dennis Brouwer
96	Begelman	database	rethinkdb	4	35	Dennis Brouwer
97	Begelman	database	awesome-awesomeness	1	30	Dennis Brouwer
98	Begelman	database	language	2	23	Dennis Brouwer
99	Begelman	database	data-banks	3	37	Dennis Brouwer
100	Begelman	database	couchdb	4	22	Dennis Brouwer
101	Begelman	database	oracle-cloud	4	31	Dennis Brouwer
102	Begelman	database	development	3	30	Dennis Brouwer
103	Begelman	database	information-scientifique	2	144	Dennis Brouwer
104	Begelman	racing	f1-teams	5	11	Jan Beernink
105	Begelman	racing	european-lemans-teams-2014	4	26	Jan Beernink
106	Begelman	racing	autosport	5	127	Jan Beernink
107	Begelman	racing	2015-races	4	19	Jan Beernink
108	Begelman	racing	racing-series	5	15	Jan Beernink
109	Begelman	racing	v8-supercars-teams	4	18	Jan Beernink
110	Begelman	racing	nascar-teams	4	20	Jan Beernink
111	Begelman	racing	ferrari	4	11	Jan Beernink
112	Begelman	racing	formula1	5	131	Jan Beernink
113	Begelman	racing	blancpain-gt-series-teams	4	26	Jan Beernink
114	Begelman	git	tools	4	30	Jan Beernink
115	Begelman	git	awesome-awesomeness	1	18	Jan Beernink
116	Begelman	git	scm	5	30	Jan Beernink
117	Begelman	git	repository-hosting	4	3	Jan Beernink
118	Begelman	git	technology	4	18	Jan Beernink
119	Begelman	git	gui-clients	5	4	Jan Beernink
120	Begelman	git	why-git?	5	3	Jan Beernink
121	Begelman	git	how-to	4	7	Jan Beernink
122	Begelman	git	learn-git	5	5	Jan Beernink
123	Begelman	git	development	5	48	Jan Beernink
124	Begelman	apps	iphone-apps	5	105	Jan Beernink
125	Begelman	apps	iamreporter	1	368	Jan Beernink
126	Begelman	apps	android-apps	5	201	Jan Beernink
127	Begelman	apps	ios-games	5	170	Jan Beernink
128	Begelman	apps	education-apps-for-kids	4	323	Jan Beernink
129	Begelman	apps	mac-productivity-tools	4	117	Jan Beernink
130	Begelman	apps	energy-startups	1	90	Jan Beernink
131	Begelman	apps	ipad-apps	5	561	Jan Beernink
132	Begelman	apps	top-100-notebook-ipad-apps	5	104	Jan Beernink
133	Begelman	apps	social-learning	4	208	Jan Beernink
134	Begelman	java	webapp	5	281	Jan Beernink
135	Begelman	java	jvm	5	295	Jan Beernink
136	Begelman	java	code	5	281	Jan Beernink

137	Begelman	java	jsf	4	482	Jan Beernink
138	Begelman	java	javaee7	5	491	Jan Beernink
139	Begelman	java	j2ee	5	281	Jan Beernink
140	Begelman	java	springframework	4	385	Jan Beernink
141	Begelman	java	junit	5	281	Jan Beernink
142	Begelman	java	development	5	670	Jan Beernink
143	Begelman	java	language	4	393	Jan Beernink
144	Begelman	games	unreal-engine-4	5	181	Jan Beernink
145	Begelman	games	ios-games	5	170	Jan Beernink
146	Begelman	games	html5-game-development	5	289	Jan Beernink
147	Begelman	games	maico-girardi	1	187	Jan Beernink
148	Begelman	games	unity-game-development	5	357	Jan Beernink
149	Begelman	games	steam-games	5	198	Jan Beernink
150	Begelman	games	game-design	5	120	Jan Beernink
151	Begelman	games	daves-game-list	4	260	Jan Beernink
152	Begelman	games	game-development	5	973	Jan Beernink
153	Begelman	affiliate	affiliatewindow	4	46	Klaas Joosten
154	Begelman	affiliate	coupons	4	129	Klaas Joosten
155	Begelman	affiliate	affiliatemarketing	5	238	Klaas Joosten
156	Begelman	affiliate	shareasale	5	99	Klaas Joosten
157	Begelman	affiliate	networks—north-america	5	47	Klaas Joosten
158	Begelman	affiliate	schaaf-partnercentric	2	80	Klaas Joosten
159	Begelman	affiliate	affiliatesummit	5	41	Klaas Joosten
160	Begelman	affiliate	paypro	3	76	Klaas Joosten
161	Begelman	affiliate	geno-prussakov	5	57	Klaas Joosten
162	Begelman	affiliate	cj	4	79	Klaas Joosten
163	Begelman	bookmarking	archive-of-tomorrow	2	175	Klaas Joosten
164	Begelman	bookmarking	web	4	63	Klaas Joosten
165	Begelman	bookmarking	virtual-gadgets	1	32	Klaas Joosten
166	Begelman	bookmarking	technology	3	67	Klaas Joosten
167	Begelman	bookmarking	tools	4	17	Klaas Joosten
168	Begelman	bookmarking	social	4	58	Klaas Joosten
169	Begelman	bookmarking	movies-&-tv	1	12	Klaas Joosten
170	Begelman	bookmarking	online-knowledge-&-learning	4	23	Klaas Joosten
171	Begelman	bookmarking	links	5	11	Klaas Joosten
172	Begelman	bookmarking	marketing	3	10	Klaas Joosten
173	Begelman	startup	red-herring	4	273	Klaas Joosten
174	Begelman	startup	startup-tools	5	407	Klaas Joosten
175	Begelman	startup	websummit-2014-startups	5	1927	Klaas Joosten
176	Begelman	startup	startupeu	3	510	Klaas Joosten
177	Begelman	startup	invision	2	273	Klaas Joosten
178	Begelman	startup	startupresources	5	394	Klaas Joosten
179	Begelman	startup	resources	5	486	Klaas Joosten
180	Begelman	startup	growth-hacking	5	326	Klaas Joosten
181	Begelman	startup	techcrunchdisrupt	5	413	Klaas Joosten
182	Begelman	startup	startuptools	5	368	Klaas Joosten
183	Begelman	search	search-engines	5	163	Klaas Joosten
184	Begelman	search	top-sites-fr	3	234	Klaas Joosten
185	Begelman	search	ranking-factors	5	32	Klaas Joosten
186	Begelman	search	recherche-internet	4	62	Klaas Joosten
187	Begelman	search	enterprise-content-management	4	71	Klaas Joosten
188	Begelman	search	geographically-limited	4	23	Klaas Joosten
189	Begelman	search	zoekmachine-marketing	5	38	Klaas Joosten
190	Begelman	search	google	4	103	Klaas Joosten
191	Begelman	search	content-management	4	142	Klaas Joosten
192	Begelman	search	promomasters	1	21	Klaas Joosten
193	Begelman	deeplinks	affiliate-software	4	8	Klaas Joosten
194	Begelman	deeplinks	buy-traffic	4	14	Klaas Joosten
195	Begelman	deeplinks	networks—europe	2	16	Klaas Joosten
196	Begelman	deeplinks	rating-affiliate-networks	3	11	Klaas Joosten
197	Begelman	deeplinks	data-feed-for-publishers	4	14	Klaas Joosten
198	Begelman	deeplinks	networks—north-america	3	47	Klaas Joosten
199	Begelman	deeplinks	affiliate-network-aggregators	4	10	Klaas Joosten
200	Begelman	deeplinks	conferences	3	9	Klaas Joosten
201	Begelman	deeplinks	affiliatemarketing	3	238	Klaas Joosten
202	Begelman	creativity	coffee-and-your-scratchbook	4	11	Marina Astudillo
203	Begelman	creativity	advertising-agencies	4	18	Marina Astudillo
204	Begelman	creativity	technology	3	10	Marina Astudillo
205	Begelman	creativity	awesome-websites	4	43	Marina Astudillo
206	Begelman	creativity	advertising	5	107	Marina Astudillo
207	Begelman	creativity	educational	2	11	Marina Astudillo
208	Begelman	creativity	design-sites	5	12	Marina Astudillo
209	Begelman	creativity	video	3	10	Marina Astudillo
210	Begelman	creativity	useful	4	15	Marina Astudillo
211	Begelman	creativity	graphic-designers	5	13	Marina Astudillo
212	Begelman	backpacking	gear	4	10	Marina Astudillo

213	Begelman	backpacking	transport	4	9	Marina Astudillo
214	Begelman	backpacking	backpacking-europe	5	88	Marina Astudillo
215	Begelman	backpacking	cheap-flights	5	13	Marina Astudillo
216	Begelman	backpacking	smart-sightseeing	5	9	Marina Astudillo
217	Begelman	backpacking	backpacking-east-coast-australia	5	179	Marina Astudillo
218	Begelman	backpacking	essential-gear	5	12	Marina Astudillo
219	Begelman	backpacking	key-places-to-visit	5	15	Marina Astudillo
220	Begelman	backpacking	travel	5	95	Marina Astudillo
221	Begelman	backpacking	travel-guides	5	17	Marina Astudillo
222	Begelman	art	fractals-and-mathematical-art	4	151	Marina Astudillo
223	Begelman	art	burgers	2	314	Marina Astudillo
224	Begelman	art	reggae	3	116	Marina Astudillo
225	Begelman	art	gypsy-jazz	4	124	Marina Astudillo
226	Begelman	art	itunes-top-songs	3	346	Marina Astudillo
227	Begelman	art	comedy-performances	3	139	Marina Astudillo
228	Begelman	art	amsterdam-museums	5	607	Marina Astudillo
229	Begelman	art	photography	4	123	Marina Astudillo
230	Begelman	art	design	4	223	Marina Astudillo
231	Begelman	art	video-production	4	149	Marina Astudillo
232	Begelman	tapas	best-tapas	5	10	Marina Astudillo
233	Begelman	tapas	general-barcelona	4	15	Marina Astudillo
234	Begelman	tapas	where-to-eat-in-madrid	5	14	Marina Astudillo
235	Begelman	tapas	where-to-eat-in-zaragoza	5	7	Marina Astudillo
236	Begelman	tapas	eating-spain	4	43	Marina Astudillo
237	Begelman	tapas	where-to-eat-in-sevilla	5	8	Marina Astudillo
238	Begelman	tapas	barcelona	5	92	Marina Astudillo
239	Begelman	tapas	best-places-to-stay	1	10	Marina Astudillo
240	Begelman	tapas	eating-in-valencia	4	10	Marina Astudillo
241	Begelman	tapas	best-clubs	2	10	Marina Astudillo
242	Begelman	shopping	bikinis	4	208	Marina Astudillo
243	Begelman	shopping	sneakers	4	375	Marina Astudillo
244	Begelman	shopping	amazon	4	149	Marina Astudillo
245	Begelman	shopping	gifts	4	142	Marina Astudillo
246	Begelman	shopping	coupons	5	133	Marina Astudillo
247	Begelman	shopping	top-sites-fr	3	234	Marina Astudillo
248	Begelman	shopping	watches	4	226	Marina Astudillo
249	Begelman	shopping	fashion-for-women	5	145	Marina Astudillo
250	Begelman	shopping	kindermeebelen	2	144	Marina Astudillo
251	Begelman	shopping	mensclothing	4	128	Marina Astudillo
252	Begelman	design	ouils-graphiques	5	176	Marina Polovinchuk
253	Begelman	design	invision	5	273	Marina Polovinchuk
254	Begelman	design	photoshop-video-tutorials	5	168	Marina Polovinchuk
255	Begelman	design	web-design-tools	5	241	Marina Polovinchuk
256	Begelman	design	web-development	4	133	Marina Polovinchuk
257	Begelman	design	ux	5	397	Marina Polovinchuk
258	Begelman	design	sketch	5	180	Marina Polovinchuk
259	Begelman	design	game-development	4	287	Marina Polovinchuk
260	Begelman	design	unity-game-development	2	152	Marina Polovinchuk
261	Begelman	design	art	5	223	Marina Polovinchuk
262	Begelman	technology	contentcuration	3	1273	Marina Polovinchuk
263	Begelman	technology	web-publishing	4	478	Marina Polovinchuk
264	Begelman	technology	zeef	5	624	Marina Polovinchuk
265	Begelman	technology	marketing-technology-landscape	5	1840	Marina Polovinchuk
266	Begelman	technology	linux	5	571	Marina Polovinchuk
267	Begelman	technology	wordpress	5	423	Marina Polovinchuk
268	Begelman	technology	online-collaboration-tools	5	614	Marina Polovinchuk
269	Begelman	technology	ipad-apps	5	561	Marina Polovinchuk
270	Begelman	technology	mlearning	2	819	Marina Polovinchuk
271	Begelman	technology	free-programming-books	5	897	Marina Polovinchuk
272	Begelman	ukraine	social-media	3	6	Marina Polovinchuk
273	Begelman	ukraine	hotels	5	6	Marina Polovinchuk
274	Begelman	ukraine	memberships	2	10	Marina Polovinchuk
275	Begelman	ukraine	travel	5	23	Marina Polovinchuk
276	Begelman	ukraine	country	5	23	Marina Polovinchuk
277	Begelman	ukraine	legal-services	2	13	Marina Polovinchuk
278	Begelman	ukraine	business-media	2	6	Marina Polovinchuk
279	Begelman	ukraine	awara	2	87	Marina Polovinchuk
280	Begelman	ukraine	europe	4	28	Marina Polovinchuk
281	Begelman	ukraine	it-solutions	3	11	Marina Polovinchuk
282	Begelman	startup	websummit-2014-startups	5	1927	Marina Polovinchuk
283	Begelman	startup	invision	4	273	Marina Polovinchuk
284	Begelman	startup	red-herring	2	273	Marina Polovinchuk
285	Begelman	startup	startupresources	5	394	Marina Polovinchuk
286	Begelman	startup	startuptools	5	368	Marina Polovinchuk
287	Begelman	startup	startupeu	5	510	Marina Polovinchuk
288	Begelman	startup	resources	5	486	Marina Polovinchuk

289	Begelman	startup	growth-hacking	5	326	Marina Polovinchuk
290	Begelman	startup	techcrunchdisrupt	5	413	Marina Polovinchuk
291	Begelman	startup	startup-tools	5	407	Marina Polovinchuk
292	Begelman	software	open-source-software	5	229	Marina Polovinchuk
293	Begelman	software	blender	2	91	Marina Polovinchuk
294	Begelman	software	invision	3	273	Marina Polovinchuk
295	Begelman	software	crm	5	135	Marina Polovinchuk
296	Begelman	software	sketch	5	180	Marina Polovinchuk
297	Begelman	software	library	5	77	Marina Polovinchuk
298	Begelman	software	after-effects-resources	5	77	Marina Polovinchuk
299	Begelman	software	top-tools-2014	4	96	Marina Polovinchuk
300	Begelman	software	all-systems	4	86	Marina Polovinchuk
301	Begelman	marketing	content-marketing	2	435	Menno Kolkert
302	Begelman	marketing	contentcuration	2	1273	Menno Kolkert
303	Begelman	marketing	growth-hacking	4	288	Menno Kolkert
304	Begelman	marketing	searchengineoptimization	2	405	Menno Kolkert
305	Begelman	marketing	startup-tools	4	406	Menno Kolkert
306	Begelman	marketing	marketing-technology-landscape	5	1840	Menno Kolkert
307	Begelman	marketing	market-research-in-africa	2	254	Menno Kolkert
308	Begelman	marketing	online-marketing-tools	4	265	Menno Kolkert
309	Begelman	marketing	nederlands-media-netwerk	3	445	Menno Kolkert
310	Begelman	marketing	web-publishing	2	475	Menno Kolkert
311	Begelman	mobile	mobile-marketing	5	99	Menno Kolkert
312	Begelman	mobile	marketing-technology-landscape	4	1840	Menno Kolkert
313	Begelman	mobile	iphone-apps	5	105	Menno Kolkert
314	Begelman	mobile	ios-games	5	170	Menno Kolkert
315	Begelman	mobile	content-marketing	4	372	Menno Kolkert
316	Begelman	mobile	android-apps	5	104	Menno Kolkert
317	Begelman	mobile	social-media-marketing	4	111	Menno Kolkert
318	Begelman	mobile	ios-development	5	113	Menno Kolkert
319	Begelman	mobile	mobile-security	5	225	Menno Kolkert
320	Begelman	mobile	android-security-and-malware	5	139	Menno Kolkert
321	Begelman	technology	marketing-technology-landscape	4	1840	Menno Kolkert
322	Begelman	technology	ipad-apps	4	561	Menno Kolkert
323	Begelman	technology	zeef	3	624	Menno Kolkert
324	Begelman	technology	free-programming-books	4	897	Menno Kolkert
325	Begelman	technology	contentcuration	4	1273	Menno Kolkert
326	Begelman	technology	web-publishing	4	478	Menno Kolkert
327	Begelman	technology	linux	5	571	Menno Kolkert
328	Begelman	technology	online-collaboration-tools	4	614	Menno Kolkert
329	Begelman	technology	wordpress	4	423	Menno Kolkert
330	Begelman	technology	mllearning	5	819	Menno Kolkert
331	Begelman	volvoceanrace	race-news	4	4	Olivier Ozinga
332	Begelman	volvoceanrace	sponsors	4	9	Olivier Ozinga
333	Begelman	volvoceanrace	abu-dhabi-ocean-racing	4	5	Olivier Ozinga
334	Begelman	volvoceanrace	vor	5	71	Olivier Ozinga
335	Begelman	volvoceanrace	team-alvimedica	5	5	Olivier Ozinga
336	Begelman	volvoceanrace	team-sca	5	7	Olivier Ozinga
337	Begelman	volvoceanrace	team-vestas-wind	5	7	Olivier Ozinga
338	Begelman	volvoceanrace	team-mapfre	5	5	Olivier Ozinga
339	Begelman	volvoceanrace	dong-feng-race-team	5	6	Olivier Ozinga
340	Begelman	volvoceanrace	team-brunel	5	7	Olivier Ozinga
341	Begelman	egypt	data	1	34	Olivier Ozinga
342	Begelman	egypt	b2b	1	34	Olivier Ozinga
343	Begelman	egypt	elgouna	5	32	Olivier Ozinga
344	Begelman	egypt	media	1	106	Olivier Ozinga
345	Begelman	egypt	consumer	1	34	Olivier Ozinga
346	Begelman	egypt	market	1	34	Olivier Ozinga
347	Begelman	egypt	africa	4	169	Olivier Ozinga
348	Begelman	egypt	marketing	1	108	Olivier Ozinga
349	Begelman	egypt	research	1	34	Olivier Ozinga
350	Begelman	egypt	business	1	83	Olivier Ozinga
351	Begelman	amsterdam	de-grachten	4	687	Rick Boerebach
352	Begelman	amsterdam	brewery	2	204	Rick Boerebach
353	Begelman	amsterdam	iamsterdam	5	204	Rick Boerebach
354	Begelman	amsterdam	tips	4	204	Rick Boerebach
355	Begelman	amsterdam	netherlands	4	335	Rick Boerebach
356	Begelman	amsterdam	burgers	1	314	Rick Boerebach
357	Begelman	amsterdam	canals	5	204	Rick Boerebach
358	Begelman	amsterdam	amsterdam-museums	5	607	Rick Boerebach
359	Begelman	amsterdam	travel	4	335	Rick Boerebach
360	Begelman	amsterdam	bitterballen	2	204	Rick Boerebach
361	Begelman	space	must-see	1	14	Rick Boerebach
362	Begelman	space	spaceflight	5	71	Rick Boerebach
363	Begelman	space	applicants-&-supporters	1	19	Rick Boerebach
364	Begelman	space	marsone	4	98	Rick Boerebach

365	Begelman	space	internationalspacestation	4	98	Rick Boerebach
366	Begelman	space	advisers	1	23	Rick Boerebach
367	Begelman	space	spacex	5	49	Rick Boerebach
368	Begelman	space	iss-accidents	5	14	Rick Boerebach
369	Begelman	space	aspiring-martians	5	76	Rick Boerebach
370	Begelman	space	news	1	18	Rick Boerebach
371	Begelman	netherlands	soest	2	310	Rick Boerebach
372	Begelman	netherlands	eemnes	2	141	Rick Boerebach
373	Begelman	netherlands	escape-rooms	2	144	Rick Boerebach
374	Begelman	netherlands	amsterdam	5	335	Rick Boerebach
375	Begelman	netherlands	apeldoorn	2	170	Rick Boerebach
376	Begelman	netherlands	dutch-start-ups	4	263	Rick Boerebach
377	Begelman	netherlands	bunschoten-spakenburg	4	166	Rick Boerebach
378	Begelman	netherlands	amersfoort	4	130	Rick Boerebach
379	Begelman	netherlands	baarn	4	216	Rick Boerebach
380	Begelman	netherlands	country	5	150	Rick Boerebach
381	Begelman	zeef	arjen-van-den-brink	5	72	Rick Boerebach
382	Begelman	zeef	technology	5	624	Rick Boerebach
383	Begelman	zeef	published-widgets	1	76	Rick Boerebach
384	Begelman	zeef	similar-projects	1	70	Rick Boerebach
385	Begelman	zeef	zeef-company-pages	4	234	Rick Boerebach
386	Begelman	zeef	golden-zeef-award	5	85	Rick Boerebach
387	Begelman	zeef	company	5	624	Rick Boerebach
388	Begelman	zeef	zeef-blog	4	69	Rick Boerebach
389	Begelman	zeef	tnw-hackbattle	4	136	Rick Boerebach
390	Begelman	zeef	fridovandriem	5	139	Rick Boerebach
391	Begelman	marketing	growth-hacking	5	288	Rick Boerebach
392	Begelman	marketing	market-research-in-africa	3	254	Rick Boerebach
393	Begelman	marketing	contentcuration	4	1273	Rick Boerebach
394	Begelman	marketing	content-marketing	5	435	Rick Boerebach
395	Begelman	marketing	web-publishing	5	475	Rick Boerebach
396	Begelman	marketing	nederlands-media-netwerk	3	445	Rick Boerebach
397	Begelman	marketing	marketing-technology-landscape	4	1840	Rick Boerebach
398	Begelman	marketing	startup-tools	4	406	Rick Boerebach
399	Begelman	marketing	online-marketing-tools	5	265	Rick Boerebach
400	Begelman	student	eat.	5	15	Rob Thorpe
401	Begelman	student	clubs.	5	20	Rob Thorpe
402	Begelman	student	-bars.	5	16	Rob Thorpe
403	Begelman	student	shopping.	5	11	Rob Thorpe
404	Begelman	student	music-venues/gig-promoters	5	9	Rob Thorpe
405	Begelman	student	liverpool-students	5	103	Rob Thorpe
406	Begelman	student	venues.	5	7	Rob Thorpe
407	Begelman	student	manchester-freshers	5	52	Rob Thorpe
408	Begelman	student	club-nights/promoters.	5	38	Rob Thorpe
409	Begelman	student	eat/drink.	5	9	Rob Thorpe
410	Begelman	uk	uk-music-festivals	5	88	Rob Thorpe
411	Begelman	uk	top-sites-uk	5	225	Rob Thorpe
412	Begelman	uk	united-kingdom	5	128	Rob Thorpe
413	Begelman	uk	liverpool	5	162	Rob Thorpe
414	Begelman	uk	manchester	5	66	Rob Thorpe
415	Begelman	uk	liverpool-students	5	103	Rob Thorpe
416	Begelman	uk	nightlife-north-uk	5	99	Rob Thorpe
417	Begelman	uk	leeds	5	111	Rob Thorpe
418	Begelman	uk	london	5	175	Rob Thorpe
419	Begelman	uk	leeds-freshers	5	106	Rob Thorpe
420	Begelman	manchester	night-life	5	8	Rob Thorpe
421	Begelman	manchester	eat/drink.	5	9	Rob Thorpe
422	Begelman	manchester	club-nights/promoters.	5	13	Rob Thorpe
423	Begelman	manchester	venues.	5	7	Rob Thorpe
424	Begelman	manchester	music	5	29	Rob Thorpe
425	Begelman	manchester	manchester-freshers	5	52	Rob Thorpe
426	Begelman	manchester	europe	5	66	Rob Thorpe
427	Begelman	manchester	uk	5	66	Rob Thorpe
428	Begelman	manchester	travel	5	66	Rob Thorpe
429	Begelman	manchester	clubs.	5	8	Rob Thorpe
430	Begelman	travel	de-grachten	4	687	Rob Thorpe
431	Begelman	travel	soest	4	310	Rob Thorpe
432	Begelman	travel	top-sites-fr	4	234	Rob Thorpe
433	Begelman	travel	croatia	4	296	Rob Thorpe
434	Begelman	travel	stpetersburg	5	311	Rob Thorpe
435	Begelman	travel	san-diego	5	381	Rob Thorpe
436	Begelman	travel	newyork	5	254	Rob Thorpe
437	Begelman	travel	amsterdam	5	335	Rob Thorpe
438	Begelman	travel	amsterdam-museums	5	607	Rob Thorpe
439	Begelman	travel	curacao	5	271	Rob Thorpe
440	Begelman	shopping	kindermeebelen	2	144	Rob Thorpe

441	Begelman	shopping	amazon	5	149	Rob Thorpe
442	Begelman	shopping	gifts	5	142	Rob Thorpe
443	Begelman	shopping	watches	5	226	Rob Thorpe
444	Begelman	shopping	fashion-for-women	5	145	Rob Thorpe
445	Begelman	shopping	sneakers	5	375	Rob Thorpe
446	Begelman	shopping	coupons	5	133	Rob Thorpe
447	Begelman	shopping	mensclothing	5	128	Rob Thorpe
448	Begelman	shopping	top-sites-fr	4	234	Rob Thorpe
449	Begelman	shopping	bikinis	5	208	Rob Thorpe
450	Begelman	electronics	televisions	4	32	Robin Eggenkamp
451	Begelman	electronics	inspiring-projects	3	30	Robin Eggenkamp
452	Begelman	electronics	chromebook	4	172	Robin Eggenkamp
453	Begelman	electronics	carelectronics	4	54	Robin Eggenkamp
454	Begelman	electronics	rs232	4	35	Robin Eggenkamp
455	Begelman	electronics	apple	4	163	Robin Eggenkamp
456	Begelman	electronics	asus	4	111	Robin Eggenkamp
457	Begelman	electronics	drones	4	29	Robin Eggenkamp
458	Begelman	electronics	electrons	2	58	Robin Eggenkamp
459	Begelman	electronics	arduino	5	117	Robin Eggenkamp
460	Begelman	apple	ios-development	4	113	Robin Eggenkamp
461	Begelman	apple	iphone-apps	5	105	Robin Eggenkamp
462	Begelman	apple	swift	5	73	Robin Eggenkamp
463	Begelman	apple	ios-games	4	170	Robin Eggenkamp
464	Begelman	apple	iphone	5	45	Robin Eggenkamp
465	Begelman	apple	mac-productivity-tools	5	117	Robin Eggenkamp
466	Begelman	apple	company	4	163	Robin Eggenkamp
467	Begelman	apple	technology	5	163	Robin Eggenkamp
468	Begelman	apple	electronics	4	163	Robin Eggenkamp
469	Begelman	apple	apple-watch	5	60	Robin Eggenkamp
470	Begelman	zeef	tnw-hackbattle	2	136	Robin Eggenkamp
471	Begelman	zeef	golden-zeef-award	5	85	Robin Eggenkamp
472	Begelman	zeef	zeef-blog	5	69	Robin Eggenkamp
473	Begelman	zeef	company	4	624	Robin Eggenkamp
474	Begelman	zeef	zeef-company-pages	5	234	Robin Eggenkamp
475	Begelman	zeef	published-widgets	4	76	Robin Eggenkamp
476	Begelman	zeef	technology	4	624	Robin Eggenkamp
477	Begelman	zeef	similar-projects	2	70	Robin Eggenkamp
478	Begelman	zeef	arjen-van-den-brink	2	72	Robin Eggenkamp
479	Begelman	zeef	fridovandriem	4	139	Robin Eggenkamp
480	Begelman	photography	astrophotography	4	40	Robin Eggenkamp
481	Begelman	photography	fotografia	5	33	Robin Eggenkamp
482	Begelman	photography	advertising	4	107	Robin Eggenkamp
483	Begelman	photography	art	4	123	Robin Eggenkamp
484	Begelman	photography	technology	4	131	Robin Eggenkamp
485	Begelman	photography	image-hosting	4	25	Robin Eggenkamp
486	Begelman	photography	free-stock-images	4	53	Robin Eggenkamp
487	Begelman	photography	wedding-photographer	5	20	Robin Eggenkamp
488	Begelman	photography	photo-publishing	5	46	Robin Eggenkamp
489	Begelman	photography	envato	2	97	Robin Eggenkamp
490	Begelman	productivity	mac-productivity-tools	5	117	Robin Eggenkamp
491	Begelman	productivity	relevant-tutorials	3	42	Robin Eggenkamp
492	Begelman	productivity	im-launches	1	59	Robin Eggenkamp
493	Begelman	productivity	open-source-productivity	5	55	Robin Eggenkamp
494	Begelman	productivity	datapyr	2	164	Robin Eggenkamp
495	Begelman	productivity	r-language	2	138	Robin Eggenkamp
496	Begelman	productivity	technology	4	67	Robin Eggenkamp
497	Begelman	productivity	business-inspired	2	48	Robin Eggenkamp
498	Begelman	productivity	ipad-productivity-tools	5	41	Robin Eggenkamp
499	Begelman	productivity	inspiration	1	131	Robin Eggenkamp
500	Begelman	handmade	wirework	5	51	Yana Ledeneva
501	Begelman	handmade	tutorials	4	9	Yana Ledeneva
502	Begelman	handmade	social-media-groups	2	6	Yana Ledeneva
503	Begelman	handmade	inspiration	4	9	Yana Ledeneva
504	Begelman	handmade	where-to-buy-materials	5	13	Yana Ledeneva
505	Begelman	handmade	books-&-magazines	4	7	Yana Ledeneva
506	Begelman	handmade	instruments	4	3	Yana Ledeneva
507	Begelman	russia	country	5	75	Yana Ledeneva
508	Begelman	russia	embassies-in-moscow	5	85	Yana Ledeneva
509	Begelman	russia	e-commerce-russia	5	121	Yana Ledeneva
510	Begelman	russia	business-russia	5	163	Yana Ledeneva
511	Begelman	russia	russian	5	75	Yana Ledeneva
512	Begelman	russia	stpetersburg	5	311	Yana Ledeneva
513	Begelman	russia	moscow	5	62	Yana Ledeneva
514	Begelman	russia	travel	4	75	Yana Ledeneva
515	Begelman	russia	awara	2	87	Yana Ledeneva
516	Begelman	russia	european-university-st-petersburg	4	35	Yana Ledeneva

517	Begelman	jobs	insertion-professionnelle	3	184	Yana Ledeneva
518	Begelman	jobs	mes-outils-2.0	2	27	Yana Ledeneva
519	Begelman	jobs	job-in-amsterdam	5	63	Yana Ledeneva
520	Begelman	jobs	remote	4	63	Yana Ledeneva
521	Begelman	jobs	sites-emploi	4	26	Yana Ledeneva
522	Begelman	jobs	rabota	5	51	Yana Ledeneva
523	Begelman	jobs	awara	2	87	Yana Ledeneva
524	Begelman	jobs	germany-usa-career-center	5	30	Yana Ledeneva
525	Begelman	jobs	techniques-de-recherche-demploi	3	32	Yana Ledeneva
526	Begelman	jobs	job	4	27	Yana Ledeneva
527	Begelman	research	nader-ale-ebrahim-web-site	2	42	Yana Ledeneva
528	Begelman	research	market-research-in-africa	5	254	Yana Ledeneva
529	Begelman	research	military-history	4	208	Yana Ledeneva
530	Begelman	research	south-africa	3	49	Yana Ledeneva
531	Begelman	research	legal-research	5	79	Yana Ledeneva
532	Begelman	research	information-scientifique	4	144	Yana Ledeneva
533	Begelman	research	tools	4	153	Yana Ledeneva
534	Begelman	research	data-science	5	45	Yana Ledeneva
535	Begelman	research	kenya	3	43	Yana Ledeneva
536	Begelman	research	technology	3	155	Yana Ledeneva
537	Begelman	art	fractals-and-mathematical-art	4	151	Yana Ledeneva
538	Begelman	art	video-production	4	149	Yana Ledeneva
539	Begelman	art	reggae	3	116	Yana Ledeneva
540	Begelman	art	design	4	223	Yana Ledeneva
541	Begelman	art	amsterdam-museums	4	607	Yana Ledeneva
542	Begelman	art	burgers	2	314	Yana Ledeneva
543	Begelman	art	gypsy-jazz	3	124	Yana Ledeneva
544	Begelman	art	photography	5	123	Yana Ledeneva
545	Begelman	art	itunes-top-songs	3	346	Yana Ledeneva
546	Begelman	art	comedy-performances	4	139	Yana Ledeneva

Table 8: Raw experiment results for Begelman algorithm.

No.	Algorithm	Query tag	Recommended tag	Relevance	Weight	Participant
1	FolkRank	cro	contentstrategie	4	0.011014509	Arjan Pronk
2	FolkRank	cro	startup	2	0.012778749	Arjan Pronk
3	FolkRank	cro	conversion-copywriting-resources	4	0.010856098	Arjan Pronk
4	FolkRank	cro	cro-experts-(on-twitter)	5	0.010732755	Arjan Pronk
5	FolkRank	cro	conversionrateoptimization	5	0.015619993	Arjan Pronk
6	FolkRank	cro	technology	4	0.016089635	Arjan Pronk
7	FolkRank	cro	conversion-rate-optimization	5	0.033205856	Arjan Pronk
8	FolkRank	cro	growth-hacking	4	0.012578943	Arjan Pronk
9	FolkRank	cro	marketing	4	0.018041111	Arjan Pronk
10	FolkRank	cro	optimization	5	0.016823096	Arjan Pronk
11	FolkRank	poker	about	1	0.016709279	Arjan Pronk
12	FolkRank	poker	betting	5	0.00046161	Arjan Pronk
13	FolkRank	poker	offers	2	0.017259666	Arjan Pronk
14	FolkRank	tnw	event	4	0.015932661	Arjan Pronk
15	FolkRank	tnw	braintree	4	0.012812067	Arjan Pronk
16	FolkRank	tnw	tnw-hackbattle	5	0.016011498	Arjan Pronk
17	FolkRank	tnw	zeef	4	0.028612363	Arjan Pronk
18	FolkRank	tnw	nexmo	5	0.012783871	Arjan Pronk
19	FolkRank	tnw	dropbox	5	0.013235325	Arjan Pronk
20	FolkRank	tnw	overview	3	0.012788044	Arjan Pronk
21	FolkRank	tnw	python	5	0.020433837	Arjan Pronk
22	FolkRank	event	festivals	1	0.031923189	Arjan Pronk
23	FolkRank	event	zeef	3	0.033575166	Arjan Pronk
24	FolkRank	event	startup	4	0.035364608	Arjan Pronk
25	FolkRank	event	holiday	4	0.024947288	Arjan Pronk
26	FolkRank	event	wordpress	3	0.030891947	Arjan Pronk
27	FolkRank	event	event-management	5	0.023913106	Arjan Pronk
28	FolkRank	event	halloween	1	0.024548041	Arjan Pronk
29	FolkRank	event	dutchstartupevents	4	0.0267872	Arjan Pronk
30	FolkRank	event	christmas	1	0.040618217	Arjan Pronk
31	FolkRank	event	south-by-southwest-interactive	4	0.031082655	Arjan Pronk
32	FolkRank	kids	brieven-aan-mijn-dochters	2	0.015963279	Arjan Pronk
33	FolkRank	kids	opvoeden	5	0.01789456	Arjan Pronk
34	FolkRank	kids	lego	5	0.019325152	Arjan Pronk
35	FolkRank	kids	tattoos-(afwasbaar--))	4	0.016117781	Arjan Pronk
36	FolkRank	kids	kindermeubelen	5	0.019777355	Arjan Pronk
37	FolkRank	kids	digikids	5	0.015808776	Arjan Pronk
38	FolkRank	kids	shopping	5	0.01997348	Arjan Pronk
39	FolkRank	kids	toys	5	0.019755532	Arjan Pronk

40	FolkRank	kids	parenting	5	0.01820529	Arjan Pronk
41	FolkRank	kids	furniture	5	0.019915936	Arjan Pronk
42	FolkRank	training	processus-creatif	1	0.033666052	Arjan Pronk
43	FolkRank	training	innovation	1	0.023406731	Arjan Pronk
44	FolkRank	training	m?tier-formateur	3	0.023175216	Arjan Pronk
45	FolkRank	training	intacct	1	0.032227001	Arjan Pronk
46	FolkRank	training	plateforme	5	0.024547507	Arjan Pronk
47	FolkRank	training	company	1	0.031258526	Arjan Pronk
48	FolkRank	training	education	5	0.024877885	Arjan Pronk
49	FolkRank	training	classes	5	0.024573227	Arjan Pronk
50	FolkRank	training	la-formation-a-distance	5	0.024402069	Arjan Pronk
51	FolkRank	training	effective-presentations	5	0.024573227	Arjan Pronk
52	FolkRank	javaee	java	5	0.023969137	Bauke Scholtz
53	FolkRank	javaee	mvc	4	0.018684528	Bauke Scholtz
54	FolkRank	javaee	glassfish	4	0.018651461	Bauke Scholtz
55	FolkRank	javaee	jsf	4	0.023417064	Bauke Scholtz
56	FolkRank	javaee	javaee7	5	0.01376372	Bauke Scholtz
57	FolkRank	javaee	framework	3	0.014435296	Bauke Scholtz
58	FolkRank	javaee	development	5	0.022749244	Bauke Scholtz
59	FolkRank	javaee	javaee8	5	0.014680653	Bauke Scholtz
60	FolkRank	javaee	tomee	4	0.015011715	Bauke Scholtz
61	FolkRank	javaee	related-zeef-pages	4	0.01360728	Bauke Scholtz
62	FolkRank	java	javafx	4	0.03287926	Bauke Scholtz
63	FolkRank	java	advanced-coding	4	0.025505555	Bauke Scholtz
64	FolkRank	java	springframework	4	0.023792375	Bauke Scholtz
65	FolkRank	java	outsourcing	3	0.046705786	Bauke Scholtz
66	FolkRank	java	technology	4	0.020306071	Bauke Scholtz
67	FolkRank	java	liferay	4	0.023454694	Bauke Scholtz
68	FolkRank	java	javaee8	5	0.024533612	Bauke Scholtz
69	FolkRank	java	jsf	4	0.026538141	Bauke Scholtz
70	FolkRank	java	hibernate-framework	4	0.024145313	Bauke Scholtz
71	FolkRank	java	development	4	0.028942174	Bauke Scholtz
72	FolkRank	caribbean	curacao	5	0.012886624	Bauke Scholtz
73	FolkRank	caribbean	antilles	5	0.010909858	Bauke Scholtz
74	FolkRank	caribbean	america	4	0.011037257	Bauke Scholtz
75	FolkRank	caribbean	secondary/middle-schools	3	0.006846123	Bauke Scholtz
76	FolkRank	caribbean	primary/elementary-schools	3	0.006851894	Bauke Scholtz
77	FolkRank	caribbean	hotels	4	0.006550904	Bauke Scholtz
78	FolkRank	caribbean	island	5	0.01099115	Bauke Scholtz
79	FolkRank	caribbean	diving	5	0.006365859	Bauke Scholtz
80	FolkRank	caribbean	travel	4	0.00983077	Bauke Scholtz
81	FolkRank	caribbean	academy/high-schools	3	0.008718866	Bauke Scholtz
82	FolkRank	martial-arts	schools-(amsterdam-area)	4	0.015429153	Bauke Scholtz
83	FolkRank	martial-arts	sport	5	0.016425302	Bauke Scholtz
84	FolkRank	martial-arts	karate	5	0.0165485	Bauke Scholtz
85	FolkRank	martial-arts	terms	4	0.015510577	Bauke Scholtz
86	FolkRank	martial-arts	about	4	0.015005581	Bauke Scholtz
87	FolkRank	martial-arts	books	4	0.015096068	Bauke Scholtz
88	FolkRank	martial-arts	karate-kid-movies	4	0.015448586	Bauke Scholtz
89	FolkRank	martial-arts	youtube	3	0.015304217	Bauke Scholtz
90	FolkRank	martial-arts	styles	4	0.015675886	Bauke Scholtz
91	FolkRank	martial-arts	movie-actors	4	0.015448586	Bauke Scholtz
92	FolkRank	zeef	python	4	0.020433837	Bauke Scholtz
93	FolkRank	development	cpp	3	0.037377152	Dennis Brouwer
94	FolkRank	development	java	4	0.047307093	Dennis Brouwer
95	FolkRank	development	rubyonrails	4	0.039639481	Dennis Brouwer
96	FolkRank	development	perl	4	0.038104223	Dennis Brouwer
97	FolkRank	development	algorithms	4	0.032719355	Dennis Brouwer
98	FolkRank	development	python	4	0.036614684	Dennis Brouwer
99	FolkRank	development	javascript	4	0.045848097	Dennis Brouwer
100	FolkRank	development	javafx	4	0.03287926	Dennis Brouwer
101	FolkRank	development	agile	4	0.051299971	Dennis Brouwer
102	FolkRank	development	clojure	4	0.039008696	Dennis Brouwer
103	FolkRank	database	postgresql	5	0.024448177	Dennis Brouwer
104	FolkRank	database	rethinkdb	4	0.032631821	Dennis Brouwer
105	FolkRank	database	startup	2	0.037444024	Dennis Brouwer
106	FolkRank	database	books,-guides-and-documentation	3	0.016727774	Dennis Brouwer
107	FolkRank	database	datab	1	0.019649271	Dennis Brouwer
108	FolkRank	database	couchdb	4	0.019649271	Dennis Brouwer
109	FolkRank	database	development	3	0.023712626	Dennis Brouwer
110	FolkRank	database	technology	3	0.020540686	Dennis Brouwer
111	FolkRank	database	mongodb	4	0.018831056	Dennis Brouwer
112	FolkRank	database	outsourcing	2	0.046709827	Dennis Brouwer
113	FolkRank	racing	malaysia	4	0.008702775	Jan Beernink
114	FolkRank	racing	asia	3	0.00888564	Jan Beernink
115	FolkRank	racing	malay	2	0.008659579	Jan Beernink

116	FolkRank	racing	sport	4	0.016896906	Jan Beernink
117	FolkRank	racing	formula1	5	0.014928602	Jan Beernink
118	FolkRank	racing	2015-teams-and-drivers	4	0.012429376	Jan Beernink
119	FolkRank	racing	2015-races	5	0.012606728	Jan Beernink
120	FolkRank	racing	2014-teams	4	0.012206473	Jan Beernink
121	FolkRank	racing	country	1	0.008865242	Jan Beernink
122	FolkRank	racing	autosport	5	0.02662091	Jan Beernink
123	FolkRank	git	gui-clients	4	0.01023072	Jan Beernink
124	FolkRank	git	tools-&-extensions	4	0.01021447	Jan Beernink
125	FolkRank	git	development	5	0.01181841	Jan Beernink
126	FolkRank	git	download-git	5	0.01021447	Jan Beernink
127	FolkRank	git	learn-git	5	0.010307748	Jan Beernink
128	FolkRank	git	how-to	4	0.010366223	Jan Beernink
129	FolkRank	git	scm	5	0.011044341	Jan Beernink
130	FolkRank	git	books	4	0.01035591	Jan Beernink
131	FolkRank	git	why-git?	5	0.010245562	Jan Beernink
132	FolkRank	git	tools	4	0.010302397	Jan Beernink
133	FolkRank	apps	education	1	0.015126163	Jan Beernink
134	FolkRank	apps	tools	4	0.014842926	Jan Beernink
135	FolkRank	apps	afvallen	2	0.02062311	Jan Beernink
136	FolkRank	apps	social-learning	4	0.014880405	Jan Beernink
137	FolkRank	apps	newreporter	1	0.014317176	Jan Beernink
138	FolkRank	apps	newmedia	1	0.014317176	Jan Beernink
139	FolkRank	apps	iamreporter	1	0.014317176	Jan Beernink
140	FolkRank	apps	running	3	0.015411247	Jan Beernink
141	FolkRank	apps	learning	3	0.01512239	Jan Beernink
142	FolkRank	apps	sport	3	0.018974315	Jan Beernink
143	FolkRank	java	outsourcing	3	0.046705786	Jan Beernink
144	FolkRank	java	jsf	5	0.026538141	Jan Beernink
145	FolkRank	java	technology	4	0.020306071	Jan Beernink
146	FolkRank	java	hibernate-framework	4	0.024145313	Jan Beernink
147	FolkRank	java	liferay	4	0.023454694	Jan Beernink
148	FolkRank	java	javaee8	5	0.024533612	Jan Beernink
149	FolkRank	java	javafx	5	0.03287926	Jan Beernink
150	FolkRank	java	advanced-coding	4	0.025505555	Jan Beernink
151	FolkRank	java	springframework	4	0.023792375	Jan Beernink
152	FolkRank	java	development	5	0.028942174	Jan Beernink
153	FolkRank	games	technology	4	0.021162887	Jan Beernink
154	FolkRank	games	mmorpg	5	0.019443442	Jan Beernink
155	FolkRank	games	dungeons-and-dragons-online	5	0.032840043	Jan Beernink
156	FolkRank	games	kingdom-hearts	5	0.024306128	Jan Beernink
157	FolkRank	games	development	4	0.022490988	Jan Beernink
158	FolkRank	games	kids	4	0.019253623	Jan Beernink
159	FolkRank	games	game-development	5	0.022909851	Jan Beernink
160	FolkRank	games	wordfeud	5	0.024178428	Jan Beernink
161	FolkRank	games	mobile	4	0.024516067	Jan Beernink
162	FolkRank	games	shopping	4	0.023065701	Jan Beernink
163	FolkRank	affiliate	schaaf-partnercentric	2	0.02427152	Klaas Joosten
164	FolkRank	affiliate	shopping	4	0.020394194	Klaas Joosten
165	FolkRank	affiliate	personal	1	0.02339584	Klaas Joosten
166	FolkRank	affiliate	clothing,-apparel-and-accessories	3	0.016605205	Klaas Joosten
167	FolkRank	affiliate	discount	4	0.019117355	Klaas Joosten
168	FolkRank	affiliate	shareasale	5	0.016609001	Klaas Joosten
169	FolkRank	affiliate	wilreynolds	4	0.018795343	Klaas Joosten
170	FolkRank	affiliate	company	3	0.023245328	Klaas Joosten
171	FolkRank	affiliate	geno-prussakov	4	0.018542434	Klaas Joosten
172	FolkRank	affiliate	marketing	4	0.018230308	Klaas Joosten
173	FolkRank	bookmarking	technology	3	0.009765351	Klaas Joosten
174	FolkRank	bookmarking	about	1	0.00983704	Klaas Joosten
175	FolkRank	bookmarking	movies	1	0.008927742	Klaas Joosten
176	FolkRank	bookmarking	social-media	3	0.007449946	Klaas Joosten
177	FolkRank	bookmarking	shopping	3	0.01265995	Klaas Joosten
178	FolkRank	bookmarking	discount	3	0.007069204	Klaas Joosten
179	FolkRank	bookmarking	web	5	0.010850629	Klaas Joosten
180	FolkRank	bookmarking	company	3	0.006223677	Klaas Joosten
181	FolkRank	bookmarking	social	3	0.0124158	Klaas Joosten
182	FolkRank	bookmarking	zeef	4	0.016731908	Klaas Joosten
183	FolkRank	startup	innovatie-jonge-ondernemingen	5	0.034037455	Klaas Joosten
184	FolkRank	startup	dutchstartupevents	4	0.0267872	Klaas Joosten
185	FolkRank	startup	vmh-digital	3	0.036568007	Klaas Joosten
186	FolkRank	startup	privacy	3	0.025738246	Klaas Joosten
187	FolkRank	startup	design	2	0.033379016	Klaas Joosten
188	FolkRank	startup	event	4	0.027656758	Klaas Joosten
189	FolkRank	startup	entrepreneur	5	0.02571645	Klaas Joosten
190	FolkRank	startup	productivity	3	0.026558547	Klaas Joosten
191	FolkRank	startup	rockstarsonly	2	0.031584038	Klaas Joosten

192	FolkRank	startup	crowdfunding	5	0.028647979	Klaas Joosten
193	FolkRank	search	promomasters	1	0.018890593	Klaas Joosten
194	FolkRank	search	communication	3	0.019445776	Klaas Joosten
195	FolkRank	search	google	5	0.027691287	Klaas Joosten
196	FolkRank	search	marketing	4	0.021301358	Klaas Joosten
197	FolkRank	search	shopping	3	0.023315271	Klaas Joosten
198	FolkRank	search	gerrit-visser	2	0.02077947	Klaas Joosten
199	FolkRank	search	top-sites-usa	3	0.020882798	Klaas Joosten
200	FolkRank	search	usa	2	0.022583196	Klaas Joosten
201	FolkRank	search	personal	3	0.020446127	Klaas Joosten
202	FolkRank	search	search-engines	5	0.024958245	Klaas Joosten
203	FolkRank	deeplinks	clicks	4	0.00632904	Klaas Joosten
204	FolkRank	deeplinks	sky-offers	1	0.006406317	Klaas Joosten
205	FolkRank	deeplinks	affiliate	3	0.010922586	Klaas Joosten
206	FolkRank	deeplinks	zeef	3	0.012241434	Klaas Joosten
207	FolkRank	deeplinks	games	1	0.007117311	Klaas Joosten
208	FolkRank	deeplinks	cpa	1	0.00632904	Klaas Joosten
209	FolkRank	deeplinks	marketing	3	0.011892382	Klaas Joosten
210	FolkRank	deeplinks	networks	3	0.006403257	Klaas Joosten
211	FolkRank	deeplinks	ecpc	3	0.00632904	Klaas Joosten
212	FolkRank	deeplinks	performancebased	4	0.00632904	Klaas Joosten
213	FolkRank	creativity	e-learning	2	0.007224714	Marina Astudillo
214	FolkRank	creativity	video	3	0.010704086	Marina Astudillo
215	FolkRank	creativity	ted	4	0.021199538	Marina Astudillo
216	FolkRank	creativity	advertising	5	0.010987459	Marina Astudillo
217	FolkRank	creativity	art	5	0.014112006	Marina Astudillo
218	FolkRank	creativity	technology	3	0.009996971	Marina Astudillo
219	FolkRank	creativity	education	2	0.010128826	Marina Astudillo
220	FolkRank	creativity	marketing	3	0.010366047	Marina Astudillo
221	FolkRank	creativity	coffee	4	0.009188595	Marina Astudillo
222	FolkRank	creativity	design	5	0.014648547	Marina Astudillo
223	FolkRank	backpacking	asia	4	0.008268698	Marina Astudillo
224	FolkRank	backpacking	usa	4	0.009628209	Marina Astudillo
225	FolkRank	backpacking	travel	4	0.022747454	Marina Astudillo
226	FolkRank	backpacking	san-diego	4	0.017571559	Marina Astudillo
227	FolkRank	backpacking	about	3	0.02021257	Marina Astudillo
228	FolkRank	backpacking	sports	2	0.007780264	Marina Astudillo
229	FolkRank	backpacking	city	4	0.009346068	Marina Astudillo
230	FolkRank	backpacking	europa	4	0.009517375	Marina Astudillo
231	FolkRank	backpacking	california	4	0.008790929	Marina Astudillo
232	FolkRank	backpacking	thailand	4	0.011438754	Marina Astudillo
233	FolkRank	art	wirework	4	0.028627403	Marina Astudillo
234	FolkRank	art	top-25-acting-schools-	4	0.020691795	Marina Astudillo
235	FolkRank	art	collectable-vinyl	3	0.020193759	Marina Astudillo
236	FolkRank	art	blues	4	0.038687319	Marina Astudillo
237	FolkRank	art	blog	2	0.019963765	Marina Astudillo
238	FolkRank	art	vinyl	4	0.020193759	Marina Astudillo
239	FolkRank	art	design	4	0.027878266	Marina Astudillo
240	FolkRank	art	3d-art	4	0.022592433	Marina Astudillo
241	FolkRank	art	acting	4	0.052932087	Marina Astudillo
242	FolkRank	art	music	4	0.039197144	Marina Astudillo
243	FolkRank	tapas	europa	4	0.006764652	Marina Astudillo
244	FolkRank	tapas	island	3	0.007669578	Marina Astudillo
245	FolkRank	tapas	brazil	3	0.007223402	Marina Astudillo
246	FolkRank	tapas	barcelona	4	0.013801062	Marina Astudillo
247	FolkRank	tapas	spain	5	0.010256379	Marina Astudillo
248	FolkRank	tapas	ibiza	4	0.010058137	Marina Astudillo
249	FolkRank	tapas	best-tapas	4	0.006442445	Marina Astudillo
250	FolkRank	tapas	startup	3	0.006734685	Marina Astudillo
251	FolkRank	tapas	city	3	0.008309132	Marina Astudillo
252	FolkRank	tapas	travel	4	0.012344008	Marina Astudillo
253	FolkRank	shopping	coffee	3	0.030837885	Marina Astudillo
254	FolkRank	shopping	jewels	4	0.033672273	Marina Astudillo
255	FolkRank	shopping	vergelijk-producten	3	0.033711511	Marina Astudillo
256	FolkRank	shopping	school-vendors	3	0.044524882	Marina Astudillo
257	FolkRank	shopping	pop-up-stores	5	0.033582998	Marina Astudillo
258	FolkRank	shopping	telecom	2	0.030145675	Marina Astudillo
259	FolkRank	shopping	mobile	2	0.027351348	Marina Astudillo
260	FolkRank	shopping	telefoonhoesjes	2	0.041530222	Marina Astudillo
261	FolkRank	shopping	fashion	4	0.037691021	Marina Astudillo
262	FolkRank	shopping	dancewear	4	0.031111204	Marina Astudillo
263	FolkRank	design	sustainability	3	0.028020863	Marina Polovinchuk
264	FolkRank	design	webdesign	5	0.02800015	Marina Polovinchuk
265	FolkRank	design	education	4	0.025264941	Marina Polovinchuk
266	FolkRank	design	typography	5	0.037001054	Marina Polovinchuk
267	FolkRank	design	motion-design	5	0.024280767	Marina Polovinchuk

268	FolkRank	design	outsourcing	2	0.046707257	Marina Polovinchuk
269	FolkRank	design	art	5	0.043737797	Marina Polovinchuk
270	FolkRank	design	smartfish-design	3	0.024194846	Marina Polovinchuk
271	FolkRank	design	sustainable-living	3	0.0267585	Marina Polovinchuk
272	FolkRank	design	inspiration	5	0.022800715	Marina Polovinchuk
273	FolkRank	technology	productivity	5	0.046548576	Marina Polovinchuk
274	FolkRank	technology	latex	1	0.040175182	Marina Polovinchuk
275	FolkRank	technology	outsourcing	2	0.048832659	Marina Polovinchuk
276	FolkRank	technology	wordpress	5	0.047017636	Marina Polovinchuk
277	FolkRank	technology	energy	5	0.046585424	Marina Polovinchuk
278	FolkRank	technology	led	3	0.039078363	Marina Polovinchuk
279	FolkRank	technology	mobile	5	0.045617242	Marina Polovinchuk
280	FolkRank	technology	hosting	5	0.040014709	Marina Polovinchuk
281	FolkRank	technology	privacy	5	0.05186499	Marina Polovinchuk
282	FolkRank	technology	automation	5	0.047589196	Marina Polovinchuk
283	FolkRank	ukraine	newspapers-eastern-europe	5	0.0105311	Marina Polovinchuk
284	FolkRank	ukraine	country	4	0.010746076	Marina Polovinchuk
285	FolkRank	ukraine	europe	4	0.012013494	Marina Polovinchuk
286	FolkRank	ukraine	eastern-europe	5	0.0105311	Marina Polovinchuk
287	FolkRank	ukraine	personal	3	0.010148783	Marina Polovinchuk
288	FolkRank	ukraine	transportation-	4	0.010201913	Marina Polovinchuk
289	FolkRank	ukraine	newspaper	2	0.014953	Marina Polovinchuk
290	FolkRank	ukraine	yulia-bodnar	4	0.010187851	Marina Polovinchuk
291	FolkRank	ukraine	hotels	4	0.01021603	Marina Polovinchuk
292	FolkRank	ukraine	news	1	0.014966788	Marina Polovinchuk
293	FolkRank	startup	entrepreneur	5	0.02571645	Marina Polovinchuk
294	FolkRank	startup	dutchstartupevents	5	0.0267872	Marina Polovinchuk
295	FolkRank	startup	productivity	5	0.026558547	Marina Polovinchuk
296	FolkRank	startup	event	5	0.027656758	Marina Polovinchuk
297	FolkRank	startup	rockstaronly	3	0.031584038	Marina Polovinchuk
298	FolkRank	startup	vmh-digital	3	0.036568007	Marina Polovinchuk
299	FolkRank	startup	innovatie-jonge-ondernemingen	5	0.034037455	Marina Polovinchuk
300	FolkRank	startup	design	5	0.033379016	Marina Polovinchuk
301	FolkRank	startup	crowdfunding	5	0.028647979	Marina Polovinchuk
302	FolkRank	startup	privacy	5	0.025738246	Marina Polovinchuk
303	FolkRank	software	plumlytics	3	0.022694841	Marina Polovinchuk
304	FolkRank	software	boost-software	5	0.024199323	Marina Polovinchuk
305	FolkRank	software	xpages	2	0.031320928	Marina Polovinchuk
306	FolkRank	software	marketing	3	0.022551759	Marina Polovinchuk
307	FolkRank	software	company	3	0.03042651	Marina Polovinchuk
308	FolkRank	software	photoshop	5	0.022308641	Marina Polovinchuk
309	FolkRank	software	gimp	2	0.024045929	Marina Polovinchuk
310	FolkRank	software	relocateme	2	0.032259191	Marina Polovinchuk
311	FolkRank	software	able-computing	4	0.02201663	Marina Polovinchuk
312	FolkRank	software	shopping	1	0.04188529	Marina Polovinchuk
313	FolkRank	marketing	contentstrategie	4	0.033467	Menno Kolkert
314	FolkRank	marketing	branding	5	0.051493969	Menno Kolkert
315	FolkRank	marketing	blogging	4	0.038375635	Menno Kolkert
316	FolkRank	marketing	social-media-slant	3	0.033319208	Menno Kolkert
317	FolkRank	marketing	likes-kopen	3	0.033827283	Menno Kolkert
318	FolkRank	marketing	infographics	2	0.048905194	Menno Kolkert
319	FolkRank	marketing	ecommerce	5	0.032347457	Menno Kolkert
320	FolkRank	marketing	research	3	0.041498282	Menno Kolkert
321	FolkRank	marketing	trafficinviter	4	0.039712305	Menno Kolkert
322	FolkRank	marketing	contentmarketing	3	0.04874039	Menno Kolkert
323	FolkRank	mobile	telecom	4	0.030145675	Menno Kolkert
324	FolkRank	mobile	wordfeud	4	0.024178428	Menno Kolkert
325	FolkRank	mobile	multimedia	4	0.023138876	Menno Kolkert
326	FolkRank	mobile	content-marketing	4	0.023233429	Menno Kolkert
327	FolkRank	mobile	games	4	0.024520825	Menno Kolkert
328	FolkRank	mobile	shopping	4	0.024811093	Menno Kolkert
329	FolkRank	mobile	multimedia-storytelling	5	0.022978953	Menno Kolkert
330	FolkRank	mobile	telefoonhoesjes	5	0.041530222	Menno Kolkert
331	FolkRank	mobile	prepaid	4	0.02517106	Menno Kolkert
332	FolkRank	mobile	wearables	5	0.023278827	Menno Kolkert
333	FolkRank	technology	mobile	4	0.045617242	Menno Kolkert
334	FolkRank	technology	led	4	0.039078363	Menno Kolkert
335	FolkRank	technology	privacy	4	0.05186499	Menno Kolkert
336	FolkRank	technology	latex	4	0.040175182	Menno Kolkert
337	FolkRank	technology	energy	4	0.046585424	Menno Kolkert
338	FolkRank	technology	automation	5	0.047589196	Menno Kolkert
339	FolkRank	technology	outsourcing	4	0.048832659	Menno Kolkert
340	FolkRank	technology	wordpress	4	0.047017636	Menno Kolkert
341	FolkRank	technology	productivity	4	0.046548576	Menno Kolkert
342	FolkRank	technology	hosting	5	0.040014709	Menno Kolkert
343	FolkRank	volvoceanrace	volvo-ocean-race	5	0.005094608	Olivier Ozinga

344	FolkRank	volvoceanrace	watersport	5	0.008066153	Olivier Ozinga
345	FolkRank	volvoceanrace	olivierozingauseridis24	1	0.007638198	Olivier Ozinga
346	FolkRank	volvoceanrace	sport	4	0.006206073	Olivier Ozinga
347	FolkRank	volvoceanrace	nl	4	0.004415901	Olivier Ozinga
348	FolkRank	volvoceanrace	sca	4	0.004222979	Olivier Ozinga
349	FolkRank	volvoceanrace	race	4	0.004207363	Olivier Ozinga
350	FolkRank	volvoceanrace	sailing	5	0.006059629	Olivier Ozinga
351	FolkRank	volvoceanrace	zeilen	5	0.005556884	Olivier Ozinga
352	FolkRank	volvoceanrace	volvo	5	0.004203636	Olivier Ozinga
353	FolkRank	egypt	telecom	1	0.01317664	Olivier Ozinga
354	FolkRank	egypt	africa	4	0.021889257	Olivier Ozinga
355	FolkRank	egypt	newspaper	1	0.017165533	Olivier Ozinga
356	FolkRank	egypt	africa-digital-marketing-agencies	1	0.015509104	Olivier Ozinga
357	FolkRank	egypt	news	1	0.017187655	Olivier Ozinga
358	FolkRank	egypt	africa-media-publishers	1	0.015572458	Olivier Ozinga
359	FolkRank	egypt	africe	1	0.014218836	Olivier Ozinga
360	FolkRank	egypt	marketing	1	0.015400629	Olivier Ozinga
361	FolkRank	egypt	business	1	0.016496653	Olivier Ozinga
362	FolkRank	egypt	media	1	0.016073461	Olivier Ozinga
363	FolkRank	amsterdam	personal	2	0.017765131	Rick Boerebach
364	FolkRank	amsterdam	collabcamp-amsterdam	3	0.018074388	Rick Boerebach
365	FolkRank	amsterdam	ajax	4	0.023285891	Rick Boerebach
366	FolkRank	amsterdam	hutspot-amsterdam	4	0.015889573	Rick Boerebach
367	FolkRank	amsterdam	startup	2	0.026301763	Rick Boerebach
368	FolkRank	amsterdam	sport-amsterdam	4	0.015732506	Rick Boerebach
369	FolkRank	amsterdam	sport	2	0.023917151	Rick Boerebach
370	FolkRank	amsterdam	amsterdamstartups	4	0.015503163	Rick Boerebach
371	FolkRank	amsterdam	soccer	2	0.023731518	Rick Boerebach
372	FolkRank	amsterdam	event	2	0.018487405	Rick Boerebach
373	FolkRank	space	spaceflight	5	0.015946299	Rick Boerebach
374	FolkRank	space	technical-details	2	0.015406361	Rick Boerebach
375	FolkRank	space	internationalspacestation	5	0.016074303	Rick Boerebach
376	FolkRank	space	aspiring-martians	4	0.0235049	Rick Boerebach
377	FolkRank	space	iss-accidents	4	0.015452181	Rick Boerebach
378	FolkRank	space	spacex	4	0.032685249	Rick Boerebach
379	FolkRank	space	pictures	1	0.015416245	Rick Boerebach
380	FolkRank	space	rocket-launches	5	0.015417495	Rick Boerebach
381	FolkRank	space	technology	4	0.020743311	Rick Boerebach
382	FolkRank	space	startup	1	0.01539929	Rick Boerebach
383	FolkRank	netherlands	eemland	2	0.021361035	Rick Boerebach
384	FolkRank	netherlands	country	5	0.022916418	Rick Boerebach
385	FolkRank	netherlands	city	3	0.019511375	Rick Boerebach
386	FolkRank	netherlands	voetbal	1	0.020304711	Rick Boerebach
387	FolkRank	netherlands	social	1	0.029742579	Rick Boerebach
388	FolkRank	netherlands	travel	5	0.033430953	Rick Boerebach
389	FolkRank	netherlands	utrecht	4	0.025905548	Rick Boerebach
390	FolkRank	netherlands	dating	1	0.03058168	Rick Boerebach
391	FolkRank	netherlands	shopping	1	0.020279812	Rick Boerebach
392	FolkRank	netherlands	startup	1	0.029994656	Rick Boerebach
393	FolkRank	zeef	startup	5	0.046093672	Rick Boerebach
394	FolkRank	zeef	personal	1	0.029556704	Rick Boerebach
395	FolkRank	zeef	folksonomy	5	0.028285642	Rick Boerebach
396	FolkRank	zeef	python	1	0.020433837	Rick Boerebach
397	FolkRank	zeef	social-bookmarking	5	0.020242313	Rick Boerebach
398	FolkRank	zeef	travel	1	0.035049603	Rick Boerebach
399	FolkRank	zeef	java	4	0.018817405	Rick Boerebach
400	FolkRank	zeef	development	4	0.033680446	Rick Boerebach
401	FolkRank	zeef	shopping	1	0.026594334	Rick Boerebach
402	FolkRank	zeef	company	5	0.025240978	Rick Boerebach
403	FolkRank	marketing	branding	5	0.051493969	Rick Boerebach
404	FolkRank	marketing	blogging	5	0.038375635	Rick Boerebach
405	FolkRank	marketing	ecommerce	4	0.032347457	Rick Boerebach
406	FolkRank	marketing	infographics	4	0.048905194	Rick Boerebach
407	FolkRank	marketing	social-media-slant	2	0.033319208	Rick Boerebach
408	FolkRank	marketing	contentstrategie	4	0.033467	Rick Boerebach
409	FolkRank	marketing	likes-kopen	4	0.033827283	Rick Boerebach
410	FolkRank	marketing	trafficinviter	2	0.039712305	Rick Boerebach
411	FolkRank	marketing	research	2	0.041498282	Rick Boerebach
412	FolkRank	marketing	contentmarketing	5	0.04874039	Rick Boerebach
413	FolkRank	student	squash-psa	1	0.015809594	Rob Thorpe
414	FolkRank	student	football-teams	5	0.015561974	Rob Thorpe
415	FolkRank	student	santiago-valencia	1	0.018371972	Rob Thorpe
416	FolkRank	student	uk	5	0.016283632	Rob Thorpe
417	FolkRank	student	manchester	5	0.020770798	Rob Thorpe
418	FolkRank	student	personal	4	0.019780891	Rob Thorpe
419	FolkRank	student	education	5	0.014739621	Rob Thorpe

420	FolkRank	student	colombia	4	0.015734395	Rob Thorpe
421	FolkRank	student	cars	3	0.016398032	Rob Thorpe
422	FolkRank	student	cities	5	0.015930955	Rob Thorpe
423	FolkRank	uk	top-sites-uk	5	0.02304422	Rob Thorpe
424	FolkRank	uk	government/-publicservices	5	0.020731231	Rob Thorpe
425	FolkRank	uk	company	4	0.021503415	Rob Thorpe
426	FolkRank	uk	shopping	4	0.0208112	Rob Thorpe
427	FolkRank	uk	travel	5	0.023001022	Rob Thorpe
428	FolkRank	uk	gambling/betting	5	0.020731231	Rob Thorpe
429	FolkRank	uk	hotels-fairy	1	0.025550273	Rob Thorpe
430	FolkRank	uk	providers/services	4	0.020727108	Rob Thorpe
431	FolkRank	uk	news	5	0.02142007	Rob Thorpe
432	FolkRank	uk	manchester	5	0.02645339	Rob Thorpe
433	FolkRank	manchester	rock	4	0.012471685	Rob Thorpe
434	FolkRank	manchester	city	5	0.01339525	Rob Thorpe
435	FolkRank	manchester	travel	5	0.01466884	Rob Thorpe
436	FolkRank	manchester	student	5	0.013962772	Rob Thorpe
437	FolkRank	manchester	uk	5	0.016283632	Rob Thorpe
438	FolkRank	manchester	event	5	0.010795165	Rob Thorpe
439	FolkRank	manchester	manchester-freshers	5	0.013735391	Rob Thorpe
440	FolkRank	manchester	music	5	0.013218539	Rob Thorpe
441	FolkRank	manchester	europa	5	0.013616297	Rob Thorpe
442	FolkRank	manchester	club-nights/promoters.	5	0.011008782	Rob Thorpe
443	FolkRank	travel	hotels-fairy	4	0.041968552	Rob Thorpe
444	FolkRank	travel	hotels	4	0.029276406	Rob Thorpe
445	FolkRank	travel	shopping	4	0.060218514	Rob Thorpe
446	FolkRank	travel	dubai2020	4	0.033752848	Rob Thorpe
447	FolkRank	travel	lifestyle-travelling	5	0.033418322	Rob Thorpe
448	FolkRank	travel	dashboard	1	0.028798946	Rob Thorpe
449	FolkRank	travel	poland	5	0.031119496	Rob Thorpe
450	FolkRank	travel	new-zealand	5	0.031653864	Rob Thorpe
451	FolkRank	travel	reizen	4	0.029436128	Rob Thorpe
452	FolkRank	travel	personal	4	0.028412913	Rob Thorpe
453	FolkRank	shopping	mobile	5	0.027351348	Rob Thorpe
454	FolkRank	shopping	jewels	5	0.033672273	Rob Thorpe
455	FolkRank	shopping	pop-up-stores	5	0.033582998	Rob Thorpe
456	FolkRank	shopping	telefoonhoesjes	3	0.041530222	Rob Thorpe
457	FolkRank	shopping	dancewear	5	0.031111204	Rob Thorpe
458	FolkRank	shopping	vergelijk-producten	3	0.033711511	Rob Thorpe
459	FolkRank	shopping	telecom	5	0.030145675	Rob Thorpe
460	FolkRank	shopping	school-vendors	3	0.044524882	Rob Thorpe
461	FolkRank	shopping	fashion	5	0.037691021	Rob Thorpe
462	FolkRank	electronics	discount	2	0.016848459	Robin Eggenkamp
463	FolkRank	electronics	moosejaw	1	0.022860646	Robin Eggenkamp
464	FolkRank	electronics	electrons	2	0.019039654	Robin Eggenkamp
465	FolkRank	electronics	asus	4	0.015899776	Robin Eggenkamp
466	FolkRank	electronics	shopping	3	0.018602142	Robin Eggenkamp
467	FolkRank	electronics	technology	4	0.016400592	Robin Eggenkamp
468	FolkRank	electronics	education	3	0.018666141	Robin Eggenkamp
469	FolkRank	electronics	deals	3	0.01637635	Robin Eggenkamp
470	FolkRank	electronics	company	2	0.025018676	Robin Eggenkamp
471	FolkRank	electronics	drones	4	0.03743039	Robin Eggenkamp
472	FolkRank	apple	development	3	0.008819343	Robin Eggenkamp
473	FolkRank	apple	games	2	0.008830713	Robin Eggenkamp
474	FolkRank	apple	ios-games	4	0.008874701	Robin Eggenkamp
475	FolkRank	apple	swift	5	0.018369429	Robin Eggenkamp
476	FolkRank	apple	cidre	1	0.012573549	Robin Eggenkamp
477	FolkRank	apple	apps	4	0.00904521	Robin Eggenkamp
478	FolkRank	apple	technology	5	0.010031236	Robin Eggenkamp
479	FolkRank	apple	mobile	4	0.008992553	Robin Eggenkamp
480	FolkRank	apple	ios	5	0.009104963	Robin Eggenkamp
481	FolkRank	apple	language	3	0.00920718	Robin Eggenkamp
482	FolkRank	zeef	social-bookmarking	4	0.020242313	Robin Eggenkamp
483	FolkRank	zeef	folksonomy	4	0.028285642	Robin Eggenkamp
484	FolkRank	zeef	development	4	0.033680446	Robin Eggenkamp
485	FolkRank	zeef	company	4	0.025240978	Robin Eggenkamp
486	FolkRank	zeef	startup	5	0.046093672	Robin Eggenkamp
487	FolkRank	zeef	personal	2	0.029556704	Robin Eggenkamp
488	FolkRank	zeef	travel	3	0.035049603	Robin Eggenkamp
489	FolkRank	zeef	shopping	3	0.026594334	Robin Eggenkamp
490	FolkRank	zeef	java	3	0.018817405	Robin Eggenkamp
491	FolkRank	zeef	python	3	0.020433837	Robin Eggenkamp
492	FolkRank	photography	newsletter	1	0.021629783	Robin Eggenkamp
493	FolkRank	photography	newsletters	1	0.021600549	Robin Eggenkamp
494	FolkRank	photography	technology	4	0.022979973	Robin Eggenkamp
495	FolkRank	photography	felicja-adamczyk	1	0.021722861	Robin Eggenkamp

496	FolkRank	photography	work-opportunities-without-a-diploma	2	0.020952653	Robin Eggenkamp
497	FolkRank	photography	e-learning	2	0.020247844	Robin Eggenkamp
498	FolkRank	photography	shopping	2	0.060242982	Robin Eggenkamp
499	FolkRank	photography	personal	2	0.024351779	Robin Eggenkamp
500	FolkRank	photography	email	1	0.021928113	Robin Eggenkamp
501	FolkRank	photography	patty-mooney	1	0.024531343	Robin Eggenkamp
502	FolkRank	productivity	privacy	2	0.025738246	Robin Eggenkamp
503	FolkRank	productivity	technology	4	0.020080747	Robin Eggenkamp
504	FolkRank	productivity	resources	3	0.019248103	Robin Eggenkamp
505	FolkRank	productivity	inspiration	1	0.027237897	Robin Eggenkamp
506	FolkRank	productivity	money-management	3	0.01915079	Robin Eggenkamp
507	FolkRank	productivity	gtd	5	0.025196854	Robin Eggenkamp
508	FolkRank	productivity	startup	2	0.019723367	Robin Eggenkamp
509	FolkRank	productivity	startuptools	4	0.019019762	Robin Eggenkamp
510	FolkRank	productivity	getting-things-done	5	0.025196854	Robin Eggenkamp
511	FolkRank	productivity	learning-gtd	5	0.01866452	Robin Eggenkamp
512	FolkRank	handmade	yana-ledeneva	2	0.002079331	Yana Ledeneva
513	FolkRank	handmade	rabota	1	0.001344178	Yana Ledeneva
514	FolkRank	handmade	jobs	1	0.001313225	Yana Ledeneva
515	FolkRank	handmade	country	1	0.002117031	Yana Ledeneva
516	FolkRank	handmade	about	3	0.012221678	Yana Ledeneva
517	FolkRank	handmade	ruussia	2	0.004572575	Yana Ledeneva
518	FolkRank	handmade	wirework	4	0.028627403	Yana Ledeneva
519	FolkRank	handmade	ruussian	2	0.002261864	Yana Ledeneva
520	FolkRank	handmade	art	4	0.014334044	Yana Ledeneva
521	FolkRank	ruussia	event	4	0.018835733	Yana Ledeneva
522	FolkRank	ruussia	news	4	0.014949312	Yana Ledeneva
523	FolkRank	ruussia	country	5	0.012811494	Yana Ledeneva
524	FolkRank	ruussia	red-herring	3	0.016346637	Yana Ledeneva
525	FolkRank	ruussia	newspaper	3	0.014940304	Yana Ledeneva
526	FolkRank	ruussia	europe	4	0.01285052	Yana Ledeneva
527	FolkRank	ruussia	travel	4	0.022290468	Yana Ledeneva
528	FolkRank	ruussia	startup	3	0.02104907	Yana Ledeneva
529	FolkRank	ruussia	moscow	5	0.012913884	Yana Ledeneva
530	FolkRank	ruussia	city	4	0.012622314	Yana Ledeneva
531	FolkRank	jobs	moteurs-de-recherche-emploi	2	0.024973773	Yana Ledeneva
532	FolkRank	jobs	job-in-amsterdam	5	0.024169813	Yana Ledeneva
533	FolkRank	jobs	sites-int?rim	2	0.023242697	Yana Ledeneva
534	FolkRank	jobs	top-sites-uk	2	0.022219418	Yana Ledeneva
535	FolkRank	jobs	startup	5	0.029867655	Yana Ledeneva
536	FolkRank	jobs	uk	4	0.025896877	Yana Ledeneva
537	FolkRank	jobs	remote	4	0.023148173	Yana Ledeneva
538	FolkRank	jobs	techniques-de-recherche-demploi	3	0.024078141	Yana Ledeneva
539	FolkRank	jobs	rabota	5	0.032738466	Yana Ledeneva
540	FolkRank	jobs	sites-emploi	4	0.054284291	Yana Ledeneva
541	FolkRank	research	smart-drugs	2	0.032070655	Yana Ledeneva
542	FolkRank	research	finance	3	0.029254868	Yana Ledeneva
543	FolkRank	research	speech	3	0.024272226	Yana Ledeneva
544	FolkRank	research	financial-markets	3	0.028494361	Yana Ledeneva
545	FolkRank	research	google	4	0.027043777	Yana Ledeneva
546	FolkRank	research	health	3	0.033503597	Yana Ledeneva
547	FolkRank	research	speeches	2	0.024272226	Yana Ledeneva
548	FolkRank	research	write	4	0.025928567	Yana Ledeneva
549	FolkRank	research	startup	3	0.046025672	Yana Ledeneva
550	FolkRank	research	schrijven	3	0.050149289	Yana Ledeneva
551	FolkRank	art	acting	3	0.052932087	Yana Ledeneva
552	FolkRank	art	wirework	4	0.028627403	Yana Ledeneva
553	FolkRank	art	3d-art	5	0.022592433	Yana Ledeneva
554	FolkRank	art	top-25-acting-schools-	3	0.020691795	Yana Ledeneva
555	FolkRank	art	blues	3	0.038687319	Yana Ledeneva
556	FolkRank	art	music	4	0.039197144	Yana Ledeneva
557	FolkRank	art	collectable-vinyl	3	0.020193759	Yana Ledeneva
558	FolkRank	art	vinyl	3	0.020193759	Yana Ledeneva
559	FolkRank	art	design	4	0.027878266	Yana Ledeneva
560	FolkRank	art	blog	4	0.019963765	Yana Ledeneva

Table 9: Raw experiment results for FolkRank algorithm.

No.	Algorithm	Query tag	Recommended tag	Relevance	Weight	Participant
1	RandomWords	cro	screen	2	0	Arjan Pronk
2	RandomWords	cro	music	2	0	Arjan Pronk
3	RandomWords	cro	guitar	1	0	Arjan Pronk
4	RandomWords	cro	glass	1	0	Arjan Pronk

5	RandomWords	cro	yellow	1	0	Arjan Pronk
6	RandomWords	cro	antartida	1	0	Arjan Pronk
7	RandomWords	cro	plants	1	0	Arjan Pronk
8	RandomWords	cro	wallet	1	0	Arjan Pronk
9	RandomWords	cro	lake	1	0	Arjan Pronk
10	RandomWords	cro	castle	1	0	Arjan Pronk
11	RandomWords	poker	shell	2	0	Arjan Pronk
12	RandomWords	poker	bed	1	0	Arjan Pronk
13	RandomWords	poker	home	1	0	Arjan Pronk
14	RandomWords	tnw	point	2	0	Arjan Pronk
15	RandomWords	tnw	crystal	2	0	Arjan Pronk
16	RandomWords	tnw	socks	1	0	Arjan Pronk
17	RandomWords	tnw	wish	1	0	Arjan Pronk
18	RandomWords	tnw	mage	1	0	Arjan Pronk
19	RandomWords	tnw	tongue	1	0	Arjan Pronk
20	RandomWords	tnw	place	5	0	Arjan Pronk
21	RandomWords	event	lines	1	0	Arjan Pronk
22	RandomWords	event	tight	3	0	Arjan Pronk
23	RandomWords	event	aloha	1	0	Arjan Pronk
24	RandomWords	event	knee	2	0	Arjan Pronk
25	RandomWords	event	finger	1	0	Arjan Pronk
26	RandomWords	event	yolo	1	0	Arjan Pronk
27	RandomWords	event	knew	1	0	Arjan Pronk
28	RandomWords	event	cola	1	0	Arjan Pronk
29	RandomWords	event	hard	1	0	Arjan Pronk
30	RandomWords	event	fold	1	0	Arjan Pronk
31	RandomWords	kids	bill	1	0	Arjan Pronk
32	RandomWords	kids	foam	1	0	Arjan Pronk
33	RandomWords	kids	work-hard	4	0	Arjan Pronk
34	RandomWords	kids	cost	1	0	Arjan Pronk
35	RandomWords	kids	case	1	0	Arjan Pronk
36	RandomWords	kids	throne	1	0	Arjan Pronk
37	RandomWords	kids	puppet	1	0	Arjan Pronk
38	RandomWords	kids	gate	1	0	Arjan Pronk
39	RandomWords	kids	nothing	1	0	Arjan Pronk
40	RandomWords	training	south	1	0	Arjan Pronk
41	RandomWords	training	chilli	1	0	Arjan Pronk
42	RandomWords	training	tempting	1	0	Arjan Pronk
43	RandomWords	training	master	1	0	Arjan Pronk
44	RandomWords	training	void	1	0	Arjan Pronk
45	RandomWords	training	folder	1	0	Arjan Pronk
46	RandomWords	training	colon	1	0	Arjan Pronk
47	RandomWords	training	fold	1	0	Arjan Pronk
48	RandomWords	training	glow	5	0	Arjan Pronk
49	RandomWords	training	lake	1	0	Arjan Pronk
50	RandomWords	javaee	glass	1	0	Bauke Scholtz
51	RandomWords	javaee	plants	1	0	Bauke Scholtz
52	RandomWords	javaee	wallet	1	0	Bauke Scholtz
53	RandomWords	javaee	antartida	1	0	Bauke Scholtz
54	RandomWords	javaee	castle	1	0	Bauke Scholtz
55	RandomWords	javaee	guitar	1	0	Bauke Scholtz
56	RandomWords	javaee	screen	2	0	Bauke Scholtz
57	RandomWords	javaee	yellow	1	0	Bauke Scholtz
58	RandomWords	javaee	lake	1	0	Bauke Scholtz
59	RandomWords	javaee	music	1	0	Bauke Scholtz
60	RandomWords	java	socks	1	0	Bauke Scholtz
61	RandomWords	java	tongue	1	0	Bauke Scholtz
62	RandomWords	java	shell	3	0	Bauke Scholtz
63	RandomWords	java	bed	1	0	Bauke Scholtz
64	RandomWords	java	place	2	0	Bauke Scholtz
65	RandomWords	java	wish	1	0	Bauke Scholtz
66	RandomWords	java	home	1	0	Bauke Scholtz
67	RandomWords	java	crystal	1	0	Bauke Scholtz
68	RandomWords	java	mage	1	0	Bauke Scholtz
69	RandomWords	java	point	1	0	Bauke Scholtz
70	RandomWords	caribbean	knee	1	0	Bauke Scholtz
71	RandomWords	caribbean	aloha	3	0	Bauke Scholtz
72	RandomWords	caribbean	finger	1	0	Bauke Scholtz
73	RandomWords	caribbean	hard	1	0	Bauke Scholtz
74	RandomWords	caribbean	lines	1	0	Bauke Scholtz
75	RandomWords	caribbean	tight	1	0	Bauke Scholtz
76	RandomWords	caribbean	yolo	3	0	Bauke Scholtz
77	RandomWords	caribbean	fold	2	0	Bauke Scholtz
78	RandomWords	caribbean	cola	4	0	Bauke Scholtz
79	RandomWords	caribbean	knew	1	0	Bauke Scholtz
80	RandomWords	martial-arts	cost	3	0	Bauke Scholtz

81	RandomWords	martial-arts	gate	1	0	Bauke Scholtz
82	RandomWords	martial-arts	glass	1	0	Bauke Scholtz
83	RandomWords	martial-arts	foam	1	0	Bauke Scholtz
84	RandomWords	martial-arts	bill	2	0	Bauke Scholtz
85	RandomWords	martial-arts	puppet	1	0	Bauke Scholtz
86	RandomWords	martial-arts	throne	2	0	Bauke Scholtz
87	RandomWords	martial-arts	case	1	0	Bauke Scholtz
88	RandomWords	martial-arts	work-hard	3	0	Bauke Scholtz
89	RandomWords	martial-arts	nothing	1	0	Bauke Scholtz
90	RandomWords	development	lake	1	0	Dennis Brouwer
91	RandomWords	development	glass	1	0	Dennis Brouwer
92	RandomWords	development	plants	1	0	Dennis Brouwer
93	RandomWords	development	screen	1	0	Dennis Brouwer
94	RandomWords	development	music	1	0	Dennis Brouwer
95	RandomWords	development	yellow	1	0	Dennis Brouwer
96	RandomWords	development	antartida	1	0	Dennis Brouwer
97	RandomWords	development	castle	1	0	Dennis Brouwer
98	RandomWords	development	wallet	1	0	Dennis Brouwer
99	RandomWords	development	guitar	1	0	Dennis Brouwer
100	RandomWords	database	point	1	0	Dennis Brouwer
101	RandomWords	database	place	1	0	Dennis Brouwer
102	RandomWords	database	socks	1	0	Dennis Brouwer
103	RandomWords	database	home	1	0	Dennis Brouwer
104	RandomWords	database	bed	1	0	Dennis Brouwer
105	RandomWords	database	tongue	1	0	Dennis Brouwer
106	RandomWords	database	wish	1	0	Dennis Brouwer
107	RandomWords	database	shell	3	0	Dennis Brouwer
108	RandomWords	database	mage	1	0	Dennis Brouwer
109	RandomWords	database	crystal	1	0	Dennis Brouwer
110	RandomWords	racing	glass	2	0	Jan Beernink
111	RandomWords	racing	yellow	3	0	Jan Beernink
112	RandomWords	racing	antartida	1	0	Jan Beernink
113	RandomWords	racing	wallet	1	0	Jan Beernink
114	RandomWords	racing	screen	3	0	Jan Beernink
115	RandomWords	racing	music	2	0	Jan Beernink
116	RandomWords	racing	guitar	1	0	Jan Beernink
117	RandomWords	racing	lake	1	0	Jan Beernink
118	RandomWords	racing	castle	1	0	Jan Beernink
119	RandomWords	racing	plants	1	0	Jan Beernink
120	RandomWords	git	tongue	1	0	Jan Beernink
121	RandomWords	git	shell	4	0	Jan Beernink
122	RandomWords	git	home	1	0	Jan Beernink
123	RandomWords	git	place	1	0	Jan Beernink
124	RandomWords	git	point	1	0	Jan Beernink
125	RandomWords	git	crystal	1	0	Jan Beernink
126	RandomWords	git	mage	1	0	Jan Beernink
127	RandomWords	git	bed	1	0	Jan Beernink
128	RandomWords	git	wish	1	0	Jan Beernink
129	RandomWords	git	socks	1	0	Jan Beernink
130	RandomWords	apps	cola	1	0	Jan Beernink
131	RandomWords	apps	hard	1	0	Jan Beernink
132	RandomWords	apps	finger	1	0	Jan Beernink
133	RandomWords	apps	knew	1	0	Jan Beernink
134	RandomWords	apps	tight	1	0	Jan Beernink
135	RandomWords	apps	lines	1	0	Jan Beernink
136	RandomWords	apps	fold	1	0	Jan Beernink
137	RandomWords	apps	knee	1	0	Jan Beernink
138	RandomWords	apps	yolo	1	0	Jan Beernink
139	RandomWords	apps	aloha	1	0	Jan Beernink
140	RandomWords	java	cost	2	0	Jan Beernink
141	RandomWords	java	nothing	1	0	Jan Beernink
142	RandomWords	java	puppet	4	0	Jan Beernink
143	RandomWords	java	work-hard	2	0	Jan Beernink
144	RandomWords	java	gate	1	0	Jan Beernink
145	RandomWords	java	bill	1	0	Jan Beernink
146	RandomWords	java	foam	1	0	Jan Beernink
147	RandomWords	java	case	1	0	Jan Beernink
148	RandomWords	java	throne	1	0	Jan Beernink
149	RandomWords	java	glass	1	0	Jan Beernink
150	RandomWords	games	tempting	1	0	Jan Beernink
151	RandomWords	games	chilli	1	0	Jan Beernink
152	RandomWords	games	lake	1	0	Jan Beernink
153	RandomWords	games	glow	1	0	Jan Beernink
154	RandomWords	games	folder	2	0	Jan Beernink
155	RandomWords	games	fold	1	0	Jan Beernink
156	RandomWords	games	colon	1	0	Jan Beernink

157	RandomWords	games	void	1	0	Jan Beernink
158	RandomWords	games	south	1	0	Jan Beernink
159	RandomWords	games	master	1	0	Jan Beernink
160	RandomWords	affiliate	screen	1	0	Klaas Joosten
161	RandomWords	affiliate	wallet	1	0	Klaas Joosten
162	RandomWords	affiliate	antartida	2	0	Klaas Joosten
163	RandomWords	affiliate	plants	1	0	Klaas Joosten
164	RandomWords	affiliate	yellow	2	0	Klaas Joosten
165	RandomWords	affiliate	glass	2	0	Klaas Joosten
166	RandomWords	affiliate	music	2	0	Klaas Joosten
167	RandomWords	affiliate	guitar	1	0	Klaas Joosten
168	RandomWords	affiliate	castle	1	0	Klaas Joosten
169	RandomWords	affiliate	lake	1	0	Klaas Joosten
170	RandomWords	bookmarking	tongue	1	0	Klaas Joosten
171	RandomWords	bookmarking	home	1	0	Klaas Joosten
172	RandomWords	bookmarking	socks	1	0	Klaas Joosten
173	RandomWords	bookmarking	place	1	0	Klaas Joosten
174	RandomWords	bookmarking	crystal	1	0	Klaas Joosten
175	RandomWords	bookmarking	bed	1	0	Klaas Joosten
176	RandomWords	bookmarking	point	1	0	Klaas Joosten
177	RandomWords	bookmarking	shell	2	0	Klaas Joosten
178	RandomWords	bookmarking	wish	4	0	Klaas Joosten
179	RandomWords	bookmarking	mage	2	0	Klaas Joosten
180	RandomWords	startup	hard	4	0	Klaas Joosten
181	RandomWords	startup	lines	1	0	Klaas Joosten
182	RandomWords	startup	fold	1	0	Klaas Joosten
183	RandomWords	startup	cola	2	0	Klaas Joosten
184	RandomWords	startup	yolo	2	0	Klaas Joosten
185	RandomWords	startup	tight	2	0	Klaas Joosten
186	RandomWords	startup	knee	1	0	Klaas Joosten
187	RandomWords	startup	aloha	1	0	Klaas Joosten
188	RandomWords	startup	knew	2	0	Klaas Joosten
189	RandomWords	startup	finger	2	0	Klaas Joosten
190	RandomWords	search	bill	2	0	Klaas Joosten
191	RandomWords	search	puppet	2	0	Klaas Joosten
192	RandomWords	search	gate	2	0	Klaas Joosten
193	RandomWords	search	work-hard	2	0	Klaas Joosten
194	RandomWords	search	case	2	0	Klaas Joosten
195	RandomWords	search	foam	2	0	Klaas Joosten
196	RandomWords	search	throne	2	0	Klaas Joosten
197	RandomWords	search	cost	2	0	Klaas Joosten
198	RandomWords	search	nothing	2	0	Klaas Joosten
199	RandomWords	search	glass	1	0	Klaas Joosten
200	RandomWords	deeplinks	fold	3	0	Klaas Joosten
201	RandomWords	deeplinks	folder	5	0	Klaas Joosten
202	RandomWords	deeplinks	chilli	1	0	Klaas Joosten
203	RandomWords	deeplinks	south	1	0	Klaas Joosten
204	RandomWords	deeplinks	lake	1	0	Klaas Joosten
205	RandomWords	deeplinks	glow	1	0	Klaas Joosten
206	RandomWords	deeplinks	master	2	0	Klaas Joosten
207	RandomWords	deeplinks	tempting	2	0	Klaas Joosten
208	RandomWords	deeplinks	void	2	0	Klaas Joosten
209	RandomWords	deeplinks	colon	2	0	Klaas Joosten
210	RandomWords	creativity	guitar	2	0	Marina Astudillo
211	RandomWords	creativity	wallet	1	0	Marina Astudillo
212	RandomWords	creativity	yellow	2	0	Marina Astudillo
213	RandomWords	creativity	castle	2	0	Marina Astudillo
214	RandomWords	creativity	antartida	1	0	Marina Astudillo
215	RandomWords	creativity	glass	3	0	Marina Astudillo
216	RandomWords	creativity	plants	1	0	Marina Astudillo
217	RandomWords	creativity	lake	1	0	Marina Astudillo
218	RandomWords	creativity	screen	1	0	Marina Astudillo
219	RandomWords	creativity	music	5	0	Marina Astudillo
220	RandomWords	backpacking	castle	4	0	Marina Astudillo
221	RandomWords	backpacking	wallet	4	0	Marina Astudillo
222	RandomWords	backpacking	plants	2	0	Marina Astudillo
223	RandomWords	backpacking	glass	2	0	Marina Astudillo
224	RandomWords	backpacking	yellow	3	0	Marina Astudillo
225	RandomWords	backpacking	screen	1	0	Marina Astudillo
226	RandomWords	backpacking	music	2	0	Marina Astudillo
227	RandomWords	backpacking	guitar	2	0	Marina Astudillo
228	RandomWords	backpacking	lake	4	0	Marina Astudillo
229	RandomWords	backpacking	antartida	3	0	Marina Astudillo
230	RandomWords	art	tongue	2	0	Marina Astudillo
231	RandomWords	art	bed	3	0	Marina Astudillo
232	RandomWords	art	place	2	0	Marina Astudillo

233	RandomWords	art	crystal	2	0	Marina Astudillo
234	RandomWords	art	home	2	0	Marina Astudillo
235	RandomWords	art	point	2	0	Marina Astudillo
236	RandomWords	art	wish	2	0	Marina Astudillo
237	RandomWords	art	mage	2	0	Marina Astudillo
238	RandomWords	art	socks	1	0	Marina Astudillo
239	RandomWords	art	shell	2	0	Marina Astudillo
240	RandomWords	tapas	tight	3	0	Marina Astudillo
241	RandomWords	tapas	knee	2	0	Marina Astudillo
242	RandomWords	tapas	cola	2	0	Marina Astudillo
243	RandomWords	tapas	hard	2	0	Marina Astudillo
244	RandomWords	tapas	aloha	1	0	Marina Astudillo
245	RandomWords	tapas	fold	1	0	Marina Astudillo
246	RandomWords	tapas	yolo	1	0	Marina Astudillo
247	RandomWords	tapas	knew	1	0	Marina Astudillo
248	RandomWords	tapas	lines	3	0	Marina Astudillo
249	RandomWords	tapas	finger	3	0	Marina Astudillo
250	RandomWords	shopping	case	3	0	Marina Astudillo
251	RandomWords	shopping	gate	3	0	Marina Astudillo
252	RandomWords	shopping	bill	4	0	Marina Astudillo
253	RandomWords	shopping	cost	4	0	Marina Astudillo
254	RandomWords	shopping	nothing	2	0	Marina Astudillo
255	RandomWords	shopping	foam	2	0	Marina Astudillo
256	RandomWords	shopping	glass	2	0	Marina Astudillo
257	RandomWords	shopping	work-hard	2	0	Marina Astudillo
258	RandomWords	shopping	puppet	2	0	Marina Astudillo
259	RandomWords	shopping	throne	2	0	Marina Astudillo
260	RandomWords	design	antartida	1	0	Marina Polovinchuk
261	RandomWords	design	screen	4	0	Marina Polovinchuk
262	RandomWords	design	yellow	3	0	Marina Polovinchuk
263	RandomWords	design	glass	3	0	Marina Polovinchuk
264	RandomWords	design	castle	2	0	Marina Polovinchuk
265	RandomWords	design	plants	3	0	Marina Polovinchuk
266	RandomWords	design	guitar	2	0	Marina Polovinchuk
267	RandomWords	design	lake	3	0	Marina Polovinchuk
268	RandomWords	design	music	3	0	Marina Polovinchuk
269	RandomWords	design	wallet	2	0	Marina Polovinchuk
270	RandomWords	technology	tongue	3	0	Marina Polovinchuk
271	RandomWords	technology	crystal	2	0	Marina Polovinchuk
272	RandomWords	technology	socks	1	0	Marina Polovinchuk
273	RandomWords	technology	shell	2	0	Marina Polovinchuk
274	RandomWords	technology	wish	3	0	Marina Polovinchuk
275	RandomWords	technology	mage	5	0	Marina Polovinchuk
276	RandomWords	technology	place	3	0	Marina Polovinchuk
277	RandomWords	technology	point	3	0	Marina Polovinchuk
278	RandomWords	technology	home	2	0	Marina Polovinchuk
279	RandomWords	technology	bed	1	0	Marina Polovinchuk
280	RandomWords	ukraine	tight	1	0	Marina Polovinchuk
281	RandomWords	ukraine	yolo	2	0	Marina Polovinchuk
282	RandomWords	ukraine	fold	1	0	Marina Polovinchuk
283	RandomWords	ukraine	finger	1	0	Marina Polovinchuk
284	RandomWords	ukraine	knew	2	0	Marina Polovinchuk
285	RandomWords	ukraine	knee	2	0	Marina Polovinchuk
286	RandomWords	ukraine	cola	2	0	Marina Polovinchuk
287	RandomWords	ukraine	lines	2	0	Marina Polovinchuk
288	RandomWords	ukraine	hard	1	0	Marina Polovinchuk
289	RandomWords	ukraine	aloha	1	0	Marina Polovinchuk
290	RandomWords	startup	gate	1	0	Marina Polovinchuk
291	RandomWords	startup	glass	1	0	Marina Polovinchuk
292	RandomWords	startup	work-hard	5	0	Marina Polovinchuk
293	RandomWords	startup	case	2	0	Marina Polovinchuk
294	RandomWords	startup	foam	2	0	Marina Polovinchuk
295	RandomWords	startup	throne	5	0	Marina Polovinchuk
296	RandomWords	startup	nothing	2	0	Marina Polovinchuk
297	RandomWords	startup	cost	5	0	Marina Polovinchuk
298	RandomWords	startup	bill	5	0	Marina Polovinchuk
299	RandomWords	startup	puppet	2	0	Marina Polovinchuk
300	RandomWords	software	glow	3	0	Marina Polovinchuk
301	RandomWords	software	chilli	2	0	Marina Polovinchuk
302	RandomWords	software	tempting	1	0	Marina Polovinchuk
303	RandomWords	software	lake	1	0	Marina Polovinchuk
304	RandomWords	software	master	5	0	Marina Polovinchuk
305	RandomWords	software	fold	1	0	Marina Polovinchuk
306	RandomWords	software	folder	3	0	Marina Polovinchuk
307	RandomWords	software	void	3	0	Marina Polovinchuk
308	RandomWords	software	south	2	0	Marina Polovinchuk

309	RandomWords	software	colon	3	0	Marina Polovinchuk
310	RandomWords	marketing	screen	2	0	Menno Kolkert
311	RandomWords	marketing	wallet	3	0	Menno Kolkert
312	RandomWords	marketing	lake	3	0	Menno Kolkert
313	RandomWords	marketing	yellow	2	0	Menno Kolkert
314	RandomWords	marketing	castle	2	0	Menno Kolkert
315	RandomWords	marketing	plants	2	0	Menno Kolkert
316	RandomWords	marketing	music	2	0	Menno Kolkert
317	RandomWords	marketing	guitar	2	0	Menno Kolkert
318	RandomWords	marketing	glass	2	0	Menno Kolkert
319	RandomWords	marketing	antartida	2	0	Menno Kolkert
320	RandomWords	mobile	crystal	2	0	Menno Kolkert
321	RandomWords	mobile	socks	2	0	Menno Kolkert
322	RandomWords	mobile	wish	2	0	Menno Kolkert
323	RandomWords	mobile	tongue	2	0	Menno Kolkert
324	RandomWords	mobile	mage	2	0	Menno Kolkert
325	RandomWords	mobile	bed	1	0	Menno Kolkert
326	RandomWords	mobile	home	2	0	Menno Kolkert
327	RandomWords	mobile	point	2	0	Menno Kolkert
328	RandomWords	mobile	shell	2	0	Menno Kolkert
329	RandomWords	mobile	place	5	0	Menno Kolkert
330	RandomWords	technology	hard	2	0	Menno Kolkert
331	RandomWords	technology	lines	2	0	Menno Kolkert
332	RandomWords	technology	knee	1	0	Menno Kolkert
333	RandomWords	technology	tight	3	0	Menno Kolkert
334	RandomWords	technology	yolo	3	0	Menno Kolkert
335	RandomWords	technology	cola	1	0	Menno Kolkert
336	RandomWords	technology	finger	1	0	Menno Kolkert
337	RandomWords	technology	knew	2	0	Menno Kolkert
338	RandomWords	technology	aloha	3	0	Menno Kolkert
339	RandomWords	technology	fold	4	0	Menno Kolkert
340	RandomWords	volvoceanrace	castle	1	0	Olivier Ozinga
341	RandomWords	volvoceanrace	glass	1	0	Olivier Ozinga
342	RandomWords	volvoceanrace	wallet	1	0	Olivier Ozinga
343	RandomWords	volvoceanrace	plants	1	0	Olivier Ozinga
344	RandomWords	volvoceanrace	music	1	0	Olivier Ozinga
345	RandomWords	volvoceanrace	lake	2	0	Olivier Ozinga
346	RandomWords	volvoceanrace	screen	1	0	Olivier Ozinga
347	RandomWords	volvoceanrace	antartida	1	0	Olivier Ozinga
348	RandomWords	volvoceanrace	yellow	1	0	Olivier Ozinga
349	RandomWords	volvoceanrace	guitar	1	0	Olivier Ozinga
350	RandomWords	egypt	crystal	1	0	Olivier Ozinga
351	RandomWords	egypt	mage	1	0	Olivier Ozinga
352	RandomWords	egypt	tongue	1	0	Olivier Ozinga
353	RandomWords	egypt	point	1	0	Olivier Ozinga
354	RandomWords	egypt	socks	1	0	Olivier Ozinga
355	RandomWords	egypt	bed	1	0	Olivier Ozinga
356	RandomWords	egypt	shell	1	0	Olivier Ozinga
357	RandomWords	egypt	home	1	0	Olivier Ozinga
358	RandomWords	egypt	place	1	0	Olivier Ozinga
359	RandomWords	egypt	wish	1	0	Olivier Ozinga
360	RandomWords	amsterdam	antartida	2	0	Rick Boerebach
361	RandomWords	amsterdam	plants	2	0	Rick Boerebach
362	RandomWords	amsterdam	glass	2	0	Rick Boerebach
363	RandomWords	amsterdam	castle	2	0	Rick Boerebach
364	RandomWords	amsterdam	guitar	1	0	Rick Boerebach
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366	RandomWords	amsterdam	music	2	0	Rick Boerebach
367	RandomWords	amsterdam	screen	2	0	Rick Boerebach
368	RandomWords	amsterdam	wallet	1	0	Rick Boerebach
369	RandomWords	amsterdam	lake	1	0	Rick Boerebach
370	RandomWords	space	tongue	1	0	Rick Boerebach
371	RandomWords	space	bed	1	0	Rick Boerebach
372	RandomWords	space	crystal	1	0	Rick Boerebach
373	RandomWords	space	home	1	0	Rick Boerebach
374	RandomWords	space	wish	1	0	Rick Boerebach
375	RandomWords	space	socks	1	0	Rick Boerebach
376	RandomWords	space	point	1	0	Rick Boerebach
377	RandomWords	space	place	1	0	Rick Boerebach
378	RandomWords	space	mage	1	0	Rick Boerebach
379	RandomWords	space	shell	1	0	Rick Boerebach
380	RandomWords	netherlands	fold	1	0	Rick Boerebach
381	RandomWords	netherlands	aloha	2	0	Rick Boerebach
382	RandomWords	netherlands	yolo	2	0	Rick Boerebach
383	RandomWords	netherlands	hard	1	0	Rick Boerebach
384	RandomWords	netherlands	lines	1	0	Rick Boerebach

385	RandomWords	netherlands	tight	1	0	Rick Boerebach
386	RandomWords	netherlands	knew	1	0	Rick Boerebach
387	RandomWords	netherlands	cola	1	0	Rick Boerebach
388	RandomWords	netherlands	finger	1	0	Rick Boerebach
389	RandomWords	netherlands	knee	1	0	Rick Boerebach
390	RandomWords	zeef	case	1	0	Rick Boerebach
391	RandomWords	zeef	gate	1	0	Rick Boerebach
392	RandomWords	zeef	foam	1	0	Rick Boerebach
393	RandomWords	zeef	bill	1	0	Rick Boerebach
394	RandomWords	zeef	work-hard	4	0	Rick Boerebach
395	RandomWords	zeef	throne	1	0	Rick Boerebach
396	RandomWords	zeef	nothing	1	0	Rick Boerebach
397	RandomWords	zeef	cost	1	0	Rick Boerebach
398	RandomWords	zeef	puppet	1	0	Rick Boerebach
399	RandomWords	zeef	glass	1	0	Rick Boerebach
400	RandomWords	marketing	colon	2	0	Rick Boerebach
401	RandomWords	marketing	south	2	0	Rick Boerebach
402	RandomWords	marketing	master	2	0	Rick Boerebach
403	RandomWords	marketing	tempting	2	0	Rick Boerebach
404	RandomWords	marketing	lake	2	0	Rick Boerebach
405	RandomWords	marketing	void	2	0	Rick Boerebach
406	RandomWords	marketing	glow	2	0	Rick Boerebach
407	RandomWords	marketing	fold	2	0	Rick Boerebach
408	RandomWords	marketing	chilli	2	0	Rick Boerebach
409	RandomWords	marketing	folder	2	0	Rick Boerebach
410	RandomWords	student	yellow	2	0	Rob Thorpe
411	RandomWords	student	music	5	0	Rob Thorpe
412	RandomWords	student	lake	2	0	Rob Thorpe
413	RandomWords	student	plants	3	0	Rob Thorpe
414	RandomWords	student	guitar	5	0	Rob Thorpe
415	RandomWords	student	antartida	1	0	Rob Thorpe
416	RandomWords	student	castle	4	0	Rob Thorpe
417	RandomWords	student	screen	3	0	Rob Thorpe
418	RandomWords	student	glass	2	0	Rob Thorpe
419	RandomWords	student	wallet	3	0	Rob Thorpe
420	RandomWords	uk	shell	2	0	Rob Thorpe
421	RandomWords	uk	mage	2	0	Rob Thorpe
422	RandomWords	uk	home	4	0	Rob Thorpe
423	RandomWords	uk	crystal	2	0	Rob Thorpe
424	RandomWords	uk	socks	2	0	Rob Thorpe
425	RandomWords	uk	bed	3	0	Rob Thorpe
426	RandomWords	uk	wish	3	0	Rob Thorpe
427	RandomWords	uk	point	3	0	Rob Thorpe
428	RandomWords	uk	place	3	0	Rob Thorpe
429	RandomWords	uk	tongue	1	0	Rob Thorpe
430	RandomWords	manchester	aloha	2	0	Rob Thorpe
431	RandomWords	manchester	yolo	2	0	Rob Thorpe
432	RandomWords	manchester	tight	2	0	Rob Thorpe
433	RandomWords	manchester	knew	1	0	Rob Thorpe
434	RandomWords	manchester	lines	1	0	Rob Thorpe
435	RandomWords	manchester	cola	3	0	Rob Thorpe
436	RandomWords	manchester	hard	2	0	Rob Thorpe
437	RandomWords	manchester	knee	1	0	Rob Thorpe
438	RandomWords	manchester	finger	2	0	Rob Thorpe
439	RandomWords	manchester	fold	1	0	Rob Thorpe
440	RandomWords	travel	work-hard	1	0	Rob Thorpe
441	RandomWords	travel	case	3	0	Rob Thorpe
442	RandomWords	travel	nothing	1	0	Rob Thorpe
443	RandomWords	travel	foam	1	0	Rob Thorpe
444	RandomWords	travel	throne	1	0	Rob Thorpe
445	RandomWords	travel	bill	4	0	Rob Thorpe
446	RandomWords	travel	cost	4	0	Rob Thorpe
447	RandomWords	travel	glass	2	0	Rob Thorpe
448	RandomWords	travel	gate	2	0	Rob Thorpe
449	RandomWords	travel	puppet	2	0	Rob Thorpe
450	RandomWords	shopping	lake	2	0	Rob Thorpe
451	RandomWords	shopping	master	2	0	Rob Thorpe
452	RandomWords	shopping	south	4	0	Rob Thorpe
453	RandomWords	shopping	glow	3	0	Rob Thorpe
454	RandomWords	shopping	folder	4	0	Rob Thorpe
455	RandomWords	shopping	fold	3	0	Rob Thorpe
456	RandomWords	shopping	chilli	3	0	Rob Thorpe
457	RandomWords	shopping	tempting	4	0	Rob Thorpe
458	RandomWords	shopping	colon	4	0	Rob Thorpe
459	RandomWords	shopping	void	3	0	Rob Thorpe
460	RandomWords	electronics	yellow	1	0	Robin Eggenkamp

461	RandomWords	electronics	screen	4	0	Robin Eggenkamp
462	RandomWords	electronics	antartida	1	0	Robin Eggenkamp
463	RandomWords	electronics	guitar	2	0	Robin Eggenkamp
464	RandomWords	electronics	music	2	0	Robin Eggenkamp
465	RandomWords	electronics	glass	1	0	Robin Eggenkamp
466	RandomWords	electronics	castle	1	0	Robin Eggenkamp
467	RandomWords	electronics	plants	1	0	Robin Eggenkamp
468	RandomWords	electronics	lake	1	0	Robin Eggenkamp
469	RandomWords	electronics	wallet	1	0	Robin Eggenkamp
470	RandomWords	apple	mage	1	0	Robin Eggenkamp
471	RandomWords	apple	home	3	0	Robin Eggenkamp
472	RandomWords	apple	crystal	1	0	Robin Eggenkamp
473	RandomWords	apple	tongue	1	0	Robin Eggenkamp
474	RandomWords	apple	point	1	0	Robin Eggenkamp
475	RandomWords	apple	shell	2	0	Robin Eggenkamp
476	RandomWords	apple	bed	1	0	Robin Eggenkamp
477	RandomWords	apple	socks	1	0	Robin Eggenkamp
478	RandomWords	apple	place	1	0	Robin Eggenkamp
479	RandomWords	apple	wish	1	0	Robin Eggenkamp
480	RandomWords	zeef	knew	1	0	Robin Eggenkamp
481	RandomWords	zeef	cola	1	0	Robin Eggenkamp
482	RandomWords	zeef	finger	1	0	Robin Eggenkamp
483	RandomWords	zeef	tight	1	0	Robin Eggenkamp
484	RandomWords	zeef	lines	1	0	Robin Eggenkamp
485	RandomWords	zeef	knee	1	0	Robin Eggenkamp
486	RandomWords	zeef	aloha	1	0	Robin Eggenkamp
487	RandomWords	zeef	fold	1	0	Robin Eggenkamp
488	RandomWords	zeef	yolo	1	0	Robin Eggenkamp
489	RandomWords	zeef	hard	1	0	Robin Eggenkamp
490	RandomWords	photography	throne	1	0	Robin Eggenkamp
491	RandomWords	photography	gate	1	0	Robin Eggenkamp
492	RandomWords	photography	work-hard	1	0	Robin Eggenkamp
493	RandomWords	photography	foam	5	0	Robin Eggenkamp
494	RandomWords	photography	case	1	0	Robin Eggenkamp
495	RandomWords	photography	cost	1	0	Robin Eggenkamp
496	RandomWords	photography	bill	1	0	Robin Eggenkamp
497	RandomWords	photography	puppet	1	0	Robin Eggenkamp
498	RandomWords	photography	glass	1	0	Robin Eggenkamp
499	RandomWords	photography	nothing	1	0	Robin Eggenkamp
500	RandomWords	productivity	colon	1	0	Robin Eggenkamp
501	RandomWords	productivity	tempting	1	0	Robin Eggenkamp
502	RandomWords	productivity	fold	1	0	Robin Eggenkamp
503	RandomWords	productivity	master	1	0	Robin Eggenkamp
504	RandomWords	productivity	folder	2	0	Robin Eggenkamp
505	RandomWords	productivity	south	1	0	Robin Eggenkamp
506	RandomWords	productivity	chilli	1	0	Robin Eggenkamp
507	RandomWords	productivity	void	1	0	Robin Eggenkamp
508	RandomWords	productivity	lake	1	0	Robin Eggenkamp
509	RandomWords	handmade	wallet	3	0	Yana Ledeneva
510	RandomWords	handmade	lake	2	0	Yana Ledeneva
511	RandomWords	handmade	castle	3	0	Yana Ledeneva
512	RandomWords	handmade	antartida	1	0	Yana Ledeneva
513	RandomWords	handmade	screen	2	0	Yana Ledeneva
514	RandomWords	handmade	music	2	0	Yana Ledeneva
515	RandomWords	handmade	plants	2	0	Yana Ledeneva
516	RandomWords	handmade	yellow	3	0	Yana Ledeneva
517	RandomWords	handmade	glass	4	0	Yana Ledeneva
518	RandomWords	handmade	guitar	4	0	Yana Ledeneva
519	RandomWords	russia	point	3	0	Yana Ledeneva
520	RandomWords	russia	shell	2	0	Yana Ledeneva
521	RandomWords	russia	home	3	0	Yana Ledeneva
522	RandomWords	russia	socks	1	0	Yana Ledeneva
523	RandomWords	russia	mage	1	0	Yana Ledeneva
524	RandomWords	russia	wish	2	0	Yana Ledeneva
525	RandomWords	russia	place	4	0	Yana Ledeneva
526	RandomWords	russia	bed	2	0	Yana Ledeneva
527	RandomWords	russia	crystal	2	0	Yana Ledeneva
528	RandomWords	russia	tongue	1	0	Yana Ledeneva
529	RandomWords	jobs	lines	2	0	Yana Ledeneva
530	RandomWords	jobs	aloha	2	0	Yana Ledeneva
531	RandomWords	jobs	cola	2	0	Yana Ledeneva
532	RandomWords	jobs	hard	3	0	Yana Ledeneva
533	RandomWords	jobs	knew	2	0	Yana Ledeneva
534	RandomWords	jobs	finger	1	0	Yana Ledeneva
535	RandomWords	jobs	tight	2	0	Yana Ledeneva
536	RandomWords	jobs	yolo	2	0	Yana Ledeneva

537	RandomWords	jobs	knee	2	0	Yana Ledeneva
538	RandomWords	jobs	fold	1	0	Yana Ledeneva
539	RandomWords	research	nothing	2	0	Yana Ledeneva
540	RandomWords	research	gate	3	0	Yana Ledeneva
541	RandomWords	research	glass	2	0	Yana Ledeneva
542	RandomWords	research	case	4	0	Yana Ledeneva
543	RandomWords	research	puppet	2	0	Yana Ledeneva
544	RandomWords	research	throne	2	0	Yana Ledeneva
545	RandomWords	research	foam	2	0	Yana Ledeneva
546	RandomWords	research	cost	4	0	Yana Ledeneva
547	RandomWords	research	bill	2	0	Yana Ledeneva
548	RandomWords	research	work-hard	3	0	Yana Ledeneva
549	RandomWords	art	fold	2	0	Yana Ledeneva
550	RandomWords	art	colon	2	0	Yana Ledeneva
551	RandomWords	art	tempting	3	0	Yana Ledeneva
552	RandomWords	art	master	3	0	Yana Ledeneva
553	RandomWords	art	south	1	0	Yana Ledeneva
554	RandomWords	art	folder	2	0	Yana Ledeneva
555	RandomWords	art	glow	2	0	Yana Ledeneva
556	RandomWords	art	void	2	0	Yana Ledeneva
557	RandomWords	art	lake	2	0	Yana Ledeneva

Table 10: Raw experiment results for RandomWords.

Appendix B

Link to GitHub repository where the source code of both Begelman algorithm and the experiment tool are.

https://github.com/santiagovalencia222/tag_clustering

Link to repository where the source code of FolkRank algorithm is, provided by their authors, A. Hotho and R. Jäschke.

<http://dev.nepomuk.semanticdesktop.org/repos/trunk/java/org.semanticdesktop.nepomuk.comp.folkpeer/src/org/semanticdesktop/nepomuk/comp/folkpeer/folkrank/>