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Science and Technology Resources on the Internet

Search Engines and Beyond: A Toolkit for Finding Free Online Resources for Science, Technology and Engineering

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Table of Contents

Introduction

"Only librarians like to search; everyone else likes to find." ~Roy Tennant

As many information professionals know, searching the Internet landscape using the Google search engine will find only 20% of the information available on the Internet. Not only are there alternative general search engines beyond Google and Yahoo, there are an abundance of specialized search engines for finding specialized content. Reaching this specialized content requires specific searching skills, knowledge of the structure of the web, and an understanding of how search engines work (Bergman 2001; Cohen 2012; Drake 2008; Fahey 2007; Lederman 2011; Sadeh 2006).

Hidden information treasures can be discovered by using specialized search engines that are able to crawl the remaining 80% of the invisible web. "The paradox of the Invisible Web is that it's easy to understand why it exists, but it's very hard to actually define in concrete, specific terms," say Chris Sherman and Gary Price in their article, The Invisible Web: Uncovering Information Sources Search Engines Can't See (2003). However, they give a simple definition, "The Invisible Web: Text pages, files, or other often high-quality authoritative information available via the World Wide Web that general-purpose search engines cannot, due to technical limitations, or will not, due to deliberate choice, add to their indices of Web pages."

Federated search engines are the tools used to uncover the invisible web. We decided to discover--and organize--resources valuable to science, technology, and engineering (STE) researchers through the use of such search engines. We further described these tools in the Meta-Search and/or Federated Search Engines section. In addition, we categorized and presented a number of freely available authoritative web resources including various databases from government and educational institutions not only from the United States, but from across the world, as well as open access publications, ranking tools, and many others.

Audience

Most faculty and students who research science, engineering and technology topics are familiar with Google and Google Scholar. Hopefully, they are also familiar with the library's fee-based databases and journals. If, however, they approach a librarian, either in person or virtually, looking for an obscure citation or for information buried in grey literature, a toolkit of free online resources can help. The list of resources we have collected and organized can be useful to faculty and students researching subjects related to science, engineering, and technology, as well as to the librarians who help them.

Scope

The aim of this webliography is to offer a selective list of search engines and information resources that will help science/technology librarians offer more subject-specific information to their STE clientele. This webliography can serve as a starting point for those interested in researching STE resources on the web, or for experienced researchers to find obscure citations.

Most of the annotations for the resources were drawn from factual information on the home page as well as commentaries by the authors.

Methods

Initially, the selection of STE resources was based on authors' knowledge accumulated while working as reference librarians at an engineering library. Additional resources were identified by using the search engine Google. From this search, we discovered relevant bibliographies and selected science/technology resources (Freund, Nemmers, & Ochoa 2007; Hupp 2008; Laycock 2011; Lederman 2011; Zillman 2009a; Zillman 2009b). In addition, several articles with relevant resources listed in the references further guided our exploration of free online tools and information resources. More resources were obtained by attending the professional meetings and conferences of library associations and science/technology-related associations, such as the American Library Association (ALA), Special Library Association (SLA), American Chemical Society (ACS), and Patents and Trademarks Depository Library Association (PTDLA).

The criteria used for selection of Internet resources for science, technology and engineering are:

- Freely accessible
- Authoritative, hidden, and comprehensive
- Science, engineering, and technology coverage as explicitly stated in the "About" section on the home page, listed as a separate link in directories/portals and databases, or available as a selection option from the "Advanced Search" screen
- Available in English
- Simple search box/interface
- Quick results
- Updated frequently

We included some information tools that do not meet all the above criteria, e.g., viXra.org. Although this science e-print site is not authoritative, it is a useful tool for finding more information on a particular topic and for discovering new research topics in the scientific community.

While selecting various resources, we set up a classification system for easier browsing and retrieval, outlined in the Table of Contents. The distinction between a database and a search engine, for example, is not easily delineated due to the complexity of these retrieval systems. Thus, we used our own judgment to assign a particular resource to a specific group in the classification system.

General Science/Technology Resources

Meta-Search and/or Federated Search Engines

According to the ComputerUser.com Dictionary, search engines are "programs on the Internet that help users search for files and information...Most search engines find files that contain a key word or words typed in by the user. Some search engines specialize in a subject area or type of file. Others, called meta-search engines, query a number of regular search engines and collect the best results." Further, another explanation for a meta-searcher is the following: "A regular search engine allows a user to search a single database. A meta-searcher is a front end that passes each query to multiple search engines".

Actually, a meta-search or federated search engine enables a user to search multiple, independent, discretely mounted data sources or databases through one search query (Luther 2003). You can find different synonyms for federated search across the Internet; other terms are broadcast search, cross-database search, deep web search, directed search, distributed search, metasearch (or meta-search), universal search, etc. Regardless of the terminology, all of them perform high-quality searches that have a ranking system to find the best results and contain intuitive navigation tools (such as topical clustering, sort options, etc.).

Bielefeld Academic Search Engine (BASE)
http://www.base-search.net/

This multi-disciplinary search engine, from Germany's Bielefeld University Library, searches academic and related web resources. The basic search screen allows the user to check a box to search for additional word forms. The advanced search has a robust list of search options: by document type, country, and publication year, plus six options for each search box. The "Check this title in Google Scholar" link is a helpful way to find the resource in a particular library collection when searching via a campus portal.

Science.gov
http://science.gov/

Provided by U.S. government agencies, this gateway offers access to over 200 million pages of selected authoritative science information. It consists of two major types of information resources: federal science and technology web sites, and specialized federal databases that index journal articles, technical reports, conference proceedings, and gray literature. The more important features include: results clustered by subtopics, authors, or dates; Wikipedia and EurekAlert! results related to the search terms [EurekAlert! is an online tool operated by the American Association for the Advancement of Science (AAAS) and provides the latest research news from the U.S. Department of Energy (DOE) and other Federal science agencies]. Site features are detailed in McKiernan's article (2003).

ScienceAccelerator.gov
http://www.scienceaccelerator.gov/

Developed and maintained by the Office of Scientific and Technical Information (OSTI), U.S. Department of Energy (DOE), this federated search engine searches resources simultaneously from multiple Department of Energy scientific and technical information databases. These resources contain the results of DOE research and development (R&D) projects and programs, major R&D accomplishments, green-energy research, proceedings and papers from science conferences, and more. The site provides RSS feeds and a widget for librarians to use on their library web pages. Ayers (2010) details this site's features. Of particular interest to researchers and educators are the following resources listed on the bottom of this site:

E-Print Network
http://www.osti.gov/eprints/

A searchable gateway to preprint servers that focuses on scientific and technical disciplines. It contains preprints, reprints, technical reports, conference publications, or other means of electronic communication in the basic and applied sciences; primarily in physics, but also including subject areas such as: chemistry, biology and the life sciences, materials science, nuclear sciences and engineering, energy research, computer and information technologies, and other disciplines of interest to the Department of Energy.

Information Bridge: DOE Scientific and Technical Information
http://www.osti.gov/bridge/

Information Bridge contains full-text and bibliographic citations from Department of Energy (DOE) research reports. It covers information in chemistry, physics, materials, environmental science, geology, engineering, mathematics, climatology, oceanography, and computer science and its related disciplines. MARC records are available for download. A widget can be embedded in a web site for users to search the reports and to receive alerts.

Science Conference Proceedings
http://www.osti.gov/scienceconferences/

This site provides access to science and technology conference proceedings and papers from a number of authoritative sites, mainly U.S. professional societies and national labs whose areas of research relate to the Department of Energy's mission. It allows the user to simultaneously search for resources from 17 societies and government institutions, as well as limit the search to a specific organization only.

ScienceCinema
http://www.osti.gov/sciencecinema/

Video files are produced by the DOE National Laboratories, other DOE research facilities, and the European Organization for Nuclear Research (CERN). ScienceCinema searches for keywords and phrases spoken within these video files. Users can select a snippet along the timeline to begin playing the video at the exact point in the video where the words are spoken. Additional related links are provided for further exploration of video files.

Scienceresearch.com
http://www.scienceresearch.com/

This federated search engine provides a single point of access to over 300 high-quality publicly searchable science and technology collections organized under 13 subject areas: Agricultural Sciences, Astronomy & Space, Biology & Nature, Chemistry, Computers & Technology, Defense Technologies, Earth & Environmental Sciences, Energy, Materials Science, Mathematics, Physics, and more. Notable contributors to these collections include: the American Nuclear Society, the Nature Publishing Group, the National Science Foundation, the National Technical Information Service (NTIS), Oxford University Press, and many more. Collections are constantly evaluated and added, as appropriate. The engine's advanced capabilities include relevance ranking, clustering, and the ability to select results and e-mail them to a colleague or export them to citation software such as EndNote or RefWorks (see under "My Selections" tab).

Scirus
http://scirus.com/

Developed by the science publisher Elsevier, this federated search engine allows researchers to search not only multiple databases (such as ScienceDirect, arXiv.org, NASA technical reports, and Medline), but also scientists' homepages, courseware, pre-print server material, patents, institutional repositories, and web sites. It enables users to limit searches to specific types of material, file formats, content providers, or subject areas. From the results screen, users can export citations into bibliographic management software.

TechXtra
http://www.techxtra.ac.uk/index.html

TechXtra is an initiative of Heriot Watt University based in Edinburgh, Scotland. This federated search engine focuses on engineering, mathematics and computing, and finds articles, books, key web sites, industry news, job announcements, technical reports, technical data, full-text e-prints, research, theses and dissertations, teaching and learning

resources, etc. Results are displayed by collection title, offering users the option of viewing results by specific collection. In many cases full text is available, noted by a green icon in the results list. Useful features include Discovery Guides from ProQuest; Design Data from Engineering Sciences Data Unit (ESDU)--an engineering advisory organization based in the United Kingdom; Industry News from over 60 sources; and more.

Trove
http://trove.nla.gov.au/

Maintained by the National Library of Australia, this site provides one-stop searching and focuses on Australian collections of all kinds, but also includes digitized book content from Open Library, Hathi Trust, and from OAIster, which includes a variety of sources, including scholarly ones.

WebCASPAR
http://webcaspar.nsf.gov/

Developed by the National Science Foundation and the National Center for Science and Engineering Statistics (NCSES), WebCASPAR provides access to science and engineering statistical data from U.S. universities and colleges, with tutorials on how to use the database. Free registration is required for full customization, although basic data is available without registration. The site includes RSS data update feed and is updated frequently but the latest data available is two years prior to the present.

Wolfram|Alpha
http://www.wolframalpha.com/

Created by a team led by Stephen Wolfram, a British scientist, this computational knowledge engine creates an output based on performing computations from its own internal knowledge base. It differs from search engines where the output from the search is a list of links to web sites. Users type their queries in a search box and WolframAlpha generates computations using data from a broad range of disciplines, including: mathematics, physics, chemistry, materials, engineering, astronomy, earth sciences, life sciences, as well from non-STEM subject areas like weather, people, music, culture, etc. To learn more about this engine, visit http://www.wolframalpha.com/faqs10.html.

Worldwidescience.org
http://worldwidescience.org/

Developed and maintained by the Office of Scientific and Technical Information (OSTI) on behalf of the WorldWideScience Alliance, this "global science gateway" provides quick results through federated searching of national and international scientific databases worldwide. The Advanced Search allows users to limit searches to a specific database. Its multilingual feature offers searching non-English scientific literature from databases in China, Russia, France, and several Latin American countries; results can be translated into one of nine languages.

Databases

ComputerUser.com Dictionary definition of database: "a large collection of data organized for rapid search and retrieval."

Cambridge Scientific Abstracts (CSA) Discovery Guides
http://www.csa.com/discoveryguides/discoveryguides-all.php

The Discovery Guides series from ProQuest provide in-depth reports on topical engineering, mathematics, and technology issues. Full text of the reports is freely available. Each report includes an overview, key citations with abstracts, and links to

selected web sites. Reports are available as an A-Z list of links. The drawback is that they are not searchable by release date. The most recent guides in the STEM disciplines are Aftershock: The Continuing Effects of Japan's March 11, 2011 Earthquake (2012), The Environmental Impact of Meat (2012), China's Surge in Renewable Energy (2011), Biofuels: What Place in Our Energy Future? (2009), Automotive Transmissions: Efficiently Transferring Power from Engine to Wheels (2008), and more.

Genamics Journal Seek
http://journalseek.net/

Produced by Genamics.com and Openly Informatics, Inc. with support from OCLC New Jersey, this searchable database of online scholarly journals does not provide full-text articles or abstracts but is directed largely at scholars trying to identify venues for publishing their research or discover new journals of interest. The site provides journal descriptions including: aims and scope, journal abbreviation, journal homepage link, subject category, and ISSN. Publishers and content providers submit requests for inclusion of their products to this site.

Portals/Directories/Gateways

ComputerUser.com Dictionary definition of portals: "Web pages that serve as gateways to the Internet. A user can set up a browser to open on a favorite portal page, which is a starting point for web surfing. Most portals have links to a variety of interesting sites, and some kind of search engine or Web directory."

Exploring and Collecting History Online (ECHO) - Science, Technology, and Industry
http://echo.gmu.edu/

This portal to over 5,000 web sites concerning the history of science, technology, and industry is a project of the Center for History and New Media, George Mason University. The web site allows searching by keywords and phrases or browsing by subject, historical period, content type, or tag cloud. The page has not been updated recently--the latest entries seem to be from 2007--although most of the links we tested are still valid. The site is still helpful to find historical information in the STEM disciplines.

Infomine
http://infomine.ucr.edu/

Although the latest blog entry dates from 2008, the site is still helpful to discover other web sites and resources. This virtual library of Internet resources is of particular interest to faculty, students, and research staff at the university level. It is built by librarians from many universities and contains useful Internet resources such as databases, electronic journals, electronic books, bulletin boards, mailing lists, online library card catalogs, articles, directories of researchers, and many other types of information. The home page contains a list of nine subject categories but of particular interest here are the physical sciences, engineering, and computing & math categories.

National Science Digital Library
http://nsdl.org/

This National Science Foundation site is directed largely towards teaching and learning audiences with an interest in science, technology, engineering, and math (STEM). The selected high-quality resources can help educators bring "cutting-edge, real-world science into their classrooms and stimulate excitement for science in today's digital learners." The site offers access to their content through Apple's iTunes Store. Users initially can evaluate a resource of interest-before clicking on it--based on the displayed data about education level, resource type, and subject. Collections, from which resources

come, are displayed on the right panel of the screen. Resources can be easily shared via Twitter, Facebook or more than 317 social network sites.

Open Access Publications

The authors support the [Budapest Open Access Initiative's](#) definition of open access: "By open access to this literature, we mean its free availability on the public internet, permitting any users to read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself."

arXiv.org
http://arxiv.org/
> This archive, owned and operated by Cornell University, consists of pre-print scientific papers in the fields of physics, mathematics, non-linear science, computer science and quantitative biology. The papers are self-archived and not peer reviewed. However, a group of subject specialists in aforementioned fields review submissions for relevancy and remove ones they deem out of scope. The site allows browsing and searching by subject. Researchers can keep up with new submissions through RSS feeds.

Directory of Open Access Journals (DOAJ)
http://www.doaj.org/
> This collection of freely available journals covers all scientific disciplines in several languages. The site offers browsing by discipline and journal title, but subject searches are not available. Not all journal titles are indexed to article level, but publishers are encouraged to supply metadata for searching deeper than the level of a journal. Limiters for searching include: article title, journal title, ISSN, author, keywords, and abstract.

InTechOpen
http://www.intechopen.com/
> InTech Publishing Group is the creator of this platform and is a multidisciplinary open access publisher of books and scientific journals covering the fields of science, technology and medicine. The [scientific board](#) consists of many scientists from around the world, including: Canada, China, France, Germany, Italy, Japan, the United Kingdom, the United States, and many others. The site can be searched by ISBN, ISSN, author, and title. It allows researchers to exchange ideas and knowledge through the site's blog.

JSTOR
http://about.jstor.org/participate-jstor/individuals/early-journal-content
> This multidisciplinary academic database covers journals in a variety of disciplines including biology, ecology, the history of science & technology, mathematics, and statistics. Although subscription based, this database now offers free access to materials published prior to 1923 in the United States and prior to 1870 elsewhere.

Online Books Page
http://onlinebooks.library.upenn.edu/
> Online Books Page is founded and edited by John Mark Ockerbloom, a digital library researcher at the University of Pennsylvania. The site is hosted by the University of Pennsylvania Libraries and draws its sources from [HathiTrust](#), [Project Gutenberg](#), [GoogleBooks](#), [Internet Archive Ebooks and Texts](#), and the [University of Michigan Digital General Collection](#). A one stop-searching for free books on the web, discoverable by subject or call number. Subjects include titles in STEM disciplines and new listings

are provided almost on a daily basis. The site includes RSS data update feeds.

viXra.org
http://vixra.org/

> This newly created database is "a repository for new ideas that the scientific establishment is not currently willing to consider." (arXiv.org implemented an endorsement system that prevented many authors from depositing their work.) The database looks similar to arXiv but differs in subject categories, which are created based on submissions. The search box allows limiting the search to abstracts, authors, papers and the full site.

Ranking Tools

Ranking tools allow users to locate articles and other documents that have cited a previously published document. The tools also help to determine where a journal is ranked in relation to others in its field, and to find individuals who are experts or have made significant contributions in a particular subject field.

CiteSeerX
http://citeseerx.ist.psu.edu/

> This tool focuses primarily on articles in the areas of computer and information sciences. Features include citation statistics, reference linking, awareness and tracking, related documents, and more. The Personal Content Portal allows the researcher to set up RSS-like notifications, create social bookmarking, and build personalized search settings.

Eigenfactor.org
http://www.eigenfactor.org

> Eigenfactor ranks journals, and its rankings are included in Thomson Reuters' subscription-based Journal of Citation Reports (JCR). The Eigenfactor web site includes an interactive mapping function showing relationships between branches of science based on the size of the field and the citations generated by journals in the field. In JCR, a journal might be assigned to different categories, whereas in Eigenfactor a journal fits only one discipline.

Highly Cited Researchers
http://isihighlycited.com/

> A valuable tool from Thomson Reuters helps researchers to "identify individuals, departments and laboratories that have made fundamental contributions to the advancement of science and technology in recent decades." It is also an excellent teaching tool to show the development of scientific ideas. Search by name, category, country, or institutional affiliation. In addition, the user can track research trends through literature references using links to and through the licensed Web of Science database.
>
> As of December 31, 2011, Thomson Reuters discontinued the maintenance of this tool as a stand-alone service and integrated it into other tools and services, such as ResearcherID and Essential Science Indicators.

SCImago Journal & Country Rank
http://www.scimagojr.com/

> Includes the journals and country scientific indicators developed from the information contained in Elsevier's subscription-based Scopus database. This search tool allows the user to compare a range of indicators between specific countries and in specific subject areas using "a map generator." It is being developed by a research group from the Consejo Superior de Investigaciones Científicas, University of Granada, and other

Spanish institutions "dedicated to information analysis, representation and retrieval by means of visualization techniques."

Journal M3trics
http://www.journalmetrics.com/

> The Scopus Journal Analyzer provides a quick, easy and transparent graphical representation of journal performance, now enriched with two journal metrics -- SJR and SNIPS. This tool allows you to compare up to 10 journals in a specific subject. The data is updated every two months.

Catalogs

ComputerUser.com Dictionary definition of catalog: "a directory of files, or a directory of storage space."

Article@INIST
http://refdoc-info.inist.fr/c2/refdoc.html

> This French site offers an English search interface that allows the user to search for documents included in the catalog at the Institute for Scientific and Technical Information, France. Only abstracts are available, but this catalog is helpful in finding obscure citations, or as "one-stop shopping" for citations.

OAIster
http://oaister.worldcat.org/

> Part of the OCLC Worldcat.org catalog, OAIster offers free access to OAIster records only. OIAster's goal is to provide access to digital resources that are freely available, difficult-to-access, and academically-oriented. Full content is available through library collections at a user's institution. Advanced searching allows for narrowing the search to year, audience, content, format and language. Default search is by keyword, title and author, but a user can change it to ISBN, ISSN, subject, publisher, and more.

Open Video Project
http://www.open-video.org/

> The Open Video Project maintains a repository of digitized videos in which engineering is well represented. A number of clips are obtained from U.S. government agencies such as: the National Records and Archives Administration, and NASA. A detailed search box allows for limiting the search by genre, duration, color, sound, and collections. The results can further be filtered by year. Although the latest video is from 2009, this is a great open source for educators who want to enhance their classroom teaching. For more recent videos in the STEM disciplines, consider checking the subscription based Journal of Visualized Experiments (JoVE), an online journal publishing visualized (video-based) research studies in biological, medical, chemical and the physical sciences.

Worldcat.org
http://www.worldcat.org/

> The world's largest catalog of books, articles, video- and audio-materials, Worldcat is a great one-stop location to begin a search on a particular topic. The results are clustered by many facets and guide the user to narrow down the search to a particular topic, format, year, etc. Of particular interest to STEM scholars is the Advanced Search box where the search can be limited to subject field and the results can be further refined by topic in the left-hand menu.

Other Science/Technology Resources

Education

Academic Earth
http://academicearth.org/

Founded in 2008 by a group of individuals, including four Yale professors, this resource was acquired by Ampush Media, a company that specializes in online media and technology for higher education. Of particular interest to teaching faculty and students, Academic Earth provides access to full video courses and lectures from world's leading scholars. Search these instructional videos by subjects, universities, and instructors. One can browse Playlists, find series of lectures grouped thematically and curated by the site's editors, or choose Courses for Credit, grouped by subject, university and degree level, and these can be further sorted in alphabetical order, popularity and relevancy currency.

Engineering Subject Centre Resource Database
http://www.engsc.ac.uk/node/128

This catalog contains over 1,000 United Kingdom learning and teaching resources or engineering academics; e.g., case studies, guides, reports, and information about educational theory and practice. The database is updated constantly with new content, and existing content is reviewed regularly to maintain quality.

National Engineering Education Delivery System (NEEDS)
http://www.needs.org/

The NEEDS team created this U.S. digital library of learning resources for engineering education, and in partnership with TeachEngineering, has further developed the Engineering Pathway, a portal to a comprehensive collection of resources for all types of engineering education. Resources can be found at the Engineering Pathway's site; one can then click on the Higher Education Community tab located in the left pane.

Patents

A great article on patent searching is available at http://www.istl.org/10-winter/internet.html to help make you an excellent searcher (LaCourse 2010). In addition, you might download the free search engine, the Patent Pal, to begin exploring patent sites across the world.

Technical Reports

Aeronautical Research Council (ARC) Technical Reports
http://aerade.cranfield.ac.uk/reports.html

AERADE is a project developed by Cranfield University in the United Kingdom and contains historical aerospace and defense resources on the Internet. Browse alphabetically and by subject from the main page.

Defense Technical Information Center (DTIC)
http://www.dtic.mil/dtic/

The free online version provides access to materials produced by the Department of Defense (DoD) such as directives and instructions, budget information, conference and symposia proceedings, patents and patent applications, and other topics of interest to the research community. An Advanced search screen allows limiting the search to technical reports only. No registration to the public site is required.

NASA Technical Reports Server (NTRS)
http://ntrs.nasa.gov/

NASA Technical Reports collection includes conference papers, journal articles, meeting papers, patents, research reports, images, movies, and technical videos. Browse by date, collection, or by a specific NASA location. Or search using advanced search features.

Virtual Technical Reports Center
http://www.lib.umd.edu/ENGIN/TechReports/Virtual-TechReports.html
> Maintained by the University of Maryland Libraries, this site is a good place to start if you are looking for preprints and technical reports from around the world. It lists hundreds of gray literature-producing agencies sorted by institution.

Theses and Dissertations/Institutional Repositories

A one-stop search for theses and dissertations is Google Scholar; use Advanced Scholar Search and limit the search to a specific subject area to receive more targeted results. Other places to search for these materials are university repositories web sites. Looking for materials outside the United States? Try some of the links listed in this section.

Australasian Digital Theses (ADT)
http://adt.caul.edu.au
> Australasian digital theses server has been decommissioned in 2011 and now they can be found through the Trove service listed in the Meta-Search and/or Federated Search Engines section of this webliography. This database contains details of theses produced by postgraduate research students at more than 30 Australasian universities. The database offers free access to the full text of many digital theses hosted at the participating universities servers. To access this free content, search for a specific topic in the books section on the web site, then from the left pane narrow down your query to format (theses) and availability.

CaltechAUTHORS
http://authors.library.caltech.edu/browseviews.html
> Authored by faculty and other researchers at the California Institute of Technology, this repository of research papers can be browsed by person, year, document type, research group and collection. Research groups include applied & computational mathematics, advanced computing, earthquake, fluid and solid mechanics, and more.

DiVA - Academic Archive On-Line
http://www.diva-portal.org/
> The DiVA archive contains doctoral and undergraduate theses and research reports from 15 Nordic universities (Sweden, Denmark, Norway). Many materials included in this database are available full text in English and other languages.

Digital Repository at the University of Maryland (DRUM)
http://drum.lib.umd.edu
> University of Maryland (UMD) in College Park is the authors' current employer and its institutional repository provides free access to the theses and dissertations of its scholars and researchers. DRUM contains three types of materials: faculty-deposited documents, a library-managed collection of UM theses and dissertations, and collections of technical reports. Materials are available full text but some restrictions might be in place at the authors' requests. Browse by community/collection, title, author or date. Search all items in DRUM by using the yellow search box at the top of the navigation bar on the left. Specific search techniques are described in the Help section of the page.

DSpace@MIT
https://dspace.mit.edu/

DSpace@MIT is a digital repository created to capture, distribute and preserve the intellectual output of the Massachusetts Institute of Technology (MIT). It provides stable long-term storage needed to house the digital products of MIT faculty and researchers, including preprints, technical reports, working papers, conference papers, digital theses and dissertations, images, and more. It contains an open-access collection of articles written by MIT faculty.

Foreign Doctoral Dissertations from the Center for Research Libraries (CRL)
http://www.crl.edu/catalog/dissertationSearch.asp

CRL provides access to doctoral dissertations submitted to institutions outside the U.S. and Canada. An advanced search allows users to search by author, title, and subject, and to further limit the search to language and the country of publication. Browsing by country and awarding institution is available. Full text is not available, but "scholars and researchers from CRL member institutions have free and unlimited use of the CRL collections through interlibrary loan."

Institutional Repository Search
http://irs.mimas.ac.uk/demonstrator/

This discovery service showcases United Kingdom research and education, but also provides access to institutions worldwide. Subject coverage is broad; resource types include journal articles, theses, technical reports, and conference papers. On the bottom left side of the results screen, the site provides an interactive view of the search terms through an autonomy 3D visualization tool in beta version. This tool allows for the discovery of related search terms with links to relevant resources (see an example here for a search with keywords "wind turbines;" flash plug-in is required).

Networked Digital Library of Theses and Dissertations (NDLTD)
http://www.ndltd.org/serviceproviders/scirus-etd-search

This public initiative, funded by the U.S. Department of Education, aims to construct a global digital library of electronic theses and dissertations (ETD). Most of the participating universities are in the USA, though initiatives from other countries are included. Advanced search offers a number of menu choices plus limiting by subject and date range. Full text is available.

US Army Corps of Engineers (USACE) Publications
http://www.usace.army.mil/publications/

This is the official repository of USACE engineering regulations, circulars, manuals (EMs) and other official public documents of the USACE. All documents are linked to free full-text PDFs.

Subject-Specific Resources

This list is highly selective and does not aim to encompass all subject areas in science, engineering, and technology.

Agriculture

AGRIS: Agricultural Database
http://agris.fao.org/

AGRIS includes grey literature from more than 100 countries and includes unpublished scientific and technical reports, theses, conference papers, government publications in the areas of agriculture, forestry, animal husbandry, aquatic sciences and fisheries, and human nutrition. It is produced by the U.N. Food and Agriculture Organization. There is

a PDF icon for full-text of the articles; some articles require further clicks to obtain the full text.

Aerospace Engineering

BEACON eSpace
http://trs-new.jpl.nasa.gov/dspace/

Jet Propulsion Laboratory (JPL) is the chief NASA center dedicated to planning, creating, and running unmanned space missions to explore the solar system. JPL's web site, BEACON eSpace, has digital copies of technical publications authored by JPL employees. It includes preprints, meeting papers, journal articles and other publications cleared for external distribution from 1992 to the present.

Astrophysics

Astrophysics Data System (ADS)
http://adswww.harvard.edu/

A digital library portal, aimed at researchers and scholars in astronomy and physics. It is operated by the Smithsonian Astrophysical Observatory (SAO) under a NASA grant, and maintains three databases with bibliographic records: Astronomy and Astrophysics, Physics, and arXiv e-prints. The ADS portal provides one-stop searching and pointers to external resources containing abstracts and full text articles. The only full-text materials hosted on the site are those scanned by ADS and include selected articles and books from a wealth of publications, as well as pages provided through the Historical Literature Project in partnership with the John G. Wolbach Library at the Harvard-Smithsonian Center for Astrophysics. There are also free custom notification services, either e-mail or RSS feeds, promoting current awareness of the recent technical literature in astronomy and physics.

Biology

BioMed Central
http://www.biomedcentral.com

BioMed Central's portfolio of open access journals includes general titles alongside specialist journals that focus on particular disciplines. Journals can be browsed alphabetically or by subject area. Articles can be browsed depending on a user's interest, either by publication date or popularity. The site includes RSS data update feeds and allows users to download citations to bibliographic management software.

Public Library of Science (PLoS)
http://www.plos.org/

A non-profit organization founded by a group of biomedical scientists, currently publishes seven open access biomedical journals. To search a specific collection within the site, click on the Publications tab. Search for journal articles, blogs, news, and more.

PubMed Central
http://www.ncbi.nlm.nih.gov/pmc/

U.S. National Institutes of Health's National Library of Medicine provides this free archive containing citations and links to some free-text from various resources, such as MEDLINE, life science journals, and online books. The "Related articles" function is very precise in identifying additional relevant articles to the search query. "My NCBI" (with free registration) provides tools for saving searches, filtering search results, setting up automatic updates via RSS feeds, etc.

Chemistry

Chemistry: A Guide to Web Resources
http://libguides.library.albany.edu/chem_web_guide

> Created by Michael Knee, a science bibliographer at the University at Albany, State University of New York, this subject guide contains a wide range of web resources related to chemistry, including search engines, academic departments worldwide, biographies, book reviews, history, software and many more.

Civil Engineering

Geotechnical, Rock and Water Resources Library (GROW)
http://www.grow.arizona.edu/SPT--BrowseResources.php

> Funded via the National Science Foundation, created and maintained by the University of Arizona's Department of Civil Engineering and other campus partners, GROW Digital Library provides free, high-quality digital learning objects that can be used for self-study or repurposed for instructional needs in the area of civil engineering. The repository contains over 1,000 approved resources harvested from the web and elsewhere, as well resources developed by GROW's team members. Browse resources in three collections: Geotechnical Engineering, Rock Engineering, and Water Resources. An Advanced Search allows limiting the results by interactivity type and level, audience, learning time, resource type, and language.

Computer Sciences and Mathematics

Arnetminer
http://arnetminer.org/

> This online service aims to index and search academic social networks. It allows searching researchers' profiles, experts in a specific topic, courses being taught in academia and by whom, as well academic rankings.

Hewlett Packard (HP) Laboratories Technical Reports
http://www.hpl.hp.com/techreports/

> HP Labs technical reports from 1990 to the present. Topics include: computer science, communication networks, and applied mathematics with a focus on cloud and security, information analytics, intelligent infrastructure, mobile and immersive experiences, networking and communication, and sustainability. Some reports are full text; some are abstracts only.

Environment and Energy

ERL: Environmental & Energy Resources Library
http://www.eerl.org

> The ERL collection, supported by a National Science Foundation (NSF) grant, consists of STEM resources related to environmental science and technology. The materials range from classroom-ready materials to regulatory information and global environmental issues. Some of the areas include: air quality, emergency preparedness and response, safety and health, and sustainability. One can browse resources in 31 classifications, e.g. with the highest number of records in Education and Training Resources, Energy, and Natural Resources Management. The Advanced search site offers the options to search in 18 fields, including by URL, e-mail, classification, contributor, publisher, keyword, subject, title, etc. To search for records in a specific year, consider

typing the year of interest in the Description field, then click on the More info link on the right side of the result to get to the release date of the document.

Energy Technology Data Exchange
https://www.etde.org/etdeweb/logon.jsp

Energy Technology Data Exchange is the result of a 1987 agreement under the International Energy Agency (IEA). This exchange initiative, which contains information from the U.S. and more than a dozen other member countries, contains the latest energy-related research, including literature references and full-text documents on energy policy and planning, basic sciences and materials research, the environmental impact of energy production and use including climate change, nuclear, coal and fossil fuels, renewable energy technologies, and more. Free registration is required to search. The site offers translation tools.

Physics

INSPIRE
http://inspirehep.net/

INSPIRE is a collaborative service between four labs: DESY, Fermilab, SLAC, and CERN. It contains high-energy-physics articles, including journal papers, preprints, e-prints, technical reports, conference papers, and theses. The resources come from ADS, arXiv, HepData, PDG, and other publishers. Three different screens are available for various search levels: main search box, easy and advanced. The site provides search tips including how to do citation or caption searches, to calculate the h-index, and more. In the results page, all authors' names are linked to a list of their four most recent publications. The site's interface can be changed to different languages but the results appear in English.

CERN Document Server
http://cdsweb.cern.ch/

The CERN Document Server offers bibliographic records and full-text documents in particle physics and related areas. The search screen allows narrowing the search query to an individual or all collections (Articles & Preprints, Books & Proceedings, Presentations & Talks, Periodicals & Progress Reports, and Multimedia & Outreach). The Help menu is available to guide the user through the various commands and features of the database. Users can save their search history and set up alerts after creating an account. Registration is free.

Physics: A Guide to Web Resources
http://libguides.library.albany.edu/physics_web_guide

Created by Michael Knee, a science bibliographer at the University at Albany, State University of New York, this subject guide contains a wide range of web resources related to physics, including search engines, academic departments worldwide, biographies, book reviews, history, software, employment and many more.

Miscellaneous

Grants.gov
http://www07.grants.gov/index.jsp

Grants.gov is a governmental resource named the E-Grants Initiative, and is part of the President's 2002 Fiscal Year Management Agenda to improve government services to the public. It provides information about how to find and apply for grants.

Jobs

OneStep Jobs
http://www.techxtra.ac.uk/onestepjobs/
> One-stop place for searching the latest job vacancies in engineering, mathematics, and computing from various job services harvested by the TechXtra federated search engine. The site is hosted by the United Kingdom and most job announcements are UK-based.

SciCentral
http://www.scicentral.com/Y-jobs.html
> Founded by Guy Orgambide, Ph.D, an entrepreneur and consultant in North Carolina, the site offers a list of scientific job opportunities by discipline area, including the biosciences, health sciences, physics, chemistry, engineering, and more.

Conclusion

Scientists and engineers need quick and timely electronic access to a variety of information resources to support their research. This selective webliography for science/technology/engineering collects useful web-based resources that will facilitate searches for professional materials in these subjects. The aim is to offer a starting point for the novice and/or experienced librarian and the engineer to discover resources beyond fee-based databases and journals. It is important to remember that Google and similar search engines crawl the surface web only and by using specialized search engines, one can discover authoritative information hidden deeply within the web.

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