



Eight Essential Search Techniques

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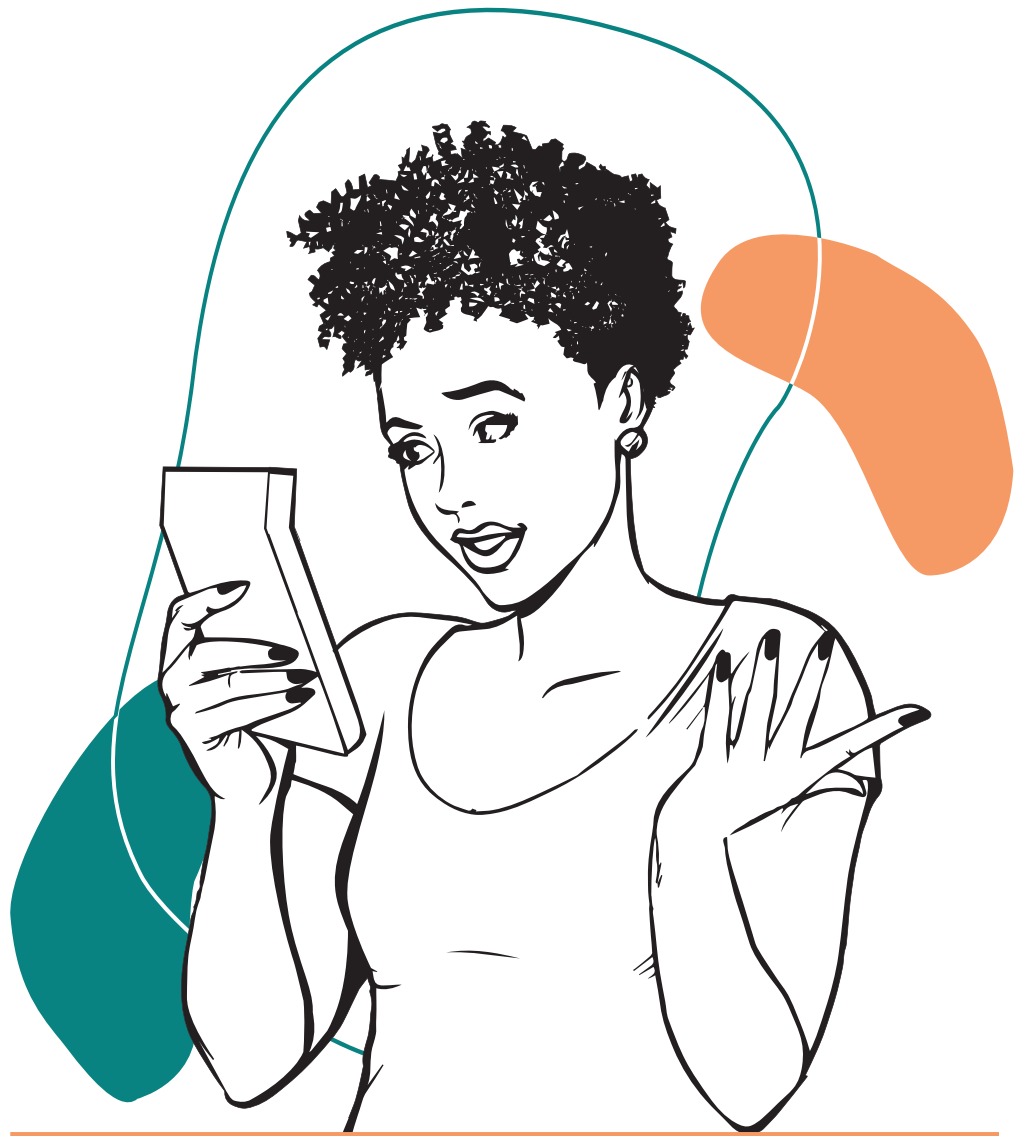
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Conducting Smarter Searches

Databases and search engines can provide thousands of results for any set of search terms. To get the most out of them you need an **effective search strategy**.

The first step is to **distil the main concepts in your question and list closely related alternatives**. This will produce a list of **search terms** which will be the focus of your search and will anchor all your other search techniques.

Once you have distilled your concepts of interest, you can refine your results on most databases using the search tools and techniques covered in the following booklet.



Truncation

Truncation is the technique of shortening a search term to capture several possible endings, which speeds up your research by showing you a range of closely related results at the same time. The most common truncation symbol is an **asterisk**, for example:

Search Term	Equivalent to searching for...	
pollut*	pollut <u>ion</u> , pollut <u>ant</u> , pollut <u>ing</u> , pollut <u>ed</u> , etc.	The number of letters to truncate varies based on the word and your search topic. If pollution is a major target of your search, pollut* would be a useful truncation since most words with this beginning are related.
organ*	organ, organ <u>ism</u> , organ <u>ic</u> , organ <u>ise</u> , organ <u>elle</u> , etc.	However, if organism is a major concept in your search, organ* would likely be an ineffective truncation, since many unrelated words begin with the same five letters.

Wildcards

A **wildcard search** is the technique of using a symbol, most commonly a **question mark**, to stand in for a single letter in your search term, or for no letter at all. They find variant spellings, so you don't miss results due to regional differences in spelling. For example:

Search Term	Equivalent to searching for...	
alumin?um	alumin <u>u</u> m, alumin <u>u</u> m	This wildcard search returns both the British English spelling alumnium and the American English spelling aluminum.

They also allow you to narrow your searches more precisely than truncation:

Search Term	Equivalent to searching for...	
carbo?yl	carbox <u>y</u> l, carbony <u>l</u>	This wildcard search returns both carboxyl and carbonyl. Unlike a truncated search, this allows you to see results for two specific terms but not for all the other terms with the same root, e.g. carboxylase, carbohydrate, and so on.

Boolean Operators

Boolean operators tell databases and search engines exactly how you want search terms to be related in your results. There are 3 operators, often written in capital letters:

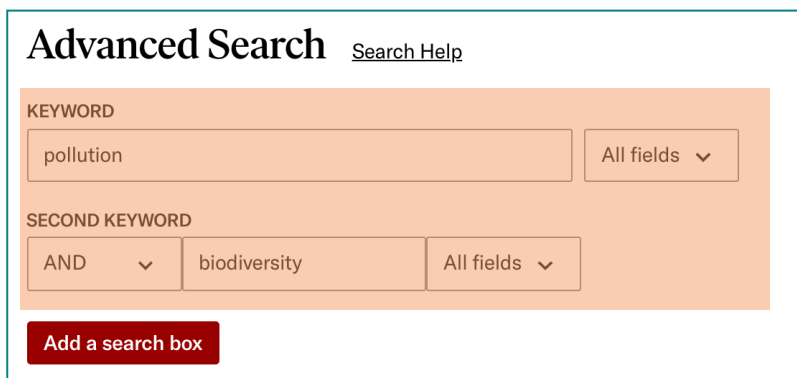
- **AND** – which returns results that **include both** of your search terms
- **OR** – which returns results that **include either** of your search terms
- **NOT** – which returns results that **exclude** a certain search term

For example, using pollution and biodiversity as search terms, the results would be:

- pollution AND biodiversity → only results with both “pollution” and “biodiversity”
- pollution OR biodiversity → results with only “pollution”, only “biodiversity”, or both
- pollution NOT(biodiversity) → only results with “pollution” and without “biodiversity”

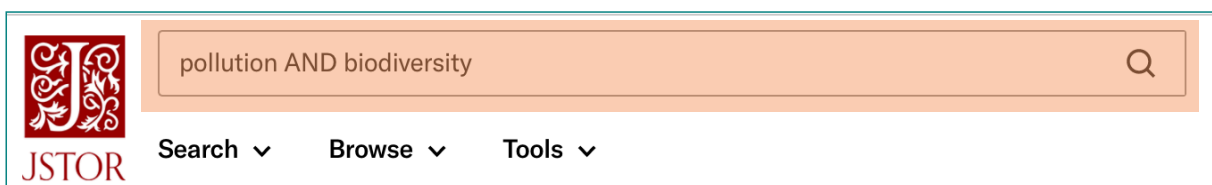
Example: Boolean Operators

Databases have multiple different ways of allowing Boolean logic in searches. Many offer dropdown menus as an advanced search option, as in this example search for pollution AND biodiversity from JSTOR:



The screenshot shows the 'Advanced Search' interface on JSTOR. It features a 'KEYWORD' field with the text 'pollution' and a dropdown menu set to 'All fields'. Below it is a 'SECOND KEYWORD' section with a dropdown menu set to 'AND', the text 'biodiversity', and another 'All fields' dropdown menu. At the bottom of the form is a red button labeled 'Add a search box'.

Almost all databases also allow you to directly type Boolean operators into their search bars as well, as in this second example from JSTOR, which produces the same results.



The screenshot shows the JSTOR search bar. On the left is the JSTOR logo. The search bar contains the text 'pollution AND biodiversity' and a search icon. Below the search bar are three dropdown menus labeled 'Search', 'Browse', and 'Tools'.

Keywords and Subject Headings

When you narrow a question to search terms such as chemical pollution, biodiversity, aquatic organisms, you create a list of **keywords**. If you search these keywords, most databases show you publications that contain them in titles or abstracts.

In addition, many databases use **subject headings**, which are predefined and controlled categories, to classify publications.

By looking up subject headings that describe your field or topic and including them in your search, you can focus your search by excluding publications in different fields with similar keywords and including in your field with different keywords.

Example: Subject Headings

In some databases, such as JSTOR, the option to search by subject headings is straightforward, and you can select your subject in a sidebar.

The screenshot shows a search interface with a sidebar on the left and search results on the right. The sidebar, titled 'SUBJECT:', lists various categories with checkboxes and counts. The 'Environmental Science' and 'Environmental Studies' categories are selected. The main area displays two search results. The first result is a journal article titled 'Impacts and prognosis of natural resource development on aquatic biodiversity in Canada's boreal zone' by David Kreutzweiser, Frederick Beall, Kara Webster, Dean Thompson, and Irena Creed, published in *Environmental Reviews*, Vol. 21, No. 4 (2013), pp. 227-259. The abstract discusses water resources and aquatic biodiversity in boreal watersheds. The second result is a journal article titled 'A Review of Economic Instruments Employed for Biodiversity Conservation' by Edem Kodzo Ekpe, published in *Consilience*, No. 9 (2013), pp. 16-32.

In other databases there are detailed lists of subject headings where each topic has a unique ID, a brief description, and is placed relative to other topics.

You may have to read the database's guide to use these headings in your searches.

This example is from the MeSH (Medical Subject Headings) list associated with PubMed's MEDLINE database.

The screenshot shows the 'Environmental Science MeSH Descriptor Data 2020' page. It features a navigation bar with tabs for 'Details', 'Qualifiers', 'MeSH Tree Structures', and 'Concepts'. The 'MeSH Tree Structures' tab is active, displaying a hierarchical list of natural science disciplines. The 'Environmental Science' descriptor is highlighted in orange. The list includes: Natural Science Disciplines [H01], Biological Science Disciplines [H01.158], Chemistry [H01.181], Earth Sciences [H01.277], Environmental Science [H01.345], Materials Science [H01.413], Mathematics [H01.548], Microtechnology [H01.570], Nanotechnology [H01.603], Physics [H01.671], and Science [H01.770].

Phrase Searching

Phrase searching is the technique of searching for multiple words as an exact phrase in with a stated word order. This is often done by enclosing the phrase in **quotation marks**.

On most databases and search engines, searching for a phrase without quotation marks returns results with any combination of the two words, searching with quotation marks returns only the exact phrase. For example:

Search Term	Equivalent to searching for...
aquatic organisms	aquatic, organisms, aquatic organisms, aquatic micro-organisms, etc.
"aquatic organisms"	aquatic organisms

Proximity and Adjacency Searches

Proximity searches, also called **adjacency searches**, help you focus your search by stating how closely together you want your search terms to appear in the results.

To do this, databases and search engines often have an operator that means **WITHIN/n**, which ensures that two words are separated by no more than n words. For example:

Search Term	Equivalent to searching for...
chemical pollution	chemical, pollution, or any combination of both
chemical WITHIN/2 pollution	chemical pollution, pollution from chemicals, chemical-caused pollution, and any phrase where chemical and pollution are no more than 1 word apart

Example: Proximity Searches

Databases often have multiple different ways of allowing proximity searches. Some offer dropdown menus as an advanced search option, as in this example search for **chemical WITHIN/5 pollution** from JSTOR.


Advanced Search [Search Help](#)

KEYWORD

SECOND KEYWORD

Many databases also allow you to directly type in adjacency operators into their search bars as well, as in this second example from JSTOR, which produces the same results.

Note: JSTOR's way of writing **word1 WITHIN/n word2** is ("**word1 word2**"~n).



[Search](#) [Browse](#) [Tools](#)

Grouping

Along with all the techniques already mentioned, you can **group** search terms, usually with **brackets**. This technique is especially useful with Boolean operators, where brackets tell the website the "order of operations", which combinations to process together and which to process first. For example:

Search Term	Equivalent to searching for...
chemical AND (pollut* OR contamina*)	chemical pollution, chemical contamination, chemical pollutants, chemical pollutants, etc.
(biodiversity AND aquatic organisms) OR "human health"	biodiversity, aquatic organisms, and any combination of the two <u>or</u> for human health

Website Search Filters

Search filters are the most familiar way to narrow or broaden your search as desired. They allow you to limit your searchers by publication date, publication type, document format, language, and other similar properties.

Most databases and search engines provide these filters as part of their advanced searches, allowing you to select the parameters of your search from menus.

Example: Search Filters

In this example of a search on PubMed, there is a sidebar offering a range of filters to narrow your search.

Including the year of publication.

How much of the article can be accessed and read on PubMed

And what type of article it is, i.e. a book, a systematic review, and so on.

The screenshot shows a PubMed search results page with a sidebar on the left containing several filter sections:

- RESULTS BY YEAR:** A bar chart showing the number of results per year from 1992 to 2018. The year 2018 is highlighted with 564 results.
- TEXT AVAILABILITY:** Three checkboxes: Abstract, Free full text, and Full text.
- ARTICLE ATTRIBUTE:** One checkbox: Associated data.
- ARTICLE TYPE:** Six checkboxes: Books and Documents, Clinical Trial, Meta-Analysis, Randomized Controlled Trial, Review, and Systematic Review.

The search results on the right are as follows:

- Female Fertility and Environmental Pollution.**
1 Canipari R, De Santis L, Cecconi S.
Cite Int J Environ Res Public Health. 2020 Nov 26;17(23):8802. doi: 10.3390/ijerph17238802. PMID: 33256215 **Free PMC article.** Review.
Share A realistic picture of our world shows that it is heavily **polluted** everywhere. Coastal regions and oceans are **polluted** by farm fertilizer, manure runoff, sewage and industrial discharges, and large isles of waste plastic are floating around, impacting sea life. ...T ...
- Chemical transformation of xenobiotics by the human gut microbiota.**
2 Koppel N, Maini Rekdal V, Balskus EP.
Cite Science. 2017 Jun 23;356(6344):eaag2770. doi: 10.1126/science.aag2770. PMID: 28642381 **Free PMC article.** Review.
Share The human gut microbiota makes key contributions to the metabolism of ingested compounds (xenobiotics), transforming hundreds of dietary components, industrial **chemicals**, and pharmaceuticals into metabolites with altered activities, toxicities, and lifetimes within the bod ...
- Gut Microbiota, Endocrine-Disrupting Chemicals, and the Diabetes Epidemic.**
3 Velmurugan G, Ramprasath T, Gilles M, Swaminathan K, Ramasamy S.
Cite Trends Endocrinol Metab. 2017 Aug;28(8):612-625. doi: 10.1016/j.tem.2017.05.001. Epub 2017 May 29. PMID: 28571659 Review.
Share This suddenly escalating rate of diabetes correlates with global industrialization and the production of plastics, pesticides, synthetic fertilizers, electronic waste, and food additives that release endocrine-disrupting **chemicals** (EDCs) into the environment and the food c ...
- Relationships between plastic litter and chemical pollutants on benthic biodiversity.**
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These training materials are provided as part of the Mawazo Learning Exchange, a professional development platform for African researchers. The Mawazo Learning Exchange is a programme of the Mawazo Institute, a non-profit research organisation based in Nairobi, Kenya. Mawazo's mission is to support the next generation of female thought leaders and scholars in Africa, and get policymakers and the public engaged with their research.



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