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Systematic Literature Reviews

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Empirical research



Scientific experiments

<https://www.hiclipart.com/free-transparent-background-png-clipart-xvfwg/download>



Surveys

<https://flyclipart.com/survey-cliparts-free-political-clipart-791774>

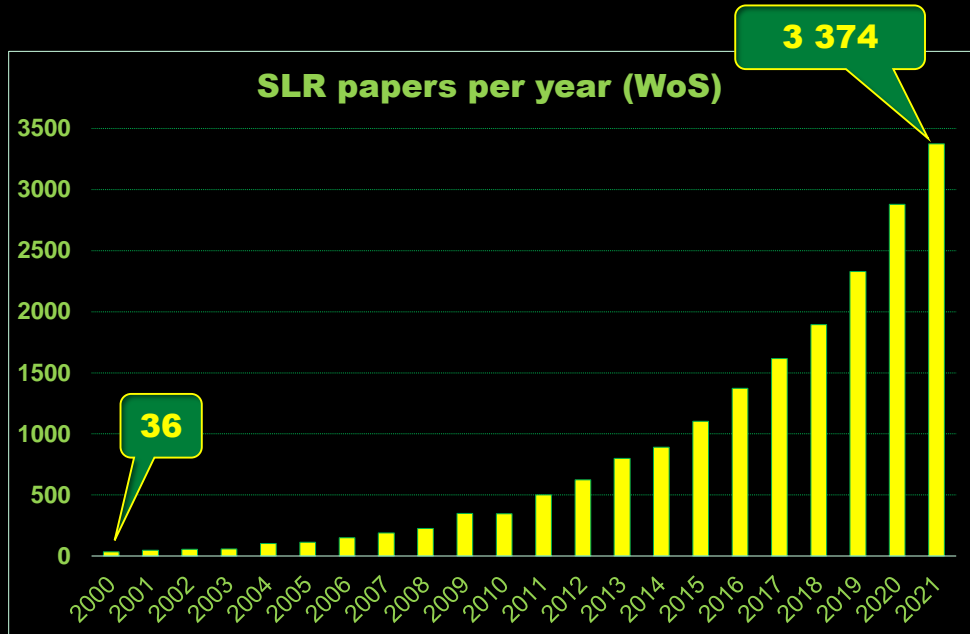
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Systematic Literature Reviews

<https://www.pinterest.com/>

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Systematic Literature Studies

Systematic Mapping Study

Systematic Literature Review

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Systematic Literature Studies

Systematic Mapping Study

Overview
of a research area

Systematic Literature Review

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Systematic Literature Studies

Systematic Mapping Study

Overview
of a research area



Systematic Literature Review

Answers
to research questions

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Systematic Literature Studies

**Systematic
Mapping Study**

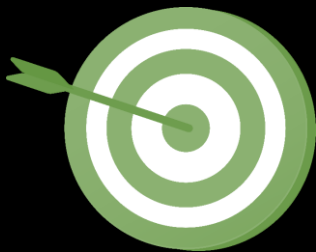
**Overview
of a research area**



**Systematic
Literature Review**

**Answers
to research questions**

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**To help the students
to manage
their systematic literature reviews**

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How to identify relevant papers?

Research paper

<https://favpng.com/download/1gb2wRvs>

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How to identify relevant papers?

Database-driven SLR

Query → **WoS Bibliographic database** → Research paper

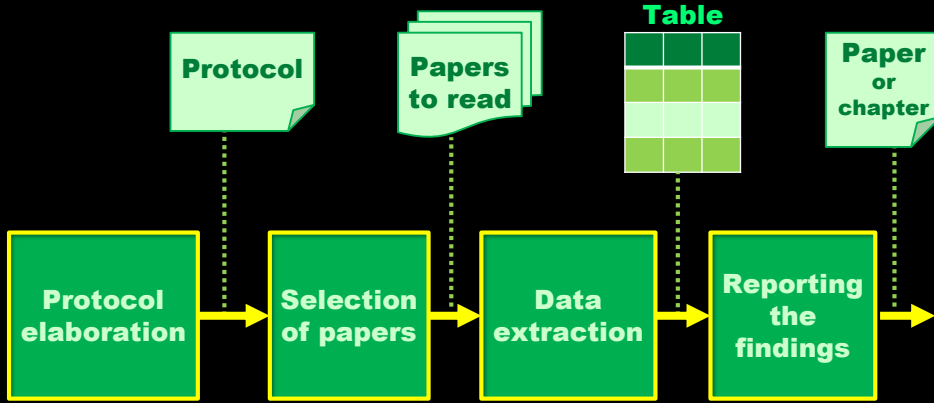
Snowballing

New research papers ← Reference ← Initial research papers ← Citation ← New research papers

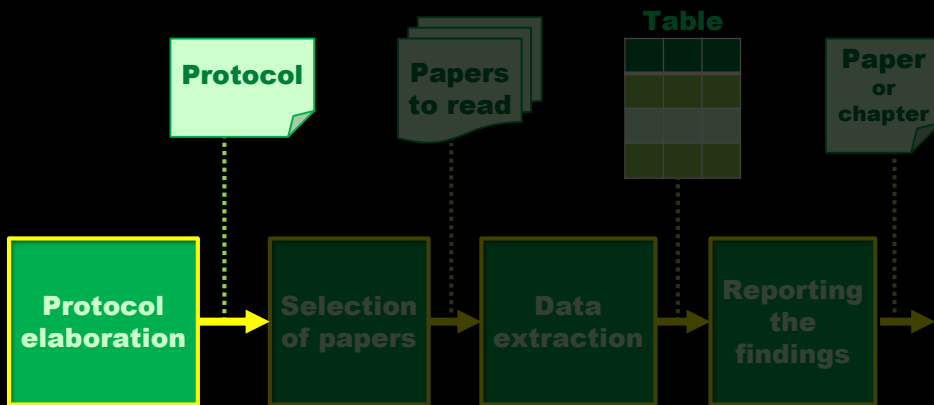
<https://favpng.com/download/1gb2wRvs>

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Outline of the SLR process



Outline of the SLR process





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SLR Protocol

- **Background**
- **Aim and questions**
- **Selection criteria**
- **Quality assessment**
- **Data extraction table**
- **Strategy and selection procedure**
- **Responses to validity threats**
- **Plan of SLR execution**

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Background

What for?



Your research project

- Context
- Aim
- Method

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Background

What for?

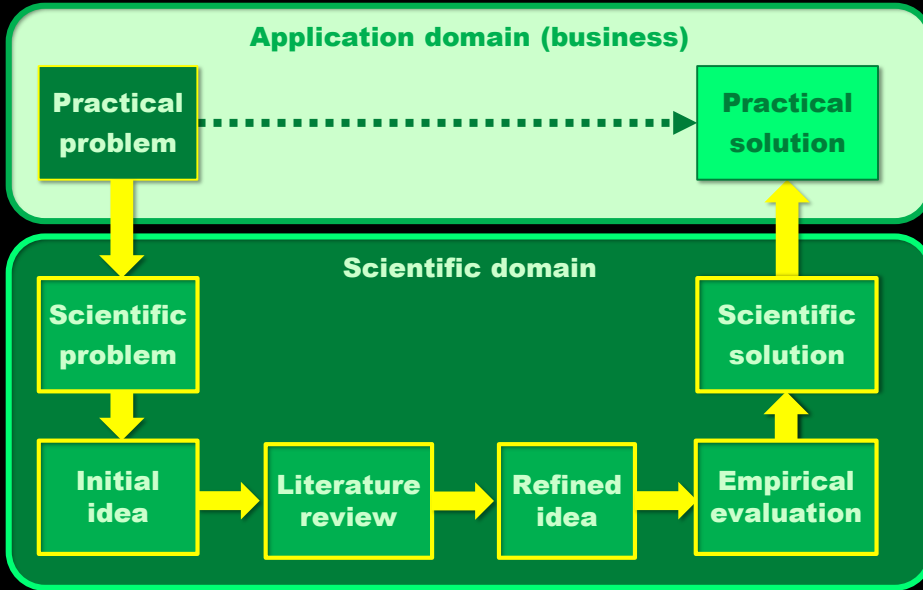


Your research project

- Context
- Aim
- Method

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A model of applied research



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Background example – First slide

Title of your thesis

Code Reviewer Recommendation

SLR Protocol

Your name

John Johnson

Your advisor

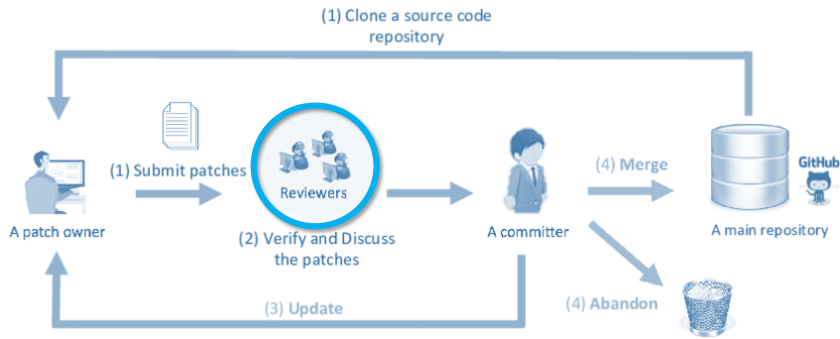
Advisor:
Prof. Nick Nickolson

<https://smartbear.com/learn/code-review/what-is-code-review/>

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Background example – Social problem (1/2)

Modern code review



Source of the picture

Hirao, Toshiki & Ihara, Akinori & Ueda, Yuki & Phannachitta, Passakorn & Matsumoto, Ken-ichi. (2016). The Impact of a Low Level of Agreement Among Reviewers in a Code Review Process. 97-110. 10.1007/978-3-319-39225-7_8.

Background example – Social problem (2/2)

Modern code review



Problem: Manual reviewer selection can take **12 days!**

Background example – Social problem (2/2)

Modern code review



Problem: Manual reviewer selection can take **12 days!**

Solution: Reviewer recommendation system
A few algorithms already exist

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Background example – Social problem (2/2)

Modern code review



Problem: Manual reviewer selection can take **12 days!**

Solution: Reviewer recommendation system
A few algorithms already exist

Question: How good are those algorithms?

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Background

What for?



Your research project

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Background example – Project's aim

Aim of the project



**Empirical evaluation
of some algorithms
of reviewer recommendation**

**The shorter
the better**

<https://www.vecteezy.com>

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Background

What for?



Your research project

- Context
- Aim
- Method

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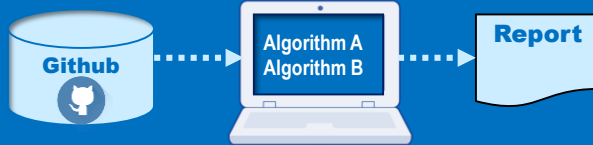
Background example – Project’s method

Outline of the project

1. SLR to prepare the experiment



2. Experiment design & execution



<https://pl.pinterest.com/>

To show the role of SLR

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SLR Protocol

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Aim & questions – Example



Aim of SLR: To prepare empirical evaluation

Questions

1. What reviewer recommendation **algorithms** have been proposed so far?
2. What quality **indicators** are in use?
3. What **datasets** are in use?

Not too many!

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Selection criteria – Example

Inclusion criteria

1. Also doctoral dissertations and MSc. thesis if available on Internet

Exclusion criteria

1. Conference abstracts
2. Language other than English
3. Published before 2014

**Give
justification**

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Quality assessment – Example

Scale of evidence strength

1. None
2. Rather weak
3. Could be stronger
4. Very strong

**Useful for
evaluation of
opinions**

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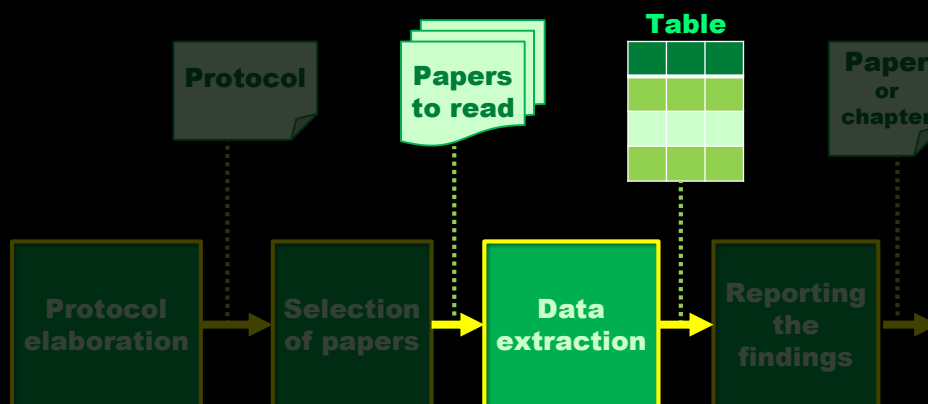
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Outline of the SLR process



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Data Extraction Table – Example

1. What reviewer recommendation **algorithms** have been proposed?
2. What quality **indicators** are in use?
3. What **datasets** are in use?

Just design.

Keep it consistent with questions!

Paper id	Algorithms	Indicators	Datasets	Remarks
Lamkanfi-2010	Text mining, 1-line summary, naïve Bayes classifier	Precision & Recall: 0.65-0.85 (p. 5), AUC	Mozilla, Eclipse, GNOME	Eclipse, Mozilla, GNOME: 900-2.300 bugs a month

Just paper id.

Bibliographic data go to 'References'

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A few tips

Table

Data extraction

- **Use Excel**
- **Avoid scrolling (keep number of columns small)**
- **Collect motivations + other interesting info**
- **Use at least 1 example to check practicality.**

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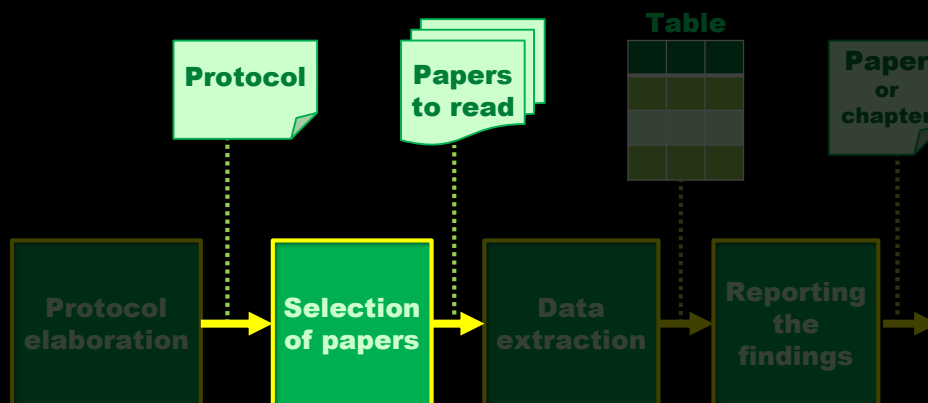
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SLR Protocol

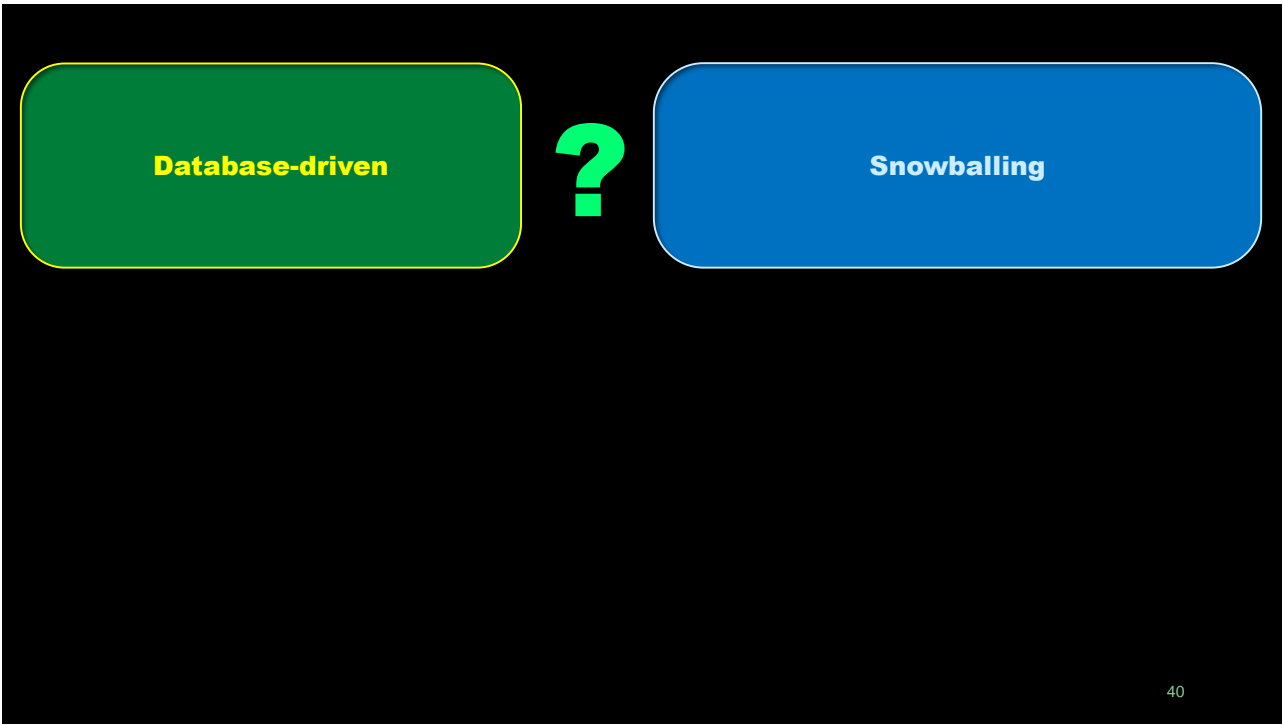
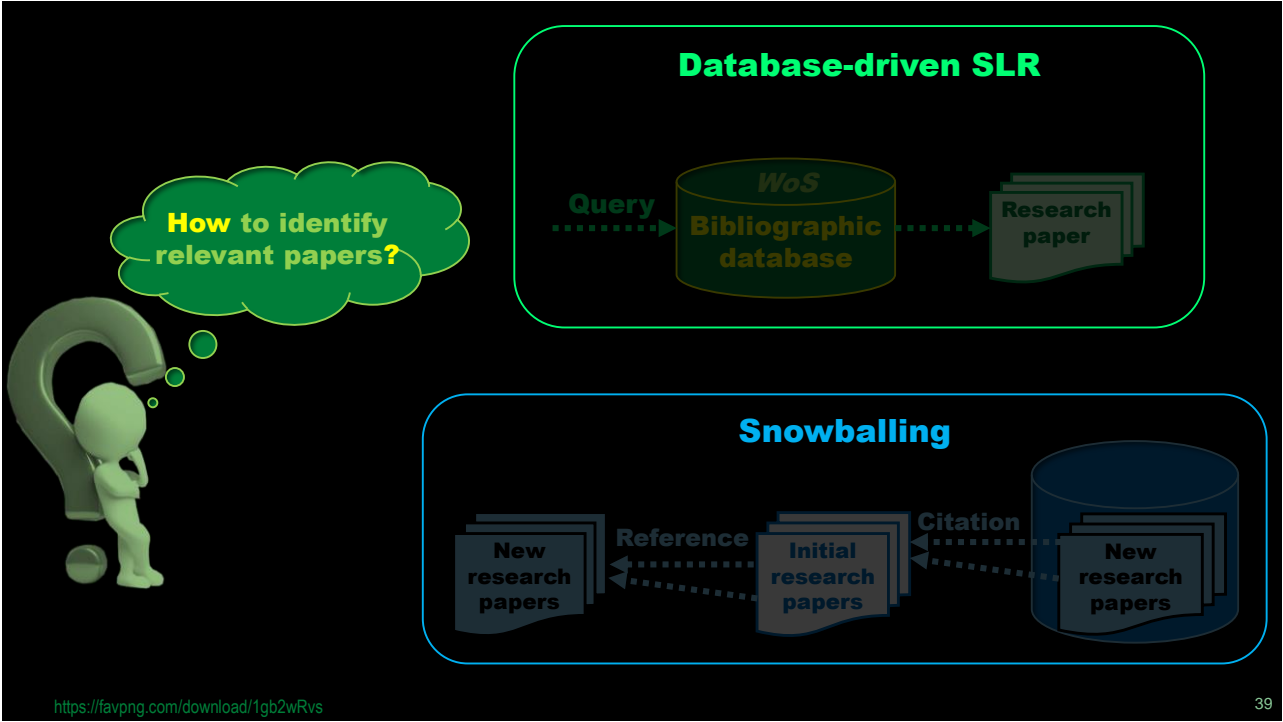
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Outline of the SLR process



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Database-driven

- What keywords?
- What bibliographic database?
- What query?



Snowballing

- What initial set of papers?
- What citation database? (e.g. WoS)

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Database-driven

- What keywords?
- What bibliographic database?
- What query?
- What procedure?



Snowballing

- What initial set of papers?
- What citation database? (e.g. WoS)
- What procedure?

1. Run the query

2. Remove irrelevant papers:

2.1. Filter by:

- Title of the paper
- Title of conf./journal
- Keywords
- Abstract

2.2. Filter by:

- Introduction
- Conclusions

1. **Final** $\leftarrow \emptyset$

2. **B** \leftarrow initial set of papers.

while **B** is nonempty:

3. **Final** = **Final** \cup **B**

4. **C** \leftarrow papers referenced by **B**

5. **C** = **C** \cup papers from WoS citing **B**

6. **C** = **C** \setminus papers in **Final**

7. Remove from **C** irrelevant papers

8. **B** \leftarrow **C**

9. Return **Final**

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Strategy – Example

1. What reviewer recommendation **algorithms** have been proposed?
2. What quality **indicators** are in use?
3. What **datasets** are in use?

SLR type: Database-driven

Keywords:

reviewer recommendation, reviewer selection

Bibliographic database: Web of Science (WoS)

Query:

reviewer **AND** (recommendation **OR** selection)

Justify

Keep it simple

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Procedure – Example

Selection procedure

1. Run the query
2. Remove irrelevant papers:
 - 2.1. Filter by:
 - Title of the paper
 - Title of conf./journal
 - Keywords
 - Abstract
 - 2.2. Filter by:
 - Introduction
 - Conclusions

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Responses to validity threats

Too many rejections during filtering

- Review of rejection decisions by somebody else

Wrong keywords

- Preceding database-driven SLR with snowballing (hybrid approach)

Incomplete set of papers

- Estimation of recall

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Estimation of recall of relevant papers

Google Scholar search results for "reviewer recommendation".

Articles About 280,000 results (0.05 sec)

Any time
 Since 2021
 Since 2020
 Since 2017
 Custom range...

Sort by relevance
 Sort by date

Any type
 include patents
 include citations

Review articles
 Create alert

Reducing human effort and improving quality in peer code reviews using automatic static analysis and reviewer recommendation
 V Balachandran - 2013 35th International Conference on ..., 2013 - ieeexplore.ieee.org
 Peer code review is a cost-effective software defect detection technique. Tool assisted code review is a form of peer code review, which can improve both quality and quantity of reviews ...
 ☆ 77 Cited by 194 Related articles All 4 versions

A novel classification method for paper-reviewer recommendation
 S Zhao, D Zhang, Z Duan, J Chen, Y Zhang, J Tang - Scientometrics, 2018 - Springer
 Reviewer recommendation problem in the research field usually refers to invite experts to comment on the quality of papers, proposals, etc. How to effectively and accurately ...
 ☆ 77 Cited by 29 Related articles All 5 versions

Who should review my code? a file location-based code-reviewer recommendation approach for modern code review
 P Thongtanunam, C Tantithamthavorn... - 2015 IEEE 22nd ..., 2015 - ieeexplore.ieee.org
 Software code review is an inspection of a code change by an independent third-party developer in order to identify and fix defects before an integration. Effectively performing ...
 ☆ 77 Cited by 187 Related articles All 16 versions

Google Scholar: Top 500 items

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Plan of SLR execution

Week	Plan [h]	Actual [h]
2.XI	8	
9.XI	8	
16.XI	8	
23.XI	8	
30.XI	8	
7.XII	8	
14.XII	8	
21.XII	7	
28.XII	-	
4.I	-	
11.I	-	
18.I	-	
Σ	63	

Number of papers: 42
Availability: 63 [h]
Time per 1 paper: 1.5 [h]

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Progress indicators

Week	Plan [h]	Actual [h]
2.XI	8	
9.XI	8	
16.XI	8	
23.XI	8	
30.XI	8	
7.XII	8	
14.XII	8	
21.XII	7	
28.XII	-	
4.I	-	
11.I	-	
18.I	-	
Σ	63	

- **Availability for reading [h]**
- **Number of papers read so far**
- **Average reading speed [h/paper]**

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Risk management

Week	Plan [h]	Actual [h]
2.XI	8	
9.XI	8	
16.XI	8	
23.XI	8	
30.XI	8	
7.XII	8	
14.XII	8	
21.XII	7	
28.XII	-	
4.I	-	
11.I	-	
18.I	-	
Σ	63	

- Lack of **time**
- Lower reading **speed**
- No **relevant** paper
- . . .

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Risk management



- Lack of **time**
- Lower reading **speed**
- No **relevant** paper
- . . .

<https://favpng.com/download/1gb2wRvs>

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Summary

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SLR Protocol

Systematic?



- **Background**
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Systematic LR:

- **Reproducible (protocol)**
- **Complete**

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Protocol reviews



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Checklist-driven review



1. Are the **questions** clear and consistent with the SLR aim
2. Is the **query** appropriately derived from the questions?
3. Is the **Data Extraction Table** consistent with the questions?
4. Does the **protocol** seem effective, i.e. is it likely that **all** relevant studies will be covered?
5. Is the SLR **execution plan** realistic?

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