

Griffith University Library

# VOSviewer workbook

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## VOSviewer

VOSviewer is a software tool for creating and visualizing bibliometrics networks. These networks can include journals, researchers, or individual publications, and they can be constructed based on citation, bibliographic coupling, co-citation, or co-authorship relations.

VOSviewer also offers text mining functionality that can be used to construct and visualize co-occurrence networks of important terms extracted from a body of scientific literature.

VOSviewer is developed by the Centre for Science and Technology Studies, Leiden University, The Netherlands.

### Introduction to VOSviewer video

Watch the *Introduction to VOSviewer* video to learn how to download VOSviewer, explore features, download data from Web of Science and create different types of visualisations: <https://www.VOSviewer.com/getting-started>

### Install VOSviewer

VOSviewer is free to download, install and use.

Install VOSviewer: <https://www.VOSviewer.com/download>

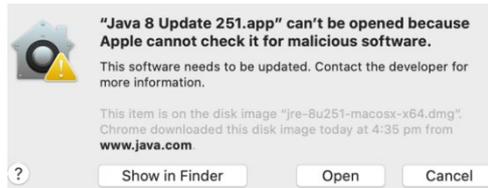
To run VOSviewer, Java version 8 or higher needs to be installed on your system. If Java is not installed on your system, you can obtain it [here](#).

### Mac

1. Download VOSviewer installation files: <https://www.VOSviewer.com/download>
2. You may get the following messages when you try to install VOSviewer:
  - i. "Cannot check for malicious content". Go to **Systems Preferences** to allow VOSviewer.
  - ii. "Unable to load Java Runtime Environment". Download and install **Java 8 or higher update** <https://www.java.com/en/>
  - iii. On attempt to install Java 8:



- iv. **System Preferences > Security & Privacy** to permit Java8. Click **Open Anyway** which opens the Alert window (below) again > select **Open**



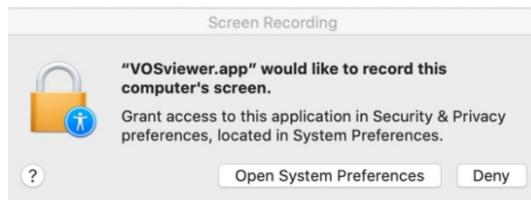
Click install:



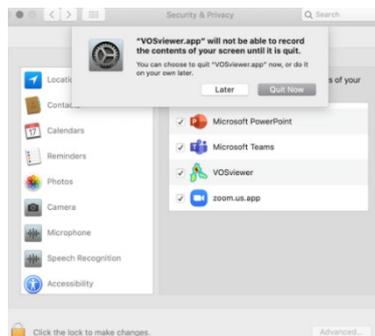
Then 'Close':



- v. **Open the VOSviewer app.** Select **Open System Preferences > Security & Privacy** window, tick box to permit which VOSviewer.

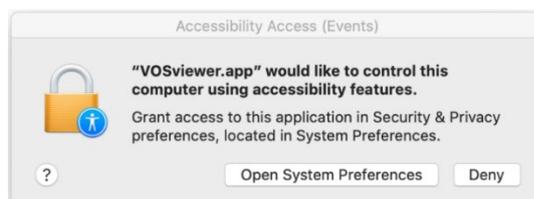


- vi. If the window below appears click **Quit Now**.



- vii. You may be prompted to login to your device. Do this and open VOSviewer.app again.

- viii. VOSviewer.app opens with an alert window:



- ix. Quit and re-open VOSviewer. You should finally be able to use VOSviewer!

## Download data: Web of Science and Scopus

You can download Web of Science (see steps 1-5) or Scopus data (step 6) to create visualisation maps in VOSviewer.

1. Go to Web of Science:  
<http://libraryproxy.griffith.edu.au/login?url=https://apps.webofknowledge.com>
2. Develop a search strategy to identify publications relevant to your topic of interest.
  - Number of publications resulting from your search strategy should be between 1000 and 3000
  - Time period should be at least ten years.

**Note the details of your search (you may need this information when writing up your results in a literature review):**

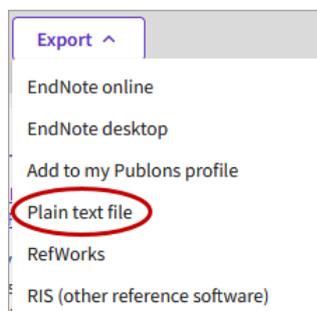
Keywords:

Total number of results:

Date range:

Document types:

3. Download your search results. To do so, in the **Export** drop-down box, choose **Plain text file**.



4. Only 1000 records can be downloaded at a time. You will need to download your search results in batches of 500 records (ie 1-500, 501-1000, 1001-1500 etc).

Choose: **Records from 1 to 500 > Full Record and Cited References > Export.**

Export Records to Plain Text File

Record Options

All records on page

Records from: 1 to 500

No more than 500 records at a time

Record Content:

Full Record and Cited References

Export Cancel

5. The file will open in Notepad (Mac opens in TextEdit).

Check your Downloads folder to check that files have saved automatically.

Alternatively save each file as a .txt file to your desktop (or a folder you can easily locate).

6. Scopus:
  - a. Export data as csv – can export up to 20,000 records.
  - b. In the export pop-up check the following boxes:
    - i. Citation information
    - ii. Bibliographical information
    - iii. Abstract & keywords
    - iv. Other information.
  - c. Check your Downloads folder to check that files have saved automatically.

## Other data sources

VOSviewer is most often used with data from Web of Science, Scopus, or Dimensions<sup>1</sup>.

The following data sources can also be used:

- PubMed (use PubMed/MEDLINE file format)
- EBSCOhost
- ProQuest
- Mendeley
- Zotero
- Google Scholar (using [Publish or Perish](#))

For all data sources *except PubMed*, the **RIS file format** should be used.

RIS is a general file format for bibliographic data that is supported by many data sources. The list of data sources provided above therefore is not exhaustive.

### PubMed

PubMed can be accessed at <https://pubmed.ncbi.nlm.nih.gov/> To export data from PubMed, choose the **Save** option and the **PubMed** format. Data exported from PubMed cannot be used for identifying citation, bibliographic coupling, and co-citation links between items. Hence, when working with PubMed data, some options in the Create Map wizard will not be available

### EBSCOhost

- Go to [database](#)
- Perform a search, and then choose **Share > E-mail a link to download exported results (up to n) > E-mail a link to a file with citations in: RIS Format (e.g. CITAVI, EasyBib, EndNote, ProCite, Reference Manager, Zotero )**

### ProQuest

- Go to [database](#)
- Perform a search, select the publications to export, and choose **Save > RIS (works with EndNote, Citavi, etc.)**.



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<sup>1</sup> Griffith University does not subscribe to Dimensions. A free version is available: <https://www.dimensions.ai/products/free/> or try out VOSviewer in Dimensions <https://app.vosviewer.com/docs/>

### Google Scholar (using Publish or Perish):

- Download the Publish or Perish software [www.harzing.com/resources/publish-or-perish](http://www.harzing.com/resources/publish-or-perish)
- Perform a lookup using Publish or Perish and choose **File > Save as RIS/RefManager ... > Save.**

### EndNote, Mendeley and Zotero

Standalone software needs to be available on your computer and you need to have a collection of publications available in Mendeley or Zotero.

**Data from reference managers can only be used to create co-authorship and co-occurrence maps.**

This data can't be used to create citation, bibliographic coupling and co-citation links between items.

#### Mendeley Desktop

Select the publications that you want to export, and then choose **File > Export > Save as type: RIS - Research Information Systems (\*.ris) -> Save.**

#### Zotero standalone

Select a library that you want to export, and then choose **File > Export Library ... > Format: RIS > OK.**

#### EndNote:

[Watch this short video.](#)

## Quick start: creating maps

Based on data from the above-mentioned data sources, VOSviewer is able to create term maps, keywords maps, and co-authorship maps. We now create a map based on the data that we have downloaded:

1. Launch VOSviewer.
2. Click **Create**.
3. Choose one of the following:
  - **Create a map based on text data** if you want to create a term map.
  - **Create a map based on bibliographic data** if you want to create a keyword map or a co-authorship map.

Click **Next**.

4. Choose from one of the following:
  - choose **Read data from reference manager files**, click **Next**, and go to the **RIS tab**.
  - if you have downloaded data from PubMed, choose **Read data from bibliographic database files**, click **Next**, and go to the **PubMed tab**.

Select the files that you have downloaded and click **Next**.

5. Follow the remaining steps in the **Create Map wizard**.
6. What do you learn from the map that you have created? Do you find it useful to work with data from alternative data sources? What do you consider to be the added value of alternative data sources relative to Web of Science and Scopus?
7. Save your map.

Optionally, repeat steps 4 to 9 to create additional maps.

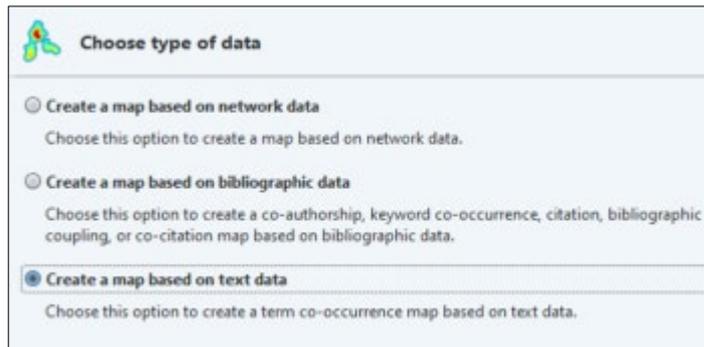
## Create a terms map

“A terms maps is a visualisation in which terms are located in such a way that the distance between two terms can be interpreted as an indication of the relatedness of the terms. In general, the smaller the distance between two terms, the stronger the terms are related to each other”.<sup>2</sup>

These instructions will help you create a term map based on Web of Science or Scopus files.

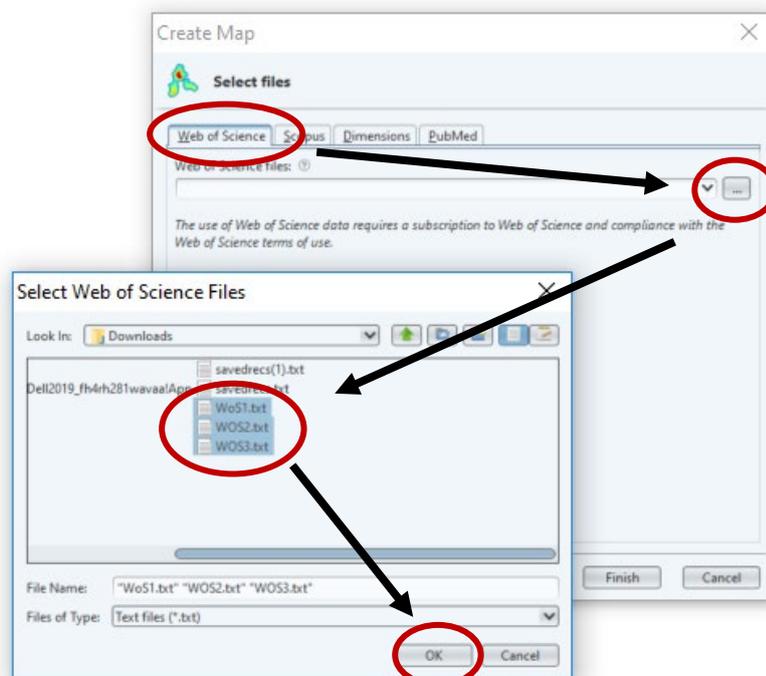
Watch the [Introduction to VOSviewer](#) video from 6:25mins to 9 mins for an overview.

1. Launch VOSviewer, click **Create > Create a map based on text data > Next > Read data from bibliographic database files > Next.**



2. Go to the **Web of Science tab** and select the files that you downloaded in the data collection assignment. Use CTRL to select multiple files in the **Select Web of Science File** dialog box. Click **Next.**

Mac users: use CMD key i/o CTRL key, click **OK**, then [Next.](#)



<sup>2</sup> Van Eck, Nees Jan, and Ludo Waltman. 2011. “Text Mining and Visualization Using VOSviewer.” <http://arxiv.org/abs/1109.2058>

3. Choose **Title and abstract fields**. Make sure that the *Ignore structured abstract labels* and *Ignore copyright statements* check boxes are checked. Click **Next**.



**Choose fields**

Fields from which terms will be extracted:

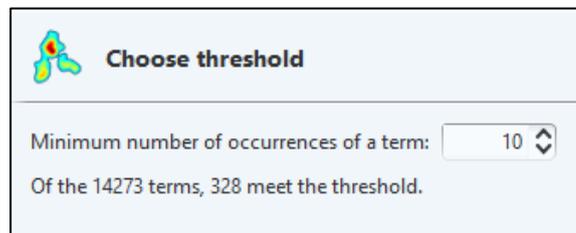
- Title and abstract fields
- Title field
- Abstract field

Ignore structured abstract labels ⓘ

Ignore copyright statements ⓘ

4. Choose **Binary counting** and click **Next**.

5. Choose the minimum number of documents in which a term is required to occur in order to remain in the analysis. The minimum number of occurrences should be at least 5. The number of terms that meet the threshold should be at most 2500. Click **Next**.



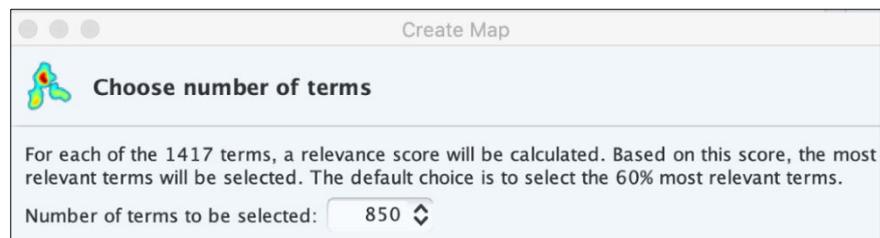
**Choose threshold**

Minimum number of occurrences of a term:

Of the 14273 terms, 328 meet the threshold.

6. Terms that do not occur in a sufficiently large number of documents have now been removed from the analysis. Among the remaining terms, choose the number of terms that should remain in the analysis.

By default, VOSviewer proposes to keep 60% of the terms. This is usually a good choice, but you may want to experiment with a smaller or a larger number of terms. VOSviewer will remove from the analysis the terms that appear to be least relevant. Click Next.



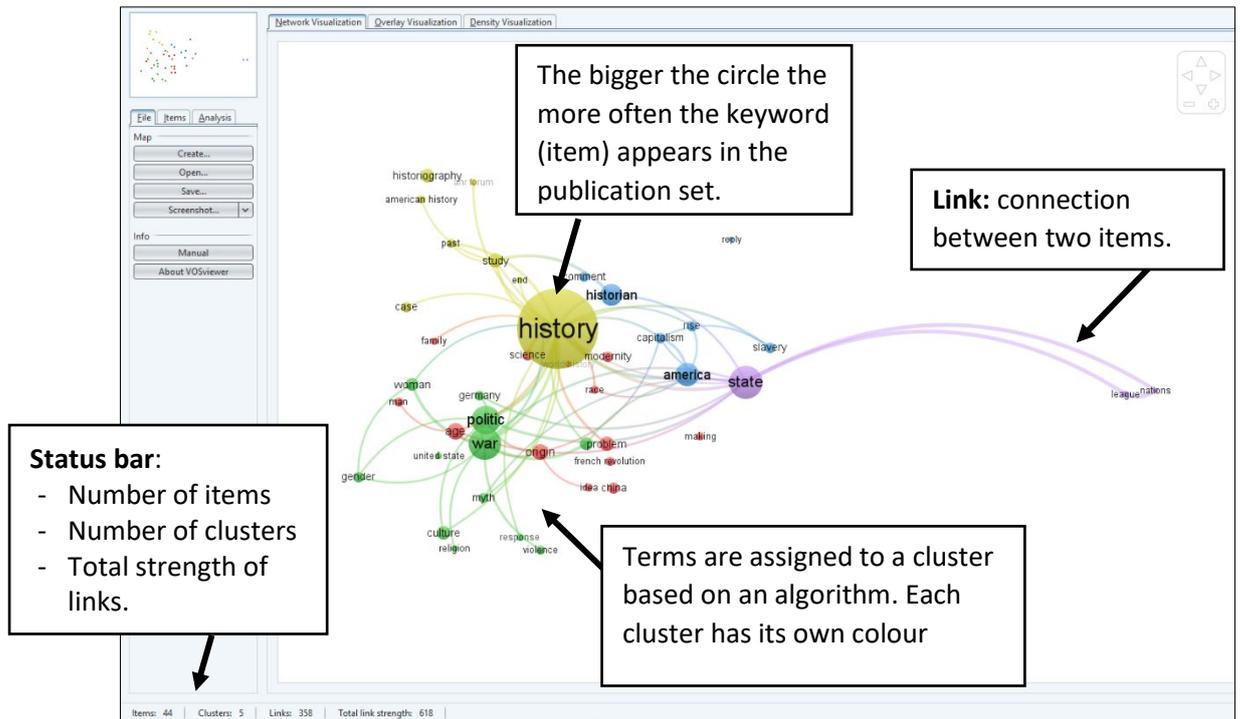
**Choose number of terms**

For each of the 1417 terms, a relevance score will be calculated. Based on this score, the most relevant terms will be selected. The default choice is to select the 60% most relevant terms.

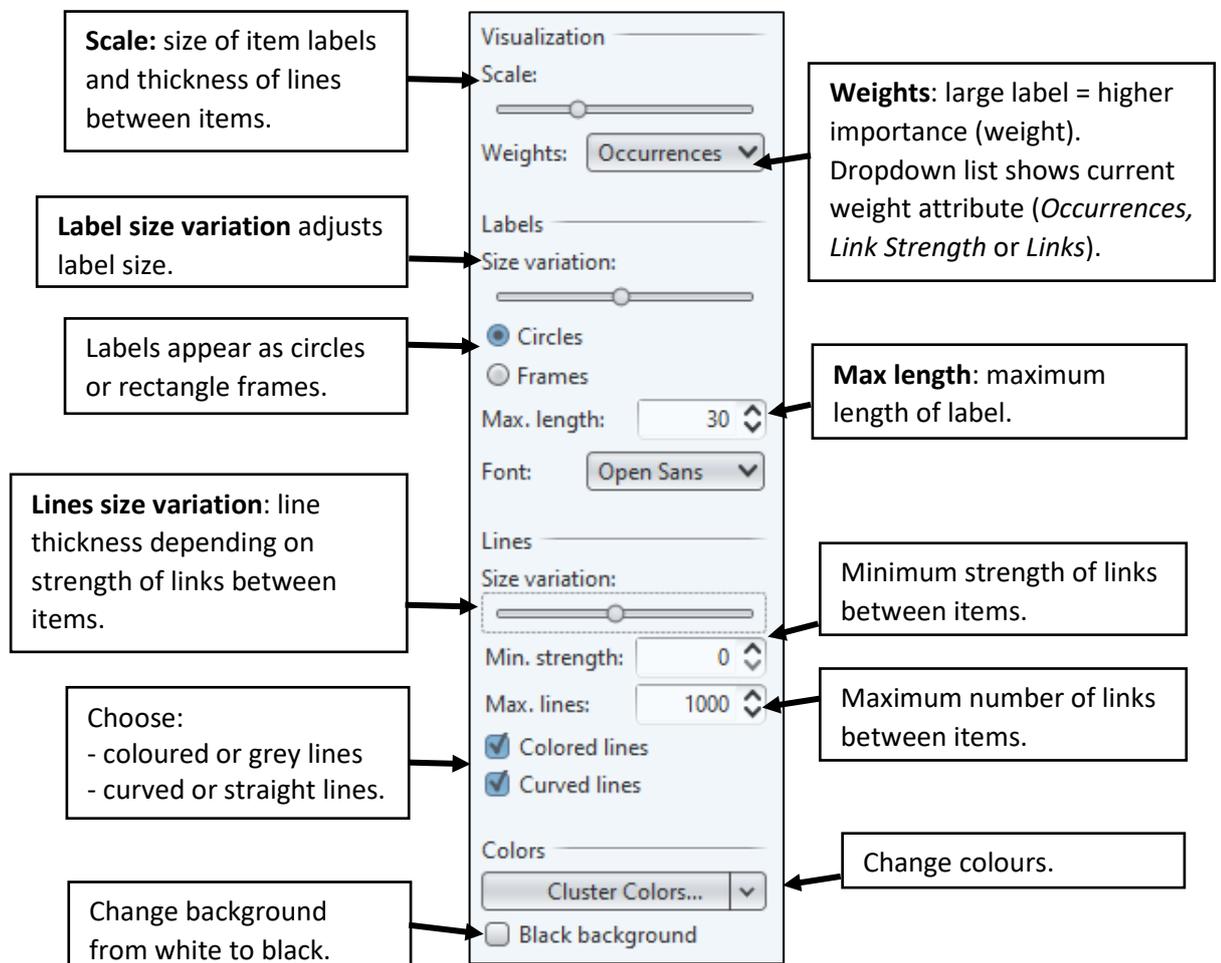
Number of terms to be selected:

7. You may want to manually remove some terms. Click **Finish** to finish creating your map.
8. Save your map: **Screenshot > Save (.jpg)**. See page 18 of the [VOSviewer manual](#) for other saving options.

# Reading a VOSviewer visualisation



The right-hand column can be used to make adjustments to the visualisation:



The **Analysis** tab in the left-hand panel is used to update the layout and clustering.

The image shows a screenshot of the 'Analysis' tab in a software interface. The 'Analysis' tab is circled in red. The interface is divided into two main sections: 'Layout' and 'Clustering'. In the 'Layout' section, the 'Attraction' parameter is set to 2 and the 'Repulsion' parameter is set to 1. In the 'Clustering' section, the 'Resolution' parameter is set to 1.00 and the 'Min. cluster size' is set to 1. The 'Update Clustering' button is also circled in red. Five callout boxes with arrows point to these specific elements, providing detailed explanations for each.

**Attraction and Repulsion** influence the way items are located in the map

**Attraction:** set value to 2 or 1

**Repulsion:** set value to 1 or 0 (must be lower than Attraction value)

**Resolution:** level of clustering detail. Enlarge the resolution to get more clusters.

**Min cluster size:** cluster to include at least the number of items specified here.

To increase the number of clusters, increase the value of the **Resolution** parameter and click **Update Clustering**.

If you are not satisfied with your map, repeat the above steps and try out different parameter values. A few iterations are usually needed to identify the most satisfactory parameter values. Do not forget the final parameter values that you use.

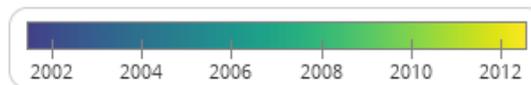
What do you observe in your map and what do you learn from it?

You may consider zooming in into specific areas in the map, or you may try to provide an interpretation of your map based on visualization presented on the **Density Visualization** tab.

## Overlay visualisation

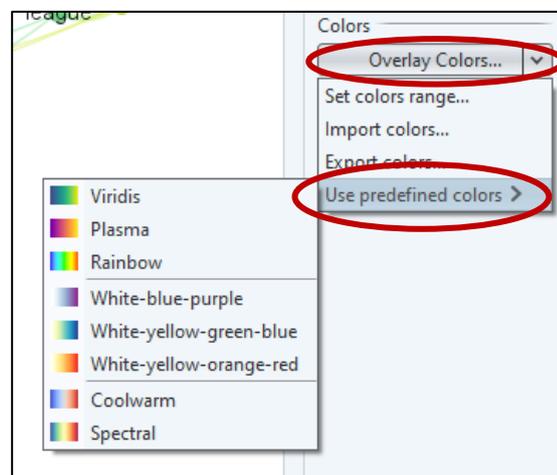
Overlay visualizations can be used to show additional information – see section 3.1.2 of the [VOSviewer manual](#) for further information.

1. Go to the **Overlay Visualization** tab. In the overlay visualization of a terms map (for example), the colour of a term indicates the average publication year of the publications in which the term occurs, with yellow indicating terms that occur mainly in recent publications and blue indicating terms that occur mainly in older publications.



Does the overlay visualization tell you something about the development over time of your research area? Is it possible to identify certain trends? Which research topics seem to be 'hot' at the moment? Which research topics show a decline in publication activity?

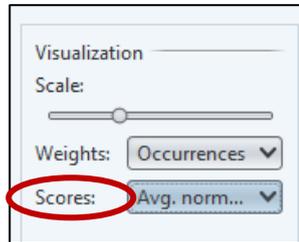
2. Click on the colour bar shown in the lower-right area of the overlay visualization. To open the **Set Overlay Colours Range** dialog box.
  - a. Change the minimum and maximum scores. This changes the colouring of your map. Try to change the minimum and maximum scores in such a way that the most satisfactory colouring of your map is obtained.
  - b. Click **Close** to close the **Set Overlay Colours Range** dialog box.
3. To change the colour scheme used in the overlay visualization, click **Overlay Colours > Use predefined colours >** choose a colour scheme.



4. Does the revised colouring of your map change your interpretation of the map?

You can also use an overlay visualization to show the citation impact of different topics within a research area.

5. In the **Scores** drop down list in the right-hand panel, choose **Avg. norm. citations** instead of **Avg. pub. year**.



6. In the overlay visualization, the colour of a term now indicates the average citation impact of the publications in which the term occurs, with yellow indicating terms that occur mainly in highly cited publications and blue indicating terms that occur mainly in lowly cited publications.

The citation impact of a publication is defined relative to the average number of citations of all publications from the same year included in your data set.

A citation impact of 1 means that a publication has been cited equally frequently as the average of all publications from the same year. A citation impact of 2 means that a publication has been cited twice as frequently as the average of all publications from the same year.

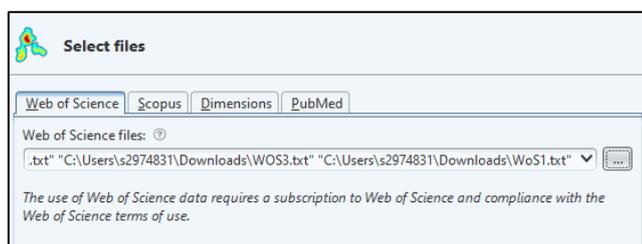
7. What does the overlay visualization tell you about the citation impact of different topics within your research area? Which topics receive a lot of citations and which topics are hardly cited?

## Create a keyword map

1. Launch VOSviewer, click **Create > Create a map based on bibliographic data > Next > Read data from bibliographic database files > Next.**



2. On the **Web of Science** tab, select the files that you downloaded previously. Click **Next.**



3. Choose:
  - **Type of analysis: Co-occurrence<sup>3</sup>**
  - **Unit of analysis: All keywords**
  - **Counting method: Full counting**
  - Click **Next**
4. Choose the default value of 5 for the **minimum number of occurrences of a keyword** and click **Next.**
5. Choose the default value for the number of keywords to be included in the analysis and click **Next.**
6. Do not remove any keywords from the analysis. Click **Finish** to finish creating your map.
7. Consider increasing or decreasing the number<sup>3</sup> of clusters in your map.

Compare your keyword map with the term map created earlier. Do the maps provide consistent results? Which of the two maps do you find more useful?

Repeat the above steps using **Author keywords** or **Keywords Plus** for the **Unit of analysis** in step 3. Of the three keyword maps that you have created, which one do you like most? To what extent do the maps provide different results?

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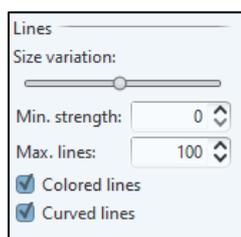
<sup>3</sup> Number of publications in which keywords appear together in title, abstract or keyword list.

## Create a co-authorship map

Co-authorship maps visualise links between jointly authored publications. Can be viewed by researchers, institutions or countries.

You can also test the effect of choosing different values for the attraction, repulsion, and resolution parameters.

1. Click **Create > Create a map based on bibliographic data > Next > Read data from bibliographic database files > Next.**
2. Go to the **Web of Science tab** and select the files that you downloaded previously. Use CTRL to select multiple files in the Select Web of Science File dialog box. Click **Next.**
3. Choose:
  - a. **Type of analysis: Co-authorship**
  - b. **Unit of analysis: Authors**
  - c. **Counting method: Full counting**
  - d. Click **Next.**
4. Use the default value of 5 for the **minimum number of documents of an author** and click **Next.**
5. Use the default value for the number of authors and click **Next.**
6. Do not remove any authors from the analysis. Click **Finish** to finish creating your map.
7. VOSviewer may indicate that some authors in your co-authorship network are unconnected from the rest of the network. In that case, you may choose either to remove the unconnected authors from the network or to keep them in the network. Choose to remove the unconnected authors.
8. In the options panel in the right area of the VOSviewer window, you may want to change the number of lines that are displayed. By default, lines are displayed for the 1000 strongest co-authorship links.



9. Go to the Analysis tab in the left-hand panel.
10. Try out different values for the attraction and repulsion parameters to find out which values give the most satisfactory results:
  - Uncheck the **Use default values check box**
  - Change the values of the **Attraction** and **Repulsion** parameters
  - Click **Update Layout.**

For most types of maps, the Attraction and Repulsion parameters should have values of, respectively, 2 and 1. However, in the case of a co-authorship map, it is often best to choose a negative value for the Repulsion parameter.

11. To increase the number of clusters, increase the value of the **Resolution parameter** and click **Update Clustering**. The Resolution parameter usually should have a value between 0.5 and 2.0.
12. Try out different parameter values in the above steps, for instance for the minimum number of documents of an author. Try to find parameter values that yield good results. Also, try out the difference between showing full first names of authors instead of only initials.
13. What do you learn from your co-authorship map?
14. Go to the **File tab** in the action panel and save your map by clicking **Save**
15. Optional: Repeat the above steps to create a co-authorship map of organizations.

## Create a thesaurus file to tidy up your data

Thesaurus files help tidy up data in co-authorship or term maps.

A common problem with co-authorship maps is that the same person is included multiple times with slightly different names (e.g., one initial vs. multiple initials).

In Terms maps, look out for terms that are synonyms or terms with a general meaning that can be excluded. Sometimes both a term itself and an abbreviation of the term occur in a map.

A thesaurus file is a plain text file consisting of two tab-delimited columns. Create the file using a text editor or a spreadsheet program such as MS Excel.

### Author thesaurus file

This thesaurus file can be used to merge the author name 'noyons, e' with the author name 'noyons, ecm', the author name 'tijssen, r' with the author name 'tijssen, rjw', etc.

Label	replace by
chen, e	chen, ec
smith, r	smith, rjw
vanraan, a	van raan, afj
vanraan, afj	van raan, afj

### Terms thesaurus file

- Merge terms. For example, merge 'Hirsch index' with the term 'H index' so that only "H index" displays in the map.
- Remove terms. For example, list 'Monday' and 'Patient' under **Label** and leave **Replace by** blank. Leaving the latter blank indicates you want to exclude the terms.

Label	Replace by
Hirsch index	H index
Journal impact factor	Impact factor
Monday	
Patient	

1. Save the thesaurus file as a .txt or .xls to your desktop or in a location you will remember.
2. Create a new map. At the choose type of analysis..." option, upload the thesaurus file under "VOSviewer thesaurus file (optional)"

**Choose type of analysis and counting method**

Type of analysis: <sup>?</sup>

- Co-authorship
- Co-occurrence
- Citation
- Bibliographic coupling
- Co-citation

Unit of analysis:

- Authors
- Organizations
- Countries

Counting method: <sup>?</sup>

- Full counting
- Fractional counting

VOSviewer thesaurus file (optional): <sup>?</sup>

Ignore documents with a large number of authors

Maximum number of authors per document:

Reduce first names of authors to initials

< Back   Next >   Finish   Cancel

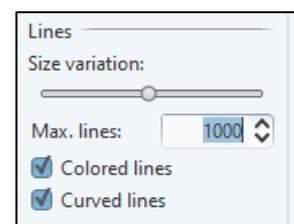
Compare the new map obtained using your thesaurus file with the original map. How large is the difference between the two maps? In the new map, did you manage to fix all problems with author names? Or merge synonyms and remove terms with general meanings for a terms map?

3. Save your new map.

## Create citation and bibliographic coupling maps

Bibliographic coupling refers to the connectivity of papers. Two publications are coupled if there is a third publication cited by both publications (overlap in the reference lists of publications). The larger the number of references two publications have in common, the stronger the bibliographic coupling between publications.

1. Launch VOSviewer, click **Create > Create a map based on bibliographic data > Next > Read data from bibliographic database files > Next**.
2. On the **Web of Science** tab, select the files that you downloaded. Click **Next**.
3. Choose
  - **Type of analysis : Citation**
  - **Unit of analysis: Documents**
  - Click **Next**.
4. Go through the remaining steps of the Create Map wizard. The default parameter values probably work well, but feel free to try out alternative values.
5. In the case of citation-based maps, it is important to display lines that indicate how items are linked to each other. By default, 1000 lines are displayed. In the options panel in the right area of the VOSviewer window, you may want to change the number of lines that are displayed.
6. Save your map.



You can repeat the above steps to create citation maps of journals and authors. Also to create bibliographic coupling maps of publications, journals, and authors.

When creating the maps, try to find parameter values that yield meaningful results. Try to avoid creating maps with more than 500 items. Also try out different values for the resolution parameter.

7. What do you learn from your maps? Which types of maps do you find most useful, and which ones do you find least useful?
8. Do citation maps and bibliographic coupling maps provide similar results? Do you observe any notable differences between the two types of maps? How can these differences be explained?
9. Compare your citation and bibliographic coupling maps of authors with the co-authorship map of authors created in the co-authorship map. What are the differences and similarities between the citation-based maps and the co-authorship map, and how can these differences and similarities be explained?

## Create a co-citation map

Co-citation maps (cited references, cited journals and cited authors<sup>4</sup>) focus on older publications. Co-citation relationships may change in future. Two publications are co-cited if a third publication cites them both. The larger the number of publications by which two publications are co-cited, the stronger the co-citation relationship between two publications.

If using Scopus data, be aware that co-citation maps created based on Scopus files tend to suffer from inaccuracies due to lack of standardization of reference data.

1. Launch VOSviewer, click **Create > Create a map based on bibliographic data > Next > Read data from bibliographic database files > Next**.
2. On the **Web of Science** tab, select the files that you downloaded in the data collection. Click **Next**.
3. Choose :
  - **Type of analysis : Co-citation**
  - **Unit of analysis : Cited references**
  - **Counting Method: Full counting**
  - Click **Next**.
4. Go through the remaining steps of the Create Map wizard. The default parameter values work well.
5. Make sure to display a suitable number of lines to indicate how items are linked to each other.
6. Save your map.

Repeat the above steps to create co-citation maps of cited journals and cited authors.

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<sup>4</sup> First author only in Web of Science.

## Using the API

VOSviewer can be provided with data downloaded through an API. The APIs of Crossref and Europe PMC are relatively easy to use.

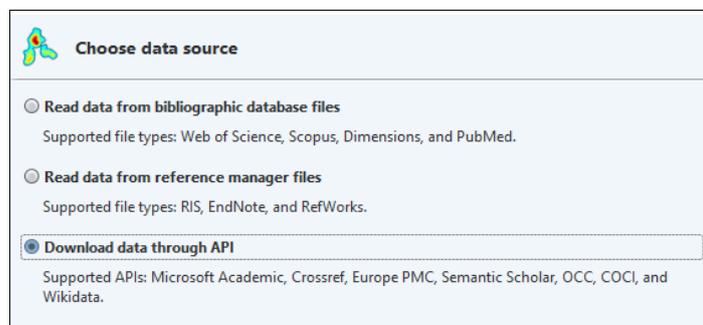
Other APIs available to use in VOSviewer are [Semantic Scholar](#), [Wikidata](#), [OpenCitations Corpus](#) and [OpenCitations Index of Crossref \(COCI\)](#).

There are 3 ways to use APIs:

1. Specify a search query and VOSviewer will download data for all documents that match the specified search criteria. This works for Crossref and Europe PMC.
2. Provide a set of DOIs to VOSviewer as a text file. VOSviewer will identify and download data for all the available documents with a matching DOI. Works for all APIs.
3. Make an API call outside VOSviewer and save the data as a JSON file. More detail in the [VOSviewer manual](#) on page 29. Works for all APIs.

The instructions below cover option 1 above: specifying a search criteria:

1. Launch VOSviewer.
2. Click **Create**.
3. Choose:
  - a. **Create a map based on text data** if you want to create a term map.
  - b. **Create a map based on bibliographic data** if you want to create a keyword map, a co-authorship map, or (only in the case of Crossref) a citation-based map. Click **Next**.
4. Choose **Download data through API** and click **Next**.



5. Make sure the **Search Query tab** is selected. Choose an API, for example:  
**Crossref** (makes research outputs easy to find, cite, link, assess, and reuse) and  
**Europe PMC** (biomedical research)
- i. Good sources if you want to focus on specific journals
  - ii. Download can be slow
  - iii. Search options – use one or a combination of the following:
    1. ORCID id (if searching for a specific researcher)
    2. Journal title
    3. Text: can only enter one word
    4. ISSN of a journal
    5. Year: specify a date range (recommend)

**Specify search query or select files**

Search Query | DOI | JSON

API: Crossref

Author:  ORCID:

Affiliation:

Journal:  ⓘ ISSN: 0028-0836

Text:  ⓘ Year: 2015 to 2020

Title only  Title and abstract

6. Follow the remaining steps in the Create Map wizard.