

LRDB: a Database of Literature Reviews in Computer Science

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Abstract. *With the increasing number of publications in the different areas of Computer Science, having a comprehensive view of state-of-the-art research is a difficult task. Literature reviews are a key means of overviewing and introducing research work on a particular topic. However, they are not always easy to find. Due to this need, we introduce LRDB, which is a web repository of literature reviews of Computer Science research. LRDB provides extended support for systematic reviews and systematic mappings, which has been received increasing attention mainly in Software Engineering. Moreover, our tool provides a set of helpful features, including a collaborative environment to keep an up-to-date catalogue of reviews and mechanisms to find interesting reviews.*

Video: <https://youtu.be/oBHvATq1Q18>

1. Introduction

Literature reviews are a key means of helping researchers to understand specific topics of different fields, including Computer Science [Erren et al. 2009], because they introduce relevant research work on a given topic, summarizing and comparing the work that has been done. Despite the usefulness and importance of literature reviews, finding them is not a trivial task due to two main reasons: (a) the number of publication venues to be searched is large, and (b) available search mechanisms are limited and often require complex queries, to find relevant publications. The lack of adequate ways to find literature reviews is even more problematic when reviews are *systematic*, because existing reviews must be found so that they can be extended by new reviews that focus on different publication years or databases. As a practical example, when searching for “systematic review AND internet of things” in three of the most popular digital libraries, a total of 1808 results are returned. Consequently, it demands much time and effort from researchers to find existing studies that are systematic reviews in the context of Internet of Things.

In response, we developed LRDB¹—Literature Review DataBase—a web repository of literature reviews in the context of Computer Science. LRDB allows literature reviews to be found in a single location, thus being a useful tool for finding and accessing collections of scientific papers. The idea is to create a collaborative environment in which users can search for and update existing literature reviews in all areas of Computer Science. Moreover, LRDB provides extended support to systematic reviews and systematic mappings, which has been receiving increasing popularity as a means of evaluating and interpreting relevant studies of a particular topic of interest with minimized research bias. In Software Engineering, systematic literature reviews have received significant attention due to their applicability and benefits to practitioners and researchers. Such popularity is demonstrated by the growing number of publications of systematic reviews in recent

¹Available at <http://prosoft.inf.ufrgs.br/lrdb>.

years. Given the importance of systematic reviews in Software Engineering, we initially populated our web repository with systematic reviews in this area.

2. Related Work

Although there are approaches to assess the quality of systematic reviews and supporting tools [Marshall et al. 2014], before performing a systematic review, it is necessary to investigate whether a secondary study with the same objective has already been published. Although the scientific databases currently available in Computer Science allows searching for existing publications, such databases do not distinguish studies as primary or secondary studies and, in particular, systematic reviews. All studies are considered primary studies, and systematic reviews are thus fragmented [Kitchenham et al. 2004]. In Software Engineering, the support to find systematic studies is based mostly on search queries and the researcher’s expertise. In Medicine, in turn, there is more extensive support [Biolchini et al. 2005]. In this field, researchers rely on a large organizational and technological structure, such as Cochrane Library², PubMed Health³, and other large databases of systematic reviews. This lack of search support in Software Engineering and, more broadly, in Computer Science calls for an organizational and technological structure similar to that existing in Medicine. This thus motivated us to develop LRDB, which is introduced in next section. Other existing tools, such as StArt⁴, focus on the definition of the review protocol.

3. LRDB

LRDB is a web-based system that allows the registration of publications in Computer Science, offering special support to systematic studies through additional collected data.

3.1. Features

We present the LRDB homepage in Figure 1, which contains the system presentation, informative meta-statistics (such as registered publications and users), and links to hot and administrative pages as well as searches. When searching specifically for systematic studies, the application provides extended search criteria. Conceived as a collaborative environment, LRDB allows users to insert and manage publications from other users to keep data up-to-date. Figure 2 presents a publication entry, where users can visualize publication metadata including whether it is systematic, access statistics and a link to the original publication as well as export the reference according to the BibTeX format.

Anyone can access and register in the application, which has three types of users: (i) *anonymous* users, who are not registered and can only view publications as well as use our search mechanisms; (ii) *registered* users, who can additionally request to add new publications or edit existing publications; and (iii) *administrators*, who can also evaluate requests for new publications, editions or deletions. LRDB is thus moderated, changes of registered users are submitted to the approval of an administrator. This is to guarantee the repository information quality. Besides the collaborative environment where users maintain data up-to-date, LRDB also provides features focused on the automation of the publication management to reduce the effort of finding and including new publications to the system. The main features provided for LRDB users are presented below.

²<http://www.cochranelibrary.com/cochrane-database-of-systematic-reviews/>

³<http://www.ncbi.nlm.nih.gov/pubmedhealth/>

⁴http://lapes.dc.ufscar.br/tools/start_tool

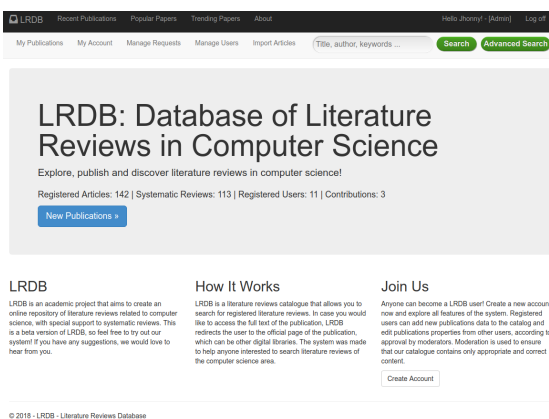


Figure 1. LRDB Home Page.

A Systematic Review of Software Development Cost Estimation Studies



• Last Update on: 6/13/2016 9:31:26 AM

Article details ↓

Title	A Systematic Review of Software Development Cost Estimation Studies
Authors	• M. Jørgensen
Publication Type	Article (Systematic Review)

Figure 2. Registered Publication.

3.1.1. Collaborative Publication Management

Registered users can insert new publications. When registering a publication, it is necessary to inform in advance the type of publication (article, book, technical report, among others) and if the review is a systematic review or mapping. This is illustrated in Figure 3. Once a type of publication has been selected, users are redirected to a web page in which they must include the study metadata, e.g. title, classification and authors. The form to be filled in is shown in Figure 4. Some of the fields vary according to the publication type. An URL or DOI (Digital Object Identifier), which allows accessing the original publication should also be provided—we do not allow uploading the publication file due to copyright issues. When the publication uses a systematic method, there are additional fields, namely searched databases and start and end years covered by the systematic review or mapping, as highlighted in Figure 4. These fields are fundamental to facilitate the task of searching for these types of publications using these criteria. To speed up the insertion process, LRDB is integrated with Crossref Metadata Search⁵ and can automatically load and fill fields in based on DOI provided. LRDB also supports the insertion of publications through the upload of BibTeX formatted files. Thus, users should only review (and possibly edit) the information and fill additional fields in.

As the community should maintain the database, LRDB provides an environment for everyone to contribute to a richer and more reliable platform. To maintain data consistency, when registered users perform any modification, it is submitted for the approval of system administrators before it is made public to other users. Edition and deletion requests should also be analyzed and approved by the administrators, who can compare the new and updated versions before deciding whether to authorize the modification.

Another important feature provided by LRDB is the relation between users and authors. The system checks if registered users have associated publications, that is, studies of their authorship. This association is performed using authors' emails, which are mandatory to create an account in LRDB. If the authors are already registered in LRDB, all the studies are displayed as their publications. This allows authors to be notified whenever a new study of their authorship is added to the repository. In addition, if a user has

⁵<https://search.crossref.org/>

Figure 3. Selection of Publication Type.

Figure 4. Addition of New Publications.

papers with different emails, which is a common situation when they worked in different institutions, they can associate additional email addresses, allowing the system to track all published studies with a single account.

3.1.2. Search Mechanisms

LRDB provides two types of searches: (i) *simple search*, which returns all publications that have any data associated with the search term; and (ii) *advanced search*, which provides filters to search for more specific characteristics. With the advanced search, it is possible to filter by authors, keywords, classification, among other fields. LRDB searches share commonalities with other digital libraries, such as IEEE Xplore or ACM DL, regarding discovering scientific and technical publications. However, LRDB provides a set of additional features for filtering systematic reviews and mappings, which are the focus of our tool. Thus, in addition to a search flag to return only systematic-based publications, the time range of the studies covered by the systematic review and the searched databases may be informed as search criteria. Figure 5 shows the LRDB advanced search, highlighting the fields for systematic reviews.

In addition to particular searches that users may make, they can access different lists of publications. They can access (i) recently added publications, (ii) popular (most accessed) publications, and (iii) trending (most recently accessed) publications.

3.1.3. Integration with Existent Digital Libraries and Services

Generating information to increase our repository is a challenge because users often do not do it. Therefore, LRDB provides for administrators a way to query other digital

Search String Elsevier

Title:

Classification:

Abstract:

Keywords:

Date Range: To

Authors:

Systematic Review Informations

Only Systematic Reviews

Covered Date Range on Systematic Review: To

Covered Databases:

Title	Journal	Author	
Gamification in software engineering education: A systematic mapping	Journal of Systems and Software	• Manal M. Alhammad • Ana M. Moreno	<input style="float: right;" type="button" value="+"/>
Requirements engineering: A systematic mapping study in agile software development	Journal of Systems and Software	• Karina Curcio • Tiago Navarro • Andrea Malucelli • Sheila Reinehr	<input style="float: right;" type="button" value="+"/>
Software patterns and requirements engineering activities in real-world settings: A systematic mapping study	Computer Standards & Interfaces	• José L. Barros-Justo • Fabiane B.V. Benitti • Ania L. Cravero-Leal	<input style="float: right;" type="button" value="+"/>
Feature interaction in software product line engineering: A systematic mapping study	Information and Software Technology	• Larissa Rocha Soares • Pierre-Yves Schobbens • Ivan do Carmo Machado • Eduardo Santana de Almeida	<input style="float: right;" type="button" value="+"/>

Figure 5. Advanced Search.

Figure 6. Importing from other Digital Libraries.

libraries, such as IEEE Xplore, Springer and Elsevier, to automatically retrieve recent publications and incorporate it in LRDB. Figure 6 shows this feature, where publications retrieved from external libraries are presented and can be added in batch.

3.2. Architecture and Technologies

The architecture of our web application, as well as used technologies, were orchestrated to contemplate the best development practices and to maintain the most used standards. The project was developed according to the Model-View-Controller architectural standard, supported by the Microsoft ASP .NET MVC and .NET Framework, which together provide a powerful environment for web development. In addition to these technologies, we used other frameworks and technologies such as the ASP .NET Razor, Bootstrap, Entity Framework, ASP .NET Identity, to provide specific functionalities. Figure 7 gives an overview of the application domain model, in which the main entities of the system are represented, along with their most relevant attributes. Such diagram guided the implementation of the system since our repository is a data-driven application.

4. Final Remarks

Searching for literature reviews is a task with limited support in Computer Science. This limitation has a stronger impact when reviews are systematic because searching for existing reviews is a key step when conducting a new systematic review. In response, we developed LRDB, presented in this paper, which is a web repository of literature reviews in the area of Computer Science. It provides the key features necessary to search and modify a repository, such as a search and addition of new publications. Moreover, to guarantee that available data is of high quality, LRDB is moderated by administrators. To encourage the addition of more papers and the immediate use of our repository, we performed an initial population of the database with systematic reviews.

A previous version of LRDB was evaluated⁶ with simulations and empirical studies regarding four perspectives: (i) tool usability, (ii) user satisfaction, (iii) ease of use and (iv) ease of learning. Such evaluation not only gave us evidence of our tool usefulness and

⁶<http://prosoft.inf.ufrgs.br/lrdb/Content/evaluation.pdf>

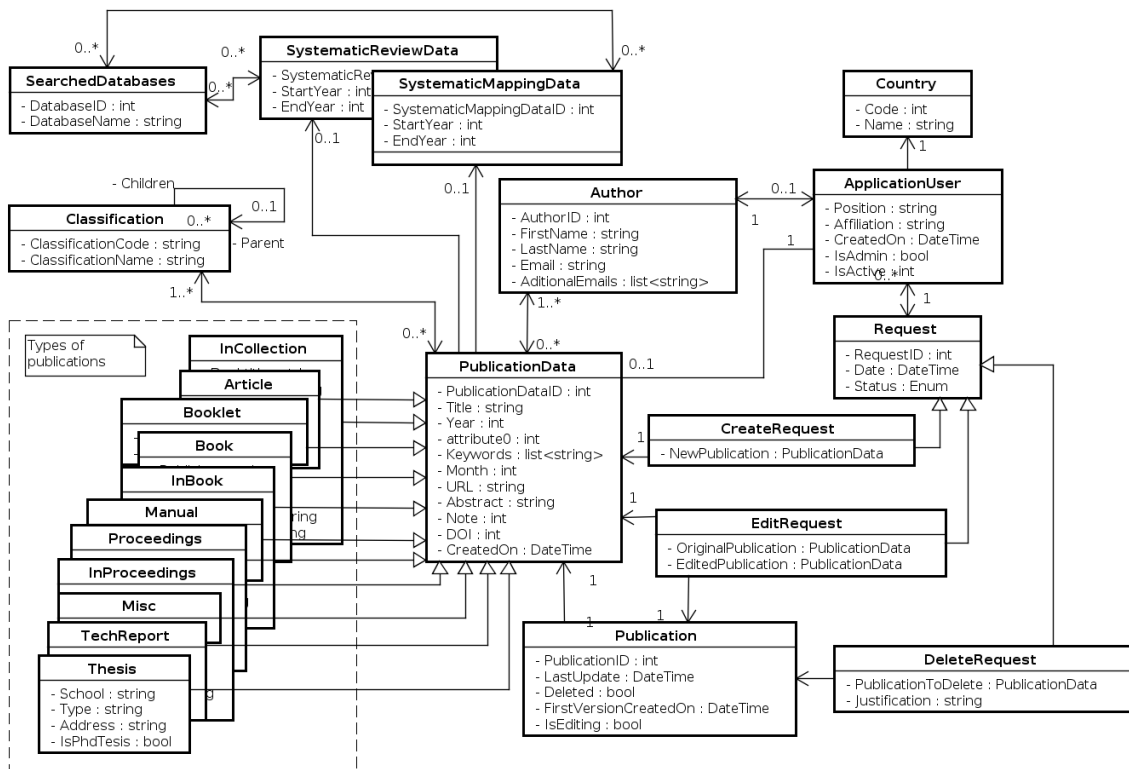


Figure 7. LRDB Domain Model.

usability but also provided insights to improve LRDB. The reported improvements and issues were addressed in the current version of our tool, as an effort to provide a useful tool for researchers and practitioners and increase the community engagement. Besides bugs and visual improvements that were all addressed, we were particularly concerned with the issues regarding the manual effort demanded from users to insert and maintain publications up-to-date. Thus, all features related to automation were introduced to increase the satisfaction of users and reduce the manual process involved in some tasks.

LRDB is available for the general public, and its code has not been made available due to security issues. Interested contributors are welcome to contact the authors.

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