

Two proposals for a new publishing and reviewing system in computer science

by

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Abstract

The current publishing model in computer science emphasizes conference publications, which has made it extremely competitive and difficult to bring new ideas to the field. The review process needs changing to allow papers and ideas to surface without restriction. This paper outlines the functional specifications of a system that was proposed in Yann LeCun’s pamphlet. The overarching goal of this new system is to maximize the Rate of Progress of Science (RPoS) over the long term. The system will rely heavily on the ideas of collaborative filtering and “wisdom of the crowds.”

Keywords: computer science, publishing model, technical requirements, functional requirements

Part I

Background

1 Introduction

2 Motivation

Publishing in computer science has long ago moved away from the traditional path that most other disciplines follow. The current model emphasizes conference publications, which has made it extremely competitive and difficult to bring new ideas to the field. As Yann LeCun points out in his *Proposal for A New Publishing Model in Computer Science*, “conference reviews tend to favor papers containing incremental improvements on well-established methods, and tend to reject papers with truly innovative ideas. The sheer volume of submissions to conferences and journals overwhelms reviewers, and the quality of the reviews suffers”[6].

The current publishing model is flawed in many ways and should be redesigned to accelerate the speed at which new ideas and results are exchanged, disseminated, evaluated, and preserved. The review process needs changing to allow papers and ideas to surface without restriction. Hence, a new publishing model should be introduced. Much of the following specifications in this white paper are based on LeCun’s proposal [6].

3 Goals and Objectives

The overarching goal of this new system is to maximize the Rate of Progress of Science (RPoS) over the long term. The system will rely heavily on the ideas of collaborative filtering and “wisdom of the crowds.”¹ To meet this goal, different aspects of it can be addressed as follows:

Social Objectives

- To create an online community of sharing and idea exchange.

¹There is an interesting book written by James Surowiecki, who presents case studies and anecdotes to illustrate the wisdom of the crowds [11].

- To allow open peer review, commenting, and rating.
- To bring attention to new rising ideas in the field.
- To utilize collaborative filtering to foster research directions and developments.

Business Objectives

- To provide a sustainable alternative to the current publishing model.
- To speed dissemination of ideas and results by separating it from the peer review process.
- To foster an open market of ideas.

Design Objectives

- To create a system that will meet all social and business objectives.
- To make the online discussion process easy and accessible.
- To preserve comments and reviews associated with a particular work.
- To make use of the best technologies and software available.

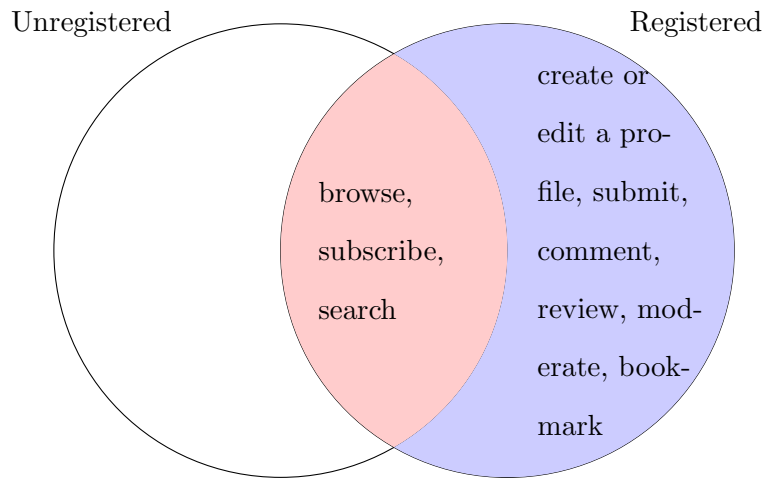
This paper will lay out the functional requirements for a system that will achieve all these objectives. Some recommendations for technical requirements and design specifications will also be provided.

Part II

Model 1

4 Functional Requirements

Figure 1: User Types and Actions



4.1 Types of Users

4.1.1 Unregistered Users

Anyone who accesses the site but does not register for an account is considered an unregistered user. These users can browse, search, and subscribe to RSS feeds.

4.1.2 Registered Users

Anyone with an institutional affiliation or passes the user verification process can create an account and become a registered user. In addition to browsing, searching, and subscribing, registered users can fall within any combination of the following types:

Authors: users who submit papers for comment and review.

Commentors: users who comment on submissions.

Reviewers: users who are part of a reviewing entity and who review submissions.

Reviewing Entities (RE): any group of registered users (one or more) who review submissions for quality and issues. RE are free to create their own policies and rules for review requests and submission criteria. For example, a journal may put together an RE to review potential articles for publication. RE members are referred to as reviewers (see above). Each RE will have a homepage that lists its policy, members, karma, and links to its reviews. Once a user joins an RE, he or she will be permanently listed as part of the RE (with active or inactive dates). A user can be part of several RE at any given time (see also [4.4.5](#)).

Moderators: users who have gained a certain amount of karma and request to moderate a subject area may be granted certain administrative controls (see also [4.4.3](#)).

4.2 User Actions

4.2.1 Registering for an account and creating a user profile

Unregistered users will be given the option to create an account on the site. Users registering with an institutional email address will automatically be allowed to create a user profile, make comments, create or join existing RE, submit reviews or papers, and earn karma. Users without institutional affiliation will need to go through the user verification process (see section [4.4.4](#)). The following information can be entered into a user profile:

- First and Last Names
- Education and Work Credentials
- Current Affiliation
- Contact Information (e.g. phone number, email, website)
- Areas of Specializations
- Current Photograph
- Brief Biography

All fields are optional but registering users are encouraged to fill out all fields to establish reputation and credentials. The basic default user profile will show the username and karma statistics (see also section 4.3.5). Additional fields will become visible if the user fills information into those fields.

4.2.2 Browsing

Registered and unregistered users can freely browse all submissions, comments, reviews, user profiles, and RE homepages.

4.2.3 Searching

Using the metadata gathered from each submission entry, users can do general keyword searches. Results may be refined through facets. Facets may include author, subject area, format type, and year. Advanced searches can also be done to limit options to specific metadata fields or find user profiles and RE homepages.

4.2.4 Subscribing

Registered and unregistered users can subscribe to RSS feeds for all new submissions or individual subject areas via links on the respective pages. Registered users will also see their subscriptions on their user homepage upon login and can choose to get email notification. Registered users can also subscribe to RE and get feeds of all RE-reviewed papers or just the ones that the RE has stamped with their approval.

4.2.5 Bookmarking

Registered users will have the ability to earmark the papers they would like to come back to at a later time through bookmarking. On every submission page, there is a button for users to save the paper for later. All the saved papers will be available on the user's homepage.

4.2.6 Commenting

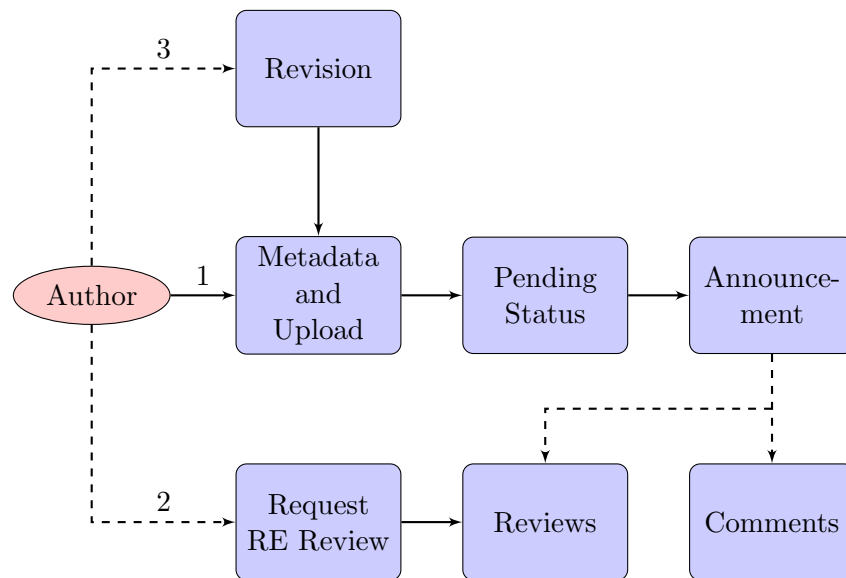
Any registered user (including the author) can make comments on a submission or a review. Users will be asked to indicate if their comment or feedback is positive, neutral, or negative; this will affect the submission’s or review’s points (see section 6.4.2). Comments can also accrue points based on upvotes and downvotes by other users, which will directly affect the commentor’s karma (see sections 6.4.1 and 4.3.5). Inappropriate comments may be deleted by the moderator(s).

4.2.7 Reviewing

Any RE can submit a review for a submission at any time. Each review is citable and can be commented upon like a submission. Reviews must be submitted under an RE, but the reviewer can opt to include his or her name or otherwise remain anonymous. In an attempt to quantify the submission, reviewers are asked to rate the submission (e.g. on a scale of 1-5) (see also section 4.3.3) and decide whether or not to give the “RE Stamp of Approval.” Reviews and related comments can accrue points based on upvotes and downvotes by users who are not part of the RE (see sections 6.4.4 and 6.4.1).

4.2.8 Submitting Papers

Figure 2: Work Flow for Paper Submissions



Papers can be submitted by any registered user as an author. A submission is defined as an initial upload (new paper) or a revision of the original paper or previous revision. Submissions can earn points (see section 4.3.3) and figure 2 illustrates the submission process. The lines marked 2 and 3 are optional paths.

Metadata and Upload: Authors must prepare metadata for each submission and upload the file in an acceptable format. Valid formats may include PDF, DjVu, and PostScript. Metadata fields include additional authors (or authors' usernames if they are registered with the site), title, abstract, keywords, and relevant subject areas (from a preset dropdown list). This information will be used to generate downloadable citation formats and to aid in searches. Initial uploads will generate the submission's homepage that will be used for all subsequent revision uploads. In other words, all the metadata fields are then prefilled with the previous upload's metadata entries and can be edited for any revision uploads. Edits will always override previous metadata entries and previous entries will not be saved. However, all uploads will be saved and listed on the homepage in reverse chronological order.

Note: If the submitting author includes the usernames of the other authors, the additional authors will be able to gain a share of the submission's points for their own karma. Additional authors may also claim authorship after the submission has already been announced and retroactively added by the submitting author or a moderator.

Pending Status: Once the author submits the initial request, he or she has 10 minutes to modify the metadata fields, upload a different file or delete the submission. After that the system indexes the submission, assigns a unique identifier, and affixes version control (see section 4.4.2).

Announcement: Once the submission has gone through, there can be no further changes except to retroactively add additional authors or authors' usernames. Users who signed up to receive email or RSS feeds of particular subject areas will receive notification that the submission is available for viewing. All submissions are archived for future access and therefore cannot be removed from the site after Announcement. The submission will show up under latest new submissions or revisions lists.

Comments and Reviews: Once the submission is available, all registered users can make com-

ments, submit reviews, and upvote or downvote the submission, users' comments, and RE reviews. Users who wish to submit a review must do so as part of an RE (see also sections 4.2.6 and 4.2.7).

Request RE Review: Authors can request that a particular RE write a review, but must wait at least 2 weeks before making another request to a different RE, regardless of whether or not the first RE had submitted a formal review.

Revision: Authors can choose to revise their original papers at any point. Revisions should be submitted through the submission's homepage under the original file's identifier so duplicate identifiers are not created for the same work. Authors are expected to cite the reviews in their revisions.

4.3 Points and Karma

Comments, reviews, and submissions gain or lose points. These points play a huge role in ranking submissions. RE and registered users gain or lose karma, which affect their reputation. Users' karma also affects their ability to vote or moderate (see section 4.3.5).

4.3.1 Points: Comments

Individual comments can be upvoted ($\uparrow$) or downvoted ($\downarrow$) by registered users who meet the karma requirements (see section 4.3.5). Commentors will be asked to indicate if their comment is positive, negative, or neutral. Moderator-deleted comments will permanently stay at 0 points, cannot be upvoted or downvoted, and will therefore not affect the submission's or the review's total points. However, the commentor will lose karma points (see section 4.3.5). The comment points are calculated as follows:

$$\text{comment points} = (\text{direct } \uparrow \text{ votes}) - (\text{direct } \downarrow \text{ votes}) \quad (1)$$

4.3.2 Points: Reviews

Individual reviews can be upvoted ($\uparrow$) or downvoted ($\downarrow$) by registered users who meet the karma requirements (see section 4.3.5). Comments made by submitting RE will not count. The review points are calculated as follows:

$$\text{weighted } \uparrow = \lfloor (\text{direct } \uparrow \text{ votes}) + 0.2 * (\text{positive comment } \uparrow \text{ votes}) \rfloor \quad (2)$$

$$\text{weighted } \downarrow = \lfloor (\text{direct } \downarrow \text{ votes}) + 0.05 * (\text{negative comment } \uparrow \text{ votes}) \rfloor \quad (3)$$

$$\text{review points} = (\text{weighted } \uparrow) - (\text{weighted } \downarrow) \quad (4)$$

4.3.3 Points: Submissions

Each submission accrue or lose points directly and as more comments and reviews are added. Author comments will not count. The submission points are calculated as follows:

$$\text{weighted } \uparrow = \lfloor (\text{direct } \uparrow \text{ votes}) + 0.2 * (\text{positive comment } \uparrow \text{ votes}) \rfloor \quad (5)$$

$$\text{weighted } \downarrow = \lfloor (\text{direct } \downarrow \text{ votes}) + 0.05 * (\text{negative comment } \uparrow \text{ votes}) \rfloor \quad (6)$$

$$\text{total review rating} = \begin{cases} \sum_{i=1}^n (\text{review rating})_i & \text{if there exists } n \text{ submission reviews} \\ 0 & \text{else} \end{cases} \quad (7)$$

$$\text{submission points} = (\text{weighted } \uparrow) - (\text{weighted } \downarrow) + (\text{total review rating}) \quad (8)$$

This is used to rank the submission and takes into account the rating from reviews (see section 4.2.7) and comments from all versions of the same work.

4.3.4 Karma: RE

RE gain karma directly from their reviews and the comments received. Review points are calculated above in equation (18). The RE points are calculated as follows:

$$\text{total review points} = \begin{cases} \sum_{i=1}^n (\text{review points})_i & \text{if there exists } n \text{ RE reviews} \\ 0 & \text{else} \end{cases} \quad (9)$$

$$\text{RE Karma} = (\text{total review points}) + (\text{success predictability})^\dagger \quad (10)$$

[†] Success predictability is measured through a combination of review rating, submission points, and citation index for all reviewed submissions. For example, if the RE gave a submission a low rating but the submission became very highly cited over time, then the RE has failed to predict success.

4.3.5 Karma: User

Individual users can gain karma. There are two types: author karma and reader karma. Author karma comes from submissions (initial uploads and subsequent revisions) (see equation (21)). Reader karma is a combination of points gained from commenting (see equation (15)) and reviewing (as part of an RE) (see equation (23)). Author karma is calculated as follows:

$$\text{Author Karma} = \begin{cases} \sum_{i=1}^n (\text{submission points})_i & \text{if author has } n \text{ submissions} \\ 0 & \text{else} \end{cases} \quad (11)$$

Reader karma is calculated as follows:

$$\text{total comment points} = \begin{cases} \sum_{i=1}^n (\text{comment points})_i & \text{if commentor has } n \text{ comments} \\ 0 & \text{else} \end{cases} \quad (12)$$

$$\text{RE cut} = \begin{cases} \sum_{i=1}^m \sum_{j=1}^n \frac{100 \times (\text{review points})_i}{(\text{RE Karma})_j} & \text{if written } m \text{ reviews for } n \text{ RE} \\ 0 & \text{else} \end{cases} \quad (13)$$

$$\text{Reader Karma} = (\text{total comment points}) + (\text{RE cut}) \quad (14)$$

Total karma will be displayed as a pie chart on the user’s homepage.

Aspects of the system require that users have a certain amount of karma to participate. This is to ensure that only established members in the community can vote or moderate. The following table lists the karma requirements:

Table 1: Karma Requirements for Voting or Moderating

Action	Karma (either type or combination)
Voting on comments	500
Voting on reviews	1,000
Moderating	20,000

4.4 Administrative Controls

4.4.1 Copyright

Authors can choose to attach a creative commons license to their work [4], but the system retains a perpetual license to host and archive the content.

4.4.2 Version Control

The system will automatically assign version numbers to all submissions under a particular title and identifier. Version 1 is always the initial upload and all subsequent versions are revisions.

4.4.3 Moderation

Users who have gained a certain amount of karma (see section 4.3.5) **and** request to moderate a subject area may be approved as moderators by existing moderators. Responsibilities include, but are not limited to, deleting inappropriate comments (which will be marked as “Deleted by moderator”), moving submissions if they are in the inappropriate subject area, and retroactively adding additional authors to a submission. If a moderator’s karma falls more than 25% below the required karma to gain moderating abilities, privileges will be revoked. Moderators may voluntarily

also step down from their posts.

4.4.4 User Verification

Users with no institutional affiliation will need to go through a verification process. This extra step is to verify identity, to maintain a community of relevant and legitimate research discussions and contributions, and to prevent spam. Users will be asked to submit evidence of involvement in the community, including the name of a member who can vouch for their credibility. This step may take some time in order to get confirmation from that member.

4.4.5 RE controls

RE can be formed by any registered user and once named, it cannot be changed. The user who initiates the formation of the RE will be given admin status. As an admin, the user can write or edit the RE policy statement, add or deactivate members, and give other members admin status. All active and inactive members are listed on the RE homepage with dates of active service (from join date to leave or deactivation date).

4.5 System Tools

4.5.1 Citation Tracker and Generator

This system will track the number of citations a submission has accrued and display it on the submission's homepage. Authors can also track how often they have been cited. This idea comes specifically from the Scopus Citation Tracker [10]. The system will also have a citation generator like CiteULike [9].

4.5.2 MathJax

“MathJax is an open source JavaScript display engine for mathematics that works in all modern browsers” [7]. This will allow users to type mathematical formulas in their comments and reviews.

4.5.3 Ranking

The following is a list of possible rankings for submissions:

- Highest number of upvotes
- Highest number of submission points
- Latest new uploads
- Latest new revisions

The same rankings will apply to the different subject areas. Users and RE can also be ranked by their accumulated karma.

4.5.4 Recommender System

This system will make 5 recommendations for similar papers on each submission's page. Recommendations are made based on proximity of the metadata.²

4.5.5 Search Results

Users can do searches based on the metadata provided by the authors (see also section 4.2.3). An algorithm similar to Google's PageRank can be implemented to sort the search results.

5 Design Specifications

The site contains user-specific pages and general pages. ■ indicate pages that are accessible to anyone. ■ indicate pages that are accessible only to registered users. Figure 4 shows the site map of the pages as a simple diagram.

²An introduction to recommenders system, written by Dietmar Jannach, was just published earlier this year [5].

5.1 User Home

5.1.1 ■ Default User Homepage

This is the default page that a registered user will see upon login or accessing the site while logged in beforehand. Otherwise, the user (unregistered or not logged in) will see the default site homepage (see section 7.4.1). This user homepage contains the user's profile (see section 4.2.1), list of RE that the user belongs to (if any), user's karma (see section 4.3.5), user's comments (listed by latest on top), bookmarked papers (see section 4.2.5), and RSS subscriptions (see section 7.4).

5.1.2 ■ Users and Public Profiles

The Users page shows a list of users through these possible filters: alphabetical (default), newest, highest ranked reader karma, highest ranked author karma, and highest ranked total karma (see section 4.3.5). Clicking on any username will open up their public profile page (see section 4.2.1), list of RE that the user belongs to (if any), user's karma (see section 4.3.5), and user's comments (listed by latest on top). If the user clicks on his or her own profile, he or she will be taken to the default user's homepage (see section 7.1.1).

5.1.3 ■ Register or Edit Profile

This page allows a new user to register for an account or a returning user to edit their information for their public profile (see section 4.2.1).

5.1.4 ■ Edit Subscriptions

This page allows the registered user to add or delete subscriptions (see section 4.2.4). Subscriptions can also be added through a link on the individual filter pages (see section 7.4).

5.1.5 ■ Initiate Submission

This page starts the submission process for either an initial upload or a revision. The process is detailed in section 4.2.8.

5.2 RE

5.2.1 ■ RE Ranking List

This page shows a list of RE through these possible filters: highest rated (default) and alphabetical. Clicking on an RE will take the user to the RE Home (see section 7.2.2). Registered users will also see a link to create an RE (see section 7.2.3).

5.2.2 ■ RE Home

This page contains the RE's member list, karma, and list of reviews. RE admins will see a link to edit the RE on this page (see section 5.2.4). If a user wants to join an RE, he or she can request to join through the particular RE's homepage and a message will be sent to the admin(s) for approval. If a member of the RE is on the RE homepage, he or she can elect to deactivate himself or herself (Note: admins cannot deactivate himself or herself unless they give up admin status and become regular members).

5.2.3 ■ Create RE

This page allows a registered user to form a uniquely named RE and add members (see also section 4.4.5).

5.2.4 ■ Edit RE

This page can only be accessed by the RE admins and only these options are available: edit the RE policy statement, give admin status to members, and add or deactivate members (see also section 4.4.5).

5.3 Pages

5.3.1 ■ Submission Page

This page shows all versions of the paper under that title, the most up-to-date user-entered metadata, the highest rated (at most) 10 comments and the highest rated (at most) 3 reviews (see

section 4.2.8). Clicking on the Comments heading opens up a page that will list all the highest rated comments or resorted into the newest comments. The same happens with the Reviews heading. Comments for the reviews are listed directly under or to the right of the review it belongs to. A mechanism to bookmark the page will also be included.

5.3.2 ■ Comments

This is a subpage of the Submission page as described above (see section 5.3.1).

5.3.3 ■ RE Reviews

This is a subpage of the Submission page as described above (see section 5.3.1).

5.3.4 ■ Search

This is a function that crawls the metadata and returns results, which can be further limited using facets (see section 4.2.3). Every page on the site will contain a simple search box in the top right corner with a link to “advanced search” which will take them to a search page with options to create a boolean string of author, title, keyword, etc.

5.4 Filters

These are presorted lists of submissions. Each of these pages can be subscribed to via RSS feeds.

5.4.1 ■ Overall Highest Rated (default site home)

This page is the default page of the site for unregistered users and users who are not logged in. It shows a list of the highest rated submissions. Clicking on a title will take the user to the Submission page of that paper (see section 5.3.1).

5.4.2 ■ Latest Submissions

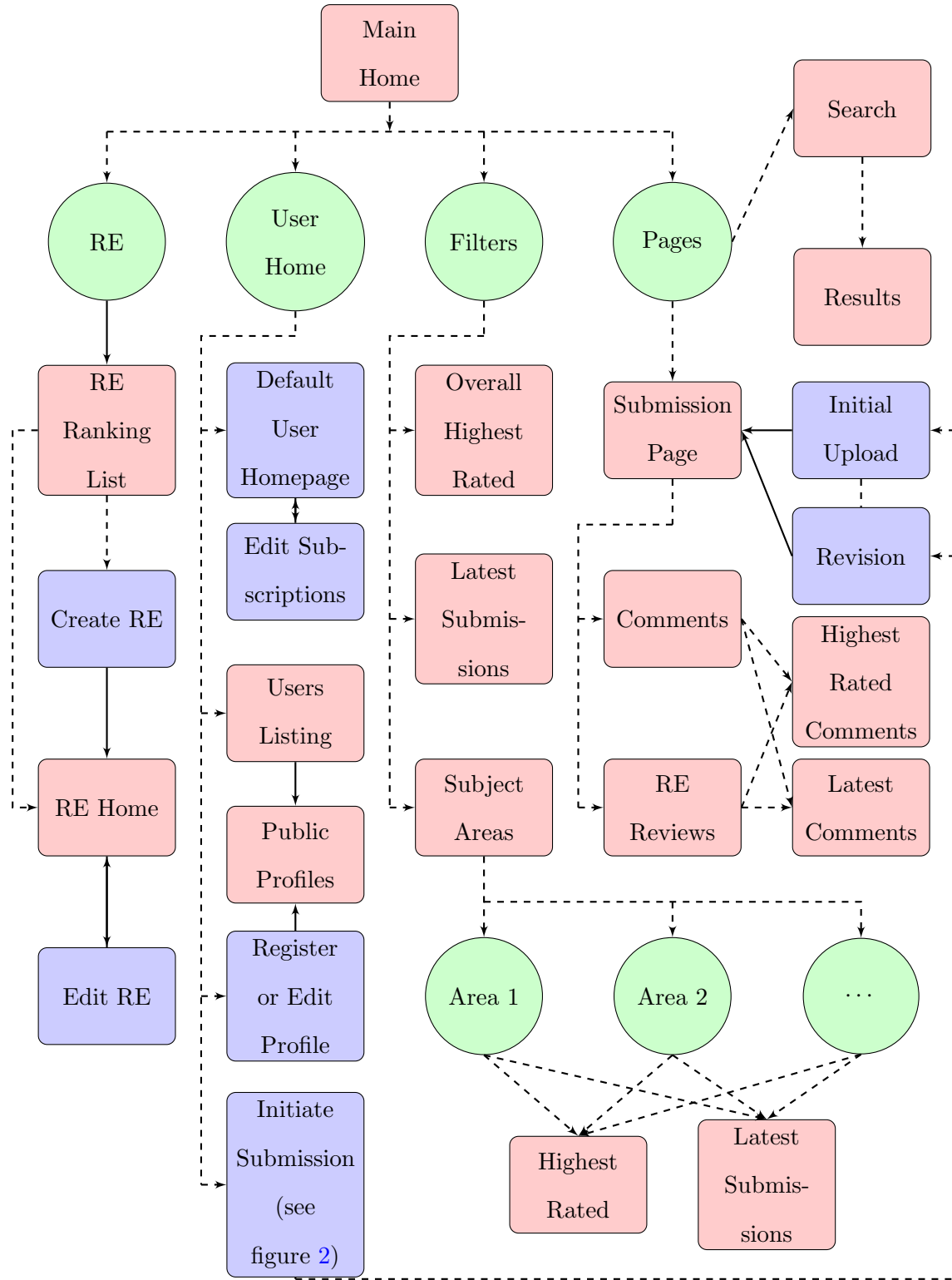
This page lists all the latest uploads. It will be divided into two sections: new uploads and revisions.

5.4.3 ■ Subject Areas

This page lists all the subject areas that submissions fall under. Clicking on a subject area heading will lead to a page listing the highest rated submissions (default) or sorted by latest submissions.

Figure 3: Site Map

Legend: Green circles (●) indicate a category (not an actual page). Red boxes (■) indicate pages that are accessible to anyone. Blue boxes (■) indicate pages that are accessible only to registered users.



Part III

Model 2

6 Functional Requirements

6.1 Users Types

6.1.1 Unregistered Users

Anyone who accesses the site but does not register for an account is considered an unregistered user. These users can only browse and search the site.

6.1.2 Registered Users

Anyone with an OpenID [8] can create an account and become a registered user with the site. In addition to browsing and searching, registered users can create and edit a profile, create or join a Reviewing Entity (RE), start new discussions, post comments to discussions and reviews, and bookmark. Each of these actions are explained in section 6.2 below.

6.1.3 Moderators

Registered users may be given moderation abilities once they have amassed a certain amount of karma (see section 6.4.5). Abilities may include deleting inappropriate comments (which will be marked as “Deleted by moderator”) and retagging discussions if they are tagged inappropriately or inadequately.

6.2 User Actions

6.2.1 Browse

All users can freely browse all discussions, reviews, comments, user profiles, and RE homepages.

6.2.2 Search

Using the metadata gathered from each discussion, users can do general keyword searches. Advanced searches can be used to limit options to specific metadata fields or find user profiles and RE homepages (see section [6.5.4](#)).

6.2.3 Create and edit a user profile

Unregistered users will be given the option to login with their OpenID [\[8\]](#) and create a profile. Once the OpenID provider has verified the user, the following fields can be edited in the user profile with the site:

- Display Name and/or Real Name
- Education and Work Credentials
- Current Affiliation
- Contact Information (e.g. phone number, email, website)
- Areas of Specializations
- Current Photograph
- Brief Biography

All fields are optional but registering users are encouraged to fill out all fields to establish reputation and credentials. The basic default user profile will show the user's name and karma statistics (see also section [6.4.5](#)). Additional fields will become visible if the user has provided information in those fields.

6.2.4 Create or join an RE

See section [6.3.1](#). Users can join or create as many RE as they wish.

6.2.5 Start new discussions

Discussions are separate from reviews. Reviews are reserved for RE (see section 6.3). Discussions can be started by any registered user and must be linked to an arXiv paper. Once a user starts a discussion, users may begin posting comments. Discussions earn points through votes and activity (see section 6.4.3).

6.2.6 Post comments

Any registered user (including the author) can post comments in a discussion or a review. Comments can also accrue points based on upvotes and downvotes by other users, which will directly affect the user's karma (see sections 6.4.1 and 6.4.5). Inappropriate comments may be deleted by the moderator(s).

6.2.7 Bookmark

Registered users can earmark discussions linked to a particular arxiv paper and also subscribe to individual RE. Every arxiv link will generate a page that will list all discussions and reviews related to it and users can bookmark this page to keep track to activity.

6.2.8 Gain karma

Through participation in the system (i.e. starting discussions, commenting, writing reviews), users can gain or lose karma, which affects their ability to vote and moderate (see section 6.4.5). This can also affect the user's reputation in the real world.

6.3 Reviewing Entity (RE)

6.3.1 Create or join an RE

Any user or group of users can form a group called a Reviewing Entity (RE) for the purpose of writing formal peer-reviews of papers that have been posted on arxiv. Once an RE has been named, it cannot be changed. The user who initiates the formation of the RE will be given admin status

of the group. As an admin, the user can write or edit the RE policy statement, add or deactivate members, and give other members admin status. All active and inactive members are listed on the RE homepage with dates of active service (from join date to leave or deactivation date).

6.3.2 Reviews and comments

Reviews can be posted at any time for any paper on arxiv. Each review is citable and can be commented upon like in discussions. Reviews must be submitted under an RE, but the reviewer can opt to include his or her name or otherwise remain anonymous. In an attempt to quantify the submission, reviewers are asked to rate the paper (e.g. on a scale of 1-5) (see also section [4.3.3](#)) and decide whether or not to give the “RE Stamp of Approval.” Reviews and related comments can accrue points based on upvotes and downvotes by users who are not part of the RE (see sections [6.4.4](#) and [6.4.1](#)).

6.3.3 RE karma

Like individual users, RE can also gain or lose karma. However, RE karma is based on the votes of their reviews and comments on those reviews and their ability to predict the success of a paper. For example, if the RE gave a submission a low rating but the submission became very highly cited over time, then the RE has failed to predict success.

6.4 Points and Karma

Comments, reviews, and submissions gain or lose points. These points play a huge role in ranking submissions. RE and registered users gain or lose karma, which affect their reputation.

6.4.1 Points: Comments

Individual comments can be upvoted ($\uparrow$) or downvoted ($\downarrow$) by registered users who meet the karma requirements (see section [6.4.5](#)). Users will indicate if their comment is positive, negative, or neutral. Moderator-deleted comments will permanently stay at 0 points, cannot be upvoted or downvoted, and will therefore not affect the discussion’s or the review’s total points. However, the

offending user will lose karma points (see section 6.4.5). The comment points are calculated as follows:

$$\text{comment points} = (\text{direct } \uparrow \text{ votes}) - (\text{direct } \downarrow \text{ votes}) \quad (15)$$

6.4.2 Points: Reviews

Individual reviews can be upvoted ($\uparrow$) or downvoted ($\downarrow$) by registered users who meet the karma requirements (see section 6.4.5). Comments made by users in the submitting RE will not count. The review points are calculated as follows:

$$\text{weighted } \uparrow = \lfloor (\text{direct } \uparrow \text{ votes}) + 0.2 * (\text{positive comment } \uparrow \text{ votes}) \rfloor \quad (16)$$

$$\text{weighted } \downarrow = \lfloor (\text{direct } \downarrow \text{ votes}) + 0.05 * (\text{negative comment } \uparrow \text{ votes}) \rfloor \quad (17)$$

$$\text{review points} = (\text{weighted } \uparrow) - (\text{weighted } \downarrow) \quad (18)$$

6.4.3 Points: Discussions

Each discussion accrues or loses points directly and as more comments are added. The submission points are calculated as follows:

$$\text{weighted } \uparrow = \lfloor (\text{direct } \uparrow \text{ votes}) + 0.2 * (\text{positive comment } \uparrow \text{ votes}) \rfloor \quad (19)$$

$$\text{weighted } \downarrow = \lfloor (\text{direct } \downarrow \text{ votes}) + 0.05 * (\text{negative comment } \uparrow \text{ votes}) \rfloor \quad (20)$$

$$\text{discussion points} = (\text{weighted } \uparrow) - (\text{weighted } \downarrow) \quad (21)$$

6.4.4 Karma: RE

RE gain karma directly from their reviews and the comments received. Review points are calculated above in equation (18). The RE points are calculated as follows:

$$\text{total review points} = \begin{cases} \sum_{i=1}^n (\text{review points})_i & \text{if there exists } n \text{ RE reviews} \\ 0 & \text{else} \end{cases} \quad (22)$$

$$\text{RE Karma} = (\text{total review points}) + (\text{success predictability})^\dagger \quad (23)$$

[†] Success predictability is measured through a combination of review rating, submission points, and citation index for all reviewed submissions (see section 6.3.3).

6.4.5 Karma: User

Individual users can gain or lose karma through starting discussions, posting comments, and writing reviews (see section 6.2.8).

$$\text{total discussion points} = \begin{cases} \sum_{i=1}^n (\text{discussion points})_i & \text{if user has began } n \text{ discussions} \\ 0 & \text{else} \end{cases} \quad (24)$$

$$\text{total comment points} = \begin{cases} \sum_{i=1}^n (\text{comment points})_i & \text{if user has made } n \text{ comments} \\ 0 & \text{else} \end{cases} \quad (25)$$

$$\text{RE cut} = \begin{cases} \sum_{i=1}^m \sum_{j=1}^n \frac{100 \times (\text{review points})_i}{(\text{RE Karma})_j} & \text{if written } m \text{ reviews for } n \text{ RE} \\ 0 & \text{else} \end{cases} \quad (26)$$

$$\text{Karma} = (\text{total discussion points}) + (\text{total comment points}) + (\text{RE cut}) \quad (27)$$

Aspects of the system require that users have a certain amount of karma to participate. This is to ensure that only established members in the community can vote or moderate. The following

table lists the karma requirements:

Table 2: Karma Requirements for Voting or Moderating

Action	Karma
Voting on discussions	0
Voting on comments	500
Voting on reviews	1,000
Moderating	20,000

6.5 System Features

6.5.1 Copyright

RE can choose to attach a creative commons license to their reviews [4], but the system retains a perpetual license to host and archive all content.

6.5.2 MathJax

“MathJax is an open source JavaScript display engine for mathematics that works in all modern browsers” [7]. This will allow users to type mathematical formulas in their comments and reviews.

6.5.3 Filters and tags

The following are possible ways discussions, reviews, users and RE can be listed:

- Highest number of discussion/review points
- Latest new discussions/reviews
- Users listed by display name or newest members
- Users/RE listed by their accumulated karma

Discussions and reviews can be tagged with preset labels or users may create and add their own labels. Pages will be dynamically created to list all discussions or reviews based on the tag selected.

6.5.4 Search Results

Users can do searches based on the tags provided by the discussions (see also section 6.2.2). An algorithm similar to Google's PageRank can be implemented to sort the search results.

7 Design Specifications

The site contains user-specific pages and general pages. ■ indicate pages that are accessible to anyone. ■ indicate pages that are accessible only to registered users. Figure 4 shows the site map of the pages as a simple diagram.

7.1 User Home

7.1.1 ■ Default User Homepage

This is the default page that a registered user will see upon login or accessing the site while logged in beforehand. Otherwise, the user (unregistered or not logged in) will see the default site homepage (see section 7.4.1). This user homepage contains the user's profile (see section 6.2.3), list of RE that the user belongs to (if any), user's karma (see section 6.4.5), user's comments (listed by latest on top), and bookmarks (see section 6.2.7).

7.1.2 ■ Users and Public Profiles

The Users page shows a list of users through these possible filters: alphabetical by display name (default), newest members, and highest ranked by karma (see section 6.4.5). Clicking on any username will open up their public profile page (see section 6.2.3), list of RE that the user belongs to (if any), user's karma (see section 6.4.5), and user's comments (listed by latest on top). If the user clicks on his or her own profile, he or she will be taken to the default user's homepage (see section 7.1.1).

7.1.3 ■ Register or Edit Profile

This page allows a new user to register for an account or a returning user to edit information for the user's public profile (see section [6.2.3](#)).

7.1.4 ■ Edit Bookmarks

This page allows the registered user to add or delete bookmarks (see section [6.2.7](#)).

7.1.5 ■ Initiate Post

Users can either start their own discussions or post comments to discussions and reviews. New discussions can be posted through a new page and comments can be made directly on the page of a discussion or a review.

7.2 RE

7.2.1 ■ RE Ranking List

This page shows a list of RE through these possible filters: highest rated (default) and alphabetical by name. Clicking on an RE will take the user to the RE Home (see section [7.2.2](#)). Registered users will also see a link to create an RE (see section [7.2.3](#)).

7.2.2 ■ RE Home

This page contains the RE's member list, karma, and list of reviews. RE admins will see a link to edit the RE on this page (see section [7.2.3](#)). If a user wants to join an RE, he or she can request to join through the particular RE's homepage and a message will be sent to the admin(s) for approval. If a member of the RE is on the RE homepage, he or she can elect to deactivate himself or herself (Note: admins cannot deactivate himself or herself unless they give up admin status and become regular members).

7.2.3 ■ Create or Edit RE

This page allows a registered user to form a uniquely named RE, edit the policy statement, give admin status to members, and add or deactivate members (see also section [6.3.1](#)).

7.2.4 ■ Write Reviews

This page is similar to the user's page to start a discussion. RE will be able to write and post their reviews through this page.

7.3 Pages

7.3.1 ■ Discussion Page

Users can start a discussion amongst other users, who can post comments to the discussion topic. Comments will be indented to allow users to make comments to other comments.

7.3.2 ■ RE Review Page

This page contains the RE review and all comments related to it (see section [7.2.4](#)).

7.3.3 ■ Arxiv Link

Each discussion and review must be linked to an arxiv link. Arxiv links on this site will dynamically generate a page that lists all the discussions and reviews linked to that arxiv paper.

7.3.4 ■ Search

This is a function that crawls the metadata and returns results, which can be further limited using facets (see section [6.2.2](#)). Every page on the site will contain a simple search box in the top right corner with a link to “advanced search” which will take them to a search page with options to create a boolean string of author, title, keyword, etc.

7.4 Filters

These are presorted lists of discussions (see section [6.5.3](#)).

7.4.1 ■ Overall Highest Rated Discussions (default site home)

This page is the default page of the site for unregistered users and users who are not logged in. It shows a list of the highest rated discussions. Clicking on a title will take the user to the discussion page (see section [7.3.1](#)).

7.4.2 ■ Latest Discussions

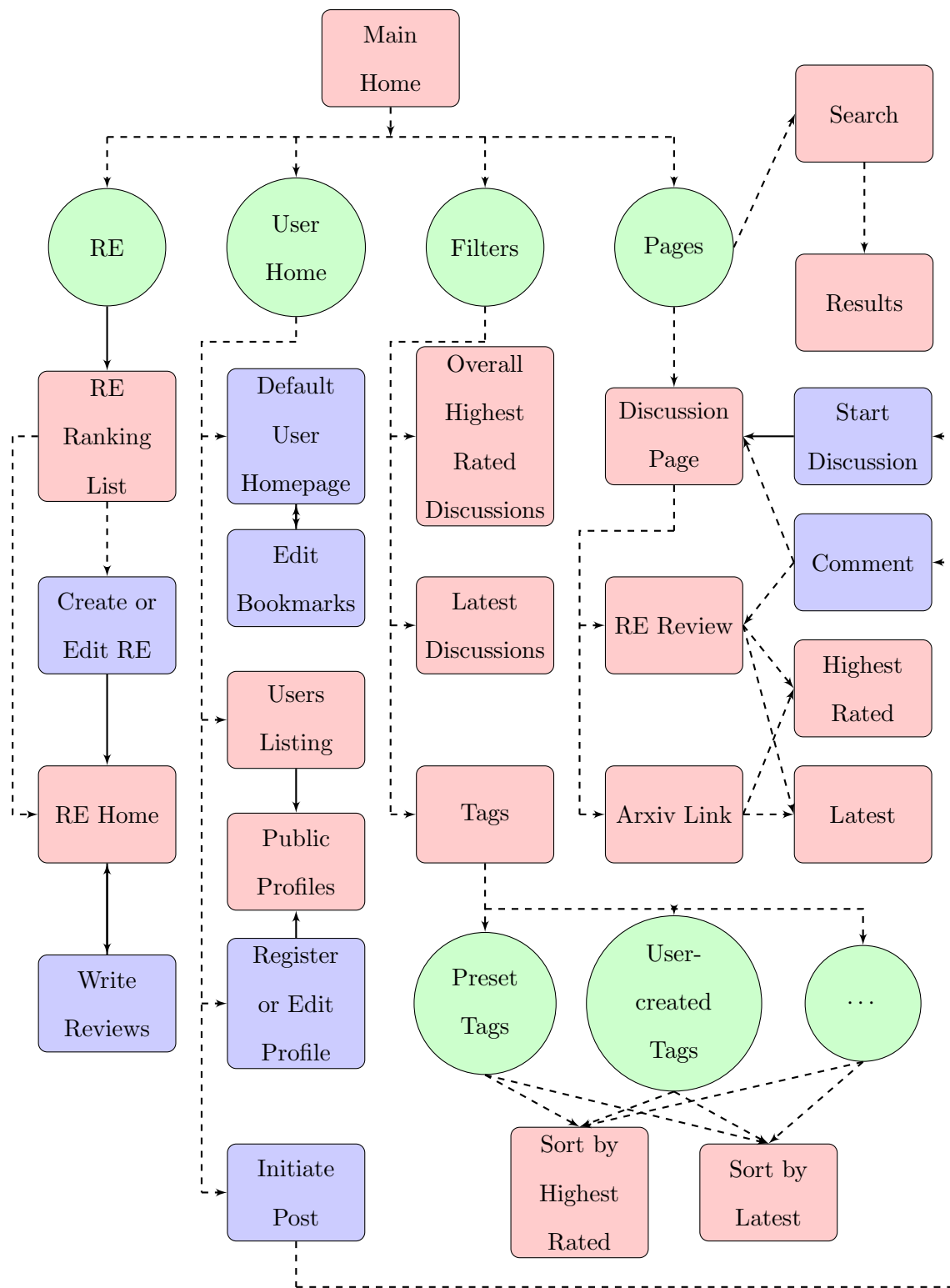
This page lists all the latest discussions.

7.4.3 ■ Tags

This page lists all the tags that discussions and reviews fall under. Tags are either preset by the system or user-created (see section [6.5.3](#)). Clicking on a tag will dynamically generate a page listing the highest rated submissions (default) or sorted by latest submissions.

Figure 4: Site Map

Legend: Green circles (●) indicate a category (not an actual page). Red boxes (■) indicate pages that are accessible to anyone. Blue boxes (■) indicate pages that are accessible only to registered users.



Part IV

Building the System

Part V

Rollout and Implementation

Part VI

Related

References

- [1] MathOverflow. <http://mathoverflow.net/>.
- [2] Reddit. <http://www.reddit.com/>.
- [3] CORNELL UNIVERSITY. arxiv. <http://arxiv.org/>.
- [4] CREATIVE COMMONS. Creative Commons. <https://creativecommons.org/>.
- [5] JANNACH, D. *Recommender Systems: An Introduction*. Cambridge University Press, New York, 2011.
- [6] LECUN, Y. Proposal for a new publishing model in computer science. <http://yann.lecun.com/ex/pamphlets/publishing-models.html>.
- [7] MATHJAX. MathJax. <http://www.mathjax.org/>.
- [8] OPENID FOUNDATION. Add OpenID to your site. <http://openid.net/add-openid/>.
- [9] OVERSITY LIMITED. CiteULike. <http://www.citeulike.org/>.
- [10] SCIVERSE. Scopus Citation Tracker. <http://www.info.sciverse.com/scopus/scopus-in-detail/tools>.
- [11] SUROWIECKI, J. *The wisdom of crowds*. Doubleday Publishing, New York, 2004.
- [12] WIKIPEDIA, THE FREE ENCYCLOPEDIA. LAMP (software bundle). [http://en.wikipedia.org/w/index.php?title=LAMP_\(software_bundle\)&oldid=445666247](http://en.wikipedia.org/w/index.php?title=LAMP_(software_bundle)&oldid=445666247).