



# DTADD Systematic Review Search Strategy

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**Project Acronym:** DTADD

**Project Title:** Digital Twin Anomaly Detection Decision-Making for Bridge Management

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# 1 Preferred Reporting Items for Systematic Review Literature Search (PRISMA-S)

## 1.1 Introduction

Systematic reviews quality heavily relies in the search strategy implemented for the information retrieval process. Nevertheless, search strategies are commonly not adequately reported. This document presents the search strategy adopted to perform the systematic review of the DTADD project and it is based on the PRISMA-S [1] checklist.

## 1.2 Search strategy

The recommended items to address in a search strategy according to the PRISMA-S checklist are presented in Table 1, Table 2, Table 3 and Table 4. This search strategy has been developed and documented to ensure transparency of the systematic review and facilitate its reproducibility.

Table 1. Information sources and methods.

<b>Database name:</b>	The following electronic database was searched: <ul style="list-style-type: none"><li>• Scopus (<a href="#">Scopus - Document search</a>).</li></ul>
<b>Multi-database searching:</b>	Not applicable.
<b>Study registries:</b>	Not applicable.
<b>Online resources and browsing:</b>	No online browsing was performed.
<b>Citation searching:</b>	The search will focus on the main sources only as it is intended to present a review with the outmost state-of-the-art available knowledge.
<b>Contacts:</b>	No further details will be searched by directly contacting authors, experts, manufacturers, or others.
<b>Other methods:</b>	Relevant research part of the personal electronic libraries of the authors will also be considered on this systematic review.

Table 2. Search strategies.

<b>Full search strategy:</b>	Seven initial keywords and similar terms of interest (namely: bridge and bridges, etc.) were used: <ul style="list-style-type: none"><li>• Bridge.</li><li>• Digital twin.</li><li>• Bridge information modelling.</li><li>• Finite elements.</li><li>• Bridge health monitoring.</li><li>• Anomaly detection algorithm.</li><li>• Cultural heritage.</li></ul>
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Six initial queries were done combining the first keyword with the rest of them:

- bridge\* AND "digital twin\*"
- bridge\* AND (BrIM OR "bridge information model\*")
- bridge\* AND (FEM OR FEA OR "finite element method\*" OR "finite element analy\*")
- bridge\* AND ("bridge health monitoring" OR "structural health monitoring")
- bridge\* AND (ADA OR "anomaly detection algorithm\*")
- bridge\* AND ("cultural heritage" OR "monument\* bridge\*" OR "old bridge\*" OR "ancient bridge\*" OR "historic\* bridge\*")

The results found after this initial 6 queries were used to perform a bibliometric analysis. As a first screening step, the combination of these 6 initial searches was

done to obtain relevant works containing at least three of the main keywords of interest:

- #1 AND #2
- #1 AND #3
- #1 AND #4
- #1 AND #5
- #1 AND #6
- #2 AND #3
- #2 AND #4
- #2 AND #5
- #2 AND #6
- #3 AND #4
- #3 AND #5
- #3 AND #6
- #4 AND #5
- #4 AND #6
- #5 AND #6

<b>Limits and restrictions:</b>	The following limits and restrictions were applied to all searches: <ul style="list-style-type: none"> <li>• Years: 2017-2022</li> <li>• Subject: Engineering</li> <li>• Language: English</li> <li>• Type: Article, conference, review, book chapter</li> </ul>
<b>Search filters:</b>	The search was limited to the search fields of title, abstract and keywords.
<b>Prior work:</b>	The search strategy adopted has been created specifically for this systematic review. No search strategies from previous literature reviews have been adopted.
<b>Updates:</b>	No update method will be used (although Scopus allows the use of search alerts) as the final manuscript will be completed shortly after the search had been performed.
<b>Dates of searchers:</b>	The search was conducted on 10/12/2022.

*Table 3. Peer review.*

<b>Peer review:</b>	The search strategy document will be made available online along with the systematic review protocol in the OSF website. Both documents are available to receive open peer reviews under the Resources tab of the project Registry website DOI: <a href="https://osf.io/sh9b2">https://osf.io/sh9b2</a>
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*Table 4. Managing records.*

<b>Total records:</b>	A total of 9110 works were found on Scopus (from all 21 searches). 8673 records from the first 6 searches, and 437 from the combination of searches.
<b>Deduplication:</b>	Duplicates were removed using Excel remove duplicates tool. After deduplication from the records found in the initial 6 searches, 6835 records remained. Only 329 records remained after deduplication of the combination of searches entries. These last records, are the records that will be used and that will be manually screened to assess their suitability to be included in this systematic review along with the top ten most cited works of the initial six searches (thus 389 records in total).



## References

1. Rethlefsen, M.L., et al., *PRISMA-S: an extension to the PRISMA Statement for Reporting Literature Searches in Systematic Reviews*. *Systematic Reviews*, 2021. **10**(1): p. 39.

## Annex A

*Table 5. History of changes.*

<b>Version</b>	<b>Publication date</b>	<b>Change</b>
1.0	06/12/2022	Initial version.
2.0	07/12/2022	Added the top ten most cited works of the initial six searches to the list of initially screened works.
3.0	08/12/2022	Reduced the years of publication to only from 2017 until 2022.
4.0	10/12/2022	The original files were corrupted, and the search was performed again. Number of items found has been updated accordingly.
5.0	18/01/2023	Provided the DOI of the project Registry so that both the Protocol and Search Strategy documents could be accessed and peer reviewed. Fixed a typo in the number of records deduplicated as previously reported, now 6835, before 6834.

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