Research Questions and Search Strategy Development

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http://libguides.lib.umanitoba.ca/statisticsscitech
Goal

Students will have a clear understanding of the steps of carrying out a literature search for their assignments and research and effectively manage their search results.
Objectives

• Differentiate between foreground and background questions
• Develop search strategies and statements
• Learn to effectively search bibliographic databases
• Review resources Web of Science, Scopus, Google Scholar and related resources
• Import database records and create bibliographies with Mendeley
• Create a research log
What Are Research Questions?
Objective 1

Analyze [http://www.astroml.org/_images/plot_moving_objects_2.png](http://www.astroml.org/_images/plot_moving_objects_2.png)
Given a question formulated in preparation for a literature search, you will be able to differentiate background and foreground questions listing two characteristics specific to each type of question.
Case

Modeling seasonal and weather dependency of cardiac arrests.

Where do you begin?
Ask the Right Question

“Paper or plastic?”
Types of Questions

• A two-model framework can be used to frame your question.
  - Background Questions
  - Foreground Questions

• This framework helps you to identify appropriate resources to better answer your question.
Background Question

topic

+ definitions

facts
Background Questions

• Why is the sky blue?
• What is mixed modeling?
• When is the Poisson Distribution used?
Case

Modeling seasonal/weather dependency of cardiac arrests.

Learning Activity

• Identify two background questions related to the case
Foreground Questions

- Research based
- Specific – narrowly focused
- Data is collected and analyzed to answer the question

Foreground Questions

Example:

Among elderly, is ginseng effective in preventing upper respiratory tract infections compared to placebo?
Questions
Why is it Important to Match the Type of Question to Appropriate Information Resources?
Objective 2

Comprehension
Given a background or foreground question, you will be able to select the appropriate information resource using the Information Retrieval Model to answer the question, listing one resource specific to each type of question.
Background Resources

Textbook

Monograph

Reference

Review Article
Definition

Monograph:
A detailed written study of a single specialized topic (distinguished from general studies in which the topic is dealt with as part of a wider subject such as a textbook).

Oxford English Dictionary Online Edition
Definition

Review Article:
An article or book published after examination of published material on a subject. It may be comprehensive to various degrees and the time range of material scrutinized may be broad or narrow, but the reviews most often desired are reviews of the current literature.

Finding Background Resources

http://umanitoba.ca/libraries/
Case

Modeling seasonal/weather dependency of cardiac arrests.

Learning Activity

• Find a resource to answer your background questions
Background Resource Search

What type of resource did you find?

Which search resource did you use?

Did you encounter any difficulties searching?

Record your answers on the worksheet and write down any reflections you may have.
A spatial analysis of the association between restaurant density and body mass index in Canadian adults
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ARTICLE INFO

Article info
- A spatial analysis of the association between restaurant density and body mass index in Canadian adults
- Methods: Individual-level data on restaurants and residential neighborhoods were obtained from the NSCL and 2007 Canadian Community Health Survey. The association between restaurant density and body mass index was assessed using spatial scan statistics, conditional logistic regression, and logistic regression.
- Results: The results showed a significant association between restaurant density and body mass index.

ABOUT THIS PAPER

Causal maps are widely employed in problem structuring interventions. They permit a rich representation of ideas, through the modelling of complex chains of causes and effects. The last stage of a problem structuring intervention is often to identify and agree to a set of potential strategic options. In some circumstances the preferred direction may emerge naturally from a process of negotiation, but in others, more-northern-formal analysis may be required to evaluate the options and understand their impacts on the goals and objectives. Such analysis may help the group to consider other options and make an informed decision. The main aim of this paper is to review systematically the approaches for evaluating options following from the use of a causal map for problem structuring: some directly using the map structure, others working with concepts extracted from it, and some external models derived from the map. Following a proposed taxonomy, each approach is presented, and its advantages and disadvantages are discussed.

Published online 24 May 2006

Keywords: cognitive maps; causal maps; problem structuring; evaluation of options

Introduction

Causal maps have been widely used in problem structuring interventions (Roseenhead and Milne, 2004), in particular in the SOOA (see chapter 2 of Roseenhead and Milne, 2004) methodology (see also Ainsley (1970), Bryson et al. (2004) and also Raff and Jenkins (2002) for other uses of causal maps). Such maps permit a rich representation of ideas, through the modelling of complex chains of argument, and are suitable for several types of analysis.

A spatial analysis of the association between restaurant density and body mass index in Canadian adults

Research Article

Published online 24 May 2006

Keywords: cognitive maps; causal maps; problem structuring; evaluation of options
Foreground Resources

Databases

• Subject Specific

  Current Index to Statistics

• Multidisciplinary

  WEB OF SCIENCE™

  MathSciNet
  Mathematical Reviews

  Scopus

  Google Scholar
Finding Foreground Resources

http://umanitoba.ca/libraries
Finding Foreground Resources
Case

Modeling seasonal/weather dependency of cardiac arrests.

Learning Activity

• Would you use a multidisciplinary database for this case?
• Why? or Why not?

http://uk-meetings.canada.travel/sites/default/files/ice_skating_on_the_river_trail_in_winnipeg_manitoba_48394.jpg?1314139505
Objective 3

Evaluation

http://4.bp.blogspot.com/-rQaFhd6NHJ0/TlJrXcsKavI/AAAAAAAAA_U/urKiFcwF7Uk/s1600/evaluation.jpg
Given a foreground question, you will be able to justify the database(s) chosen to carry out the search using 3-5 database selection criteria.
Database Selection Criteria: Foreground Questions

• Journal Databases (also known as bibliographic databases)

• Subject
  - Specific (e.g. statistics, engineering, economics)
  - Multidisciplinary (e.g. health sciences, material science)

• Publisher of Database (authoritative)
  - Government (e.g. U.S. Department of Energy)
  - Academic/Industry organization (e.g. American Statistical Association)
Database Selection Criteria: Foreground Questions

- Time period coverage (current or older)
- Search tools
  - Boolean (logic) operators
  - Thesaurus (helps you find words/phrases for your search)
  - Limit options (time period, language, publication type, etc.)
  - Search set manipulation
  - Save search results to bibliographic management software
Pattern of Literature Retrieval

Foreground

- Primary
  - Research Article Published 2010
- Secondary
  - Indexed in a Database 2010 (e.g., MathSciNet)

Background

- Tertiary
  - Review Articles or Monographs 2011
  - Textbooks 2012
  - Reference 2013 (e.g., Encyclopedias, Dictionaries, etc.)

Retrieval

1. Reference 2013
2. Textbooks 2012
3. Review Articles or Monographs 2011
4. Indexed in a Database 2010
5. Research Article Published 2010
6. Original Work (research studies) 2009
Case

Modeling seasonal/weather dependency of cardiac arrests.

Learning Activity

- Review a database listed in Foreground Resources
- Use the database selection criteria to assess its appropriateness for this case
- List 3 database selection criteria this database meets
Academic Journals

- Peer-reviewed periodicals
- Institution, corporation or a professional or scholarly society
- Researchers publish current news or reports in the form articles of their research work.
Definition

Peer-review:
“... a system... used by scientists to decide which research results should be published in a scientific journal. The peer review process subjects scientific research papers to independent scrutiny by other qualified scientific experts (peers) before they are made public.”

Sense About Science
http://www.senseaboutscience.org/pages/peer-review.html
(retrieved: Sept. 19, 2013)
Academic Journals

Types of articles:
• Letters/Communications
• Research Notes
• Articles
• Supplementary Articles
• Review Articles

Experiment-Resources.com
What is a Well-Formulated Search Statement?
Objective 4

Application
Given a question with two distinct concepts and associated synonyms within each concept, you will be able to apply appropriate Boolean operators to combine the concepts and synonyms into a well-formulated search statement.
Anatomy of a Question

Key Concepts: main topics or subjects in the question.

Synonyms: another word meaning the same thing
(e.g. synonym of dirt = earth, soil)

NOTE:
It’s important to think of all possible synonyms or related words to help achieve a comprehensive search retrieval.
Anatomy of a Question

Foreground Question:

Is physical therapy effective for treating lower back pain?

Key Concepts
# Example

<table>
<thead>
<tr>
<th>Concept A</th>
<th>Concept B</th>
<th>Concept C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Therapy</td>
<td>Lower Back Pain</td>
<td></td>
</tr>
<tr>
<td>Massage</td>
<td>Lower Back</td>
<td></td>
</tr>
<tr>
<td>Hydrotherapy</td>
<td>Ache</td>
<td>Lumbar Pain</td>
</tr>
<tr>
<td>Acupressure</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Synonyms**
How Do We Combine?

• Boolean operators are a system of symbolic logic used to express the relationship between individual terms.

• We all use these logical relationships all of the time even in non health-related topics

• Even a search as simple as… “Cats and Dogs”
Boolean Operators

• Use **OR** to connect synonymous or related terms.

• For example if searching “Cats” consider

<table>
<thead>
<tr>
<th>Persians</th>
<th>OR</th>
<th>Calicos</th>
<th>OR</th>
<th>Kittens</th>
</tr>
</thead>
</table>

10/28/16
Boolean Operators

- Use **AND** to connect all terms that must occur in the information

Retrieves only information that talks about

Cats **AND** Dogs
Boolean Tutorials

Take these two brief tutorials located at Colorado State University Libraries:

Boolean: http://lib.colostate.edu/tutorials/boolean_info.html

Advanced Boolean:
http://lib.colostate.edu/tutorials/booleanadv_info.html

Note: you will need Macromedia Flash v.5 installed on your computer
Search Principles

Good Search Technique:

• Search for one concept at a time

• Group synonymous/related terms into one set using **OR** operator

• Use **AND** operator to combine set numbers representing distinct concepts that must occur in same search
Search Principles

Well-Formulated Search Statement:

(physical therapy OR massage OR hydrotherapy OR acupressure) AND (lower back pain OR lower back ache OR lumbar pain)
Search Principles

Well-Formulated Search Statement Entered into a Database:

#1 physical therapy OR massage OR hydrotherapy OR acupressure

#2 lower back pain OR lower back ache OR lumbar pain

#3 #1 AND #2
Exercise
Well-Formulated Search Statement

• Identify key concepts in the question below
• Combine the case key concepts and their synonyms with their appropriate Boolean operators to create a well-formulated search statement

In Canada, is the incidence of heart attacks seasonally dependent?

Enter the search statement into your worksheet.
Search Principles

• Free-text searching:
  – Searches entire record for a match
    • Title, Author, Abstract, etc.
  – Very sensitive
  – Low specificity (false retrievals)
Search Principles

• Free-text searching:
  – Truncation and Wildcards:
    • Different symbols for different databases
    • Truncate using * at the end of a word:

    e.g. random*: random, randomly, randomize, randomized, randomise, randomised
Search Principles

• Free-text searching:
  – Wildcards:
    • Use to match one or more letters within a word
    • Use ? symbol
    E.g. color retrieves: colour and color
Search Principles

• Free-text searching:
  – Proximity Operators
    • Retrieve records with both search terms in same sentence in any order
    • An alternative to the AND operator to “tighten up” a free-text search
    e.g. dyslexia near/1 (treatment or treating)
         computer near/2 language

NOTE: check database “help” for syntax details
Search Principles

• Thesaurus searching:
  – Standardized subject terms organized in a hierarchical way
  – Located in “Descriptor” field
  – Systematic way of accounting for synonyms, spellings and related terms
  – Low sensitivity (Descriptor field only searched)
  – High specificity (fewer false retrievals)
  – Begin Searches With the Thesaurus (if available)
  – Use Thesaurus to help identify search terms
Other Resources

WEB OF SCIENCE™

- Multidisciplinary
- 8,000 science journals
- Science Citation Index
- Web Citation Index
- Topic searching (General Search)
- Updated weekly
General Search

• Single topic/author/reference

• Search each concept here

• Combine search sets in *Search History*

• Limits available
• Combine search sets here
• Boolean Operators
• Limits (“Refine”) available in results view
Common features with other databases:

• Marking records and saving to a list

• Search history

• Save searches to run later (“Save History”)

• Automated searching with results sent via e-mail
Cited Reference Search

• Find articles that cite an author or an article
• Who has cited me?
• Citation counts:
  – grant applications
  – tenure/promotion
  – quantitative measure that is often misused for qualitative assessments
• Citation Alert (unique feature via e-mail)
Case

Continue your research on modeling seasonal/weather dependency of cardiac arrests.

Web of Science Exercise

• Enter the search strategy into the database
• One concept at a time in General Search
• Combine with Booleans in Search History
Case

Modeling seasonal/weather dependency of cardiac arrests.

Learning Activity

• Use another database listed under foreground resources to find articles

• Compare the two databases using the database selection criteria
Exercise

Cited Reference Search

- Find the citation count for:
  - Your paper; or
  - One of your supervisor’s papers
- Display the abstract and follow the “times cited” link
- What is the most current citing paper?
Web Citation Index

- Web based documents
  - pre-prints
  - open archive repositories
  - open access journals

- Must also include as part of comprehensive search:
  - Google Scholar
  - Scopus
Why is Citing and Referencing Important?

http://www.tarleton.edu/library/images/documentation/wordle_images.jpg
Objective 5

Given a source of any format (book, journal article, website), you will be able to apply the American Statistical Association Style Guide to create in-text citations and reference lists.
When to Reference

• Ideas and research from another source used in your work
• Actual quotes from another person’s work
• **Paraphrasing** material from another person’s work
• Specific reference to another person’s work
• Using a concept or idea that has already been conceived
• When someone else’s work has been a critical element in the creation and development of your own ideas
Citing and Referencing

• Credit sources that you use
• Properly document sources you use
• Avoid plagiarism
• Ensure academic integrity
• Style guides – specific to disciplines/sub-disciplines
Citing and Referencing

The following tutorials provide an excellent overview:
http://monash.edu/library/skills/resources/tutorials/citing/index.html

Another tutorial using the Harvard style system:
https://ilrb.cf.ac.uk/citingreferences/tutorial/index.html

UM Libraries: http://libguides.lib.umanitoba.ca/citingandwriting
Citing and Referencing

American Statistical Association Style Guide [link]
Citing and Referencing

In-text citation:

• Use name-and-year system
  
  Holmgren (1958) discovered...
  Jones and Smith (1988) observed...
  3 or more authors: Harvey et al. (1999) determined that...

• Multiple in-text citations
  
  – Date order in parentheses (Smith and Smith 1958; Tukey 1965, 1980; Gilula and Smith 1971a,b; Smith 1980)
Citing and Referencing

See ASA Style Guide for examples:

• References (this is the title of the references section)
• Alphabetical order by author last name then by increasing year
Case

Prepare abstracts for export to Mendeley

Learning Activity

• Set up a Mendeley account
• Search Scopus
• Select two records for export
• Do the same for Google Scholar
Other Resources

- Biggest web search engine
- Ultimate free-text search (very sensitive)
- Default **AND** used
- Automatic stemming (variant endings) resulting in unpredictable results
  - Does not work with searches in quotations
Google Scholar ([http://scholar.google.com](http://scholar.google.com))

- Broadly searches academic/scholarly literature
- Many formats
- Multidisciplinary

Searches for:
- Articles
- Authors
- Publication
- Date
Google Scholar Coverage:

• Articles and some citations to books

• Full-text online articles (limitation)
  – Not all publishers are represented
  – Access Google Scholar from UM Libraries Web Page for access to full-text
  – Set up library link in Settings

• Citations to articles (from bibliographies of publications)
Google Books ([http://books.google.com](http://books.google.com))

- Full-text search

- Identifies content not normally accessible in other resources (e.g. library catalogues)
Google Books Content

• Scanned full-text

• Pages/images if in public domain

• Excerpts of copyright books when publisher has not permitted full-text online

• Tables of contents and index

• Link to publisher, bookstores and libraries if a scanned copy is submitted
Search Principles

Google Search Tips [link]

http://www.google.com/support/websearch/bin/static.py?hl=en&page=guide.cs&guide=1221265&rd=1
(retrieved October 13, 2013)
Quality of Web Info

• **What criteria determine quality?**
  
  — **credibility** (source, context, currency, relevance)
  
  — **content** (accuracy, sources stated, evidence)
  
  — **disclosure** (purpose of site, profiling)
  
  — **links** (selection, architecture, content, back linkages)
  
  — **design** (accessibility, logical organization)
  
  — **Interactivity** (feed back, chat, tailoring)

• From: *A Report on the Evaluation of Criteria Sets for Assessing Health Web Sites* at the following URL:


  (retrieved: Oct. 28, 2016)
Research Log

1. Source (database or search engine)
2. Date found
3. URL
4. Search history (terms)
5. Relevance/keywords
6. Reference info
Sample Research Log entry

1. Scopus
2. March 24, 2006
4. Quantum computing or quantum gates; electron spin or spin orbit coupling or spin orbit interactions
5. Very few records with only electron spin, broaden search
7. Location: c:\thesis\quantum dots\scopus230306.txt
8. RefWorks folder: quantum dots
Writing Resources

• Academic Learning Centre (UofM)
• Tutorial: Demystifying citing and referencing
• UM Libraries Guide: [http://libguides.lib.umanitoba.ca/citingandwriting](http://libguides.lib.umanitoba.ca/citingandwriting)

Copyright

[What Grad Students Need to Know](http://libguides.lib.umanitoba.ca/citingandwriting) - UofM Copyright Office.

[Copyright Basics](http://libguides.lib.umanitoba.ca/citingandwriting) – UofM Copyright Office
Thesis Toolkit

http://libguides.lib.umanitoba.ca/thesis
Mendeley

- Reference Management software
- Database of your references
- Export in BibTeX
- Access journal articles via

Other software available: UM Libraries
Finally

If you need further help or have a question contact me.

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