Research Methodology

CS 5001

Instructor: Dr. Ramoza Ahsan

Agenda

- **Review of Quiz Solution**
- **Review of Assignment 1**
- **How to write Literature Review**
- **Sample Literature reviews**
- **Citations**
- **Questions**

Contact Details

- **Contact**
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Background

- During topic selection assignment,
- You performed various searches,
- And shortlisted the papers related to your topic.

What is a review article?

- A review article is a type of secondary literature that talks about previously published work.

- "Review articles give an overview of existing literature in a field, often identifying specific problems or issues and analyze information from available published work on the topic with a balanced perspective".

6 Article types that journals publish: A guide for early career researchers – Kakolo Majumer

What is literature review?

- A literature review is a critical summary of the published works on a particular topic.

- It analyzes specific issues

- It identifies trends in research

- It points out research gaps in existing literature

How a literature review helps scientists and readers

Readers are able to:
- Form an idea about the current state of understanding on a topic
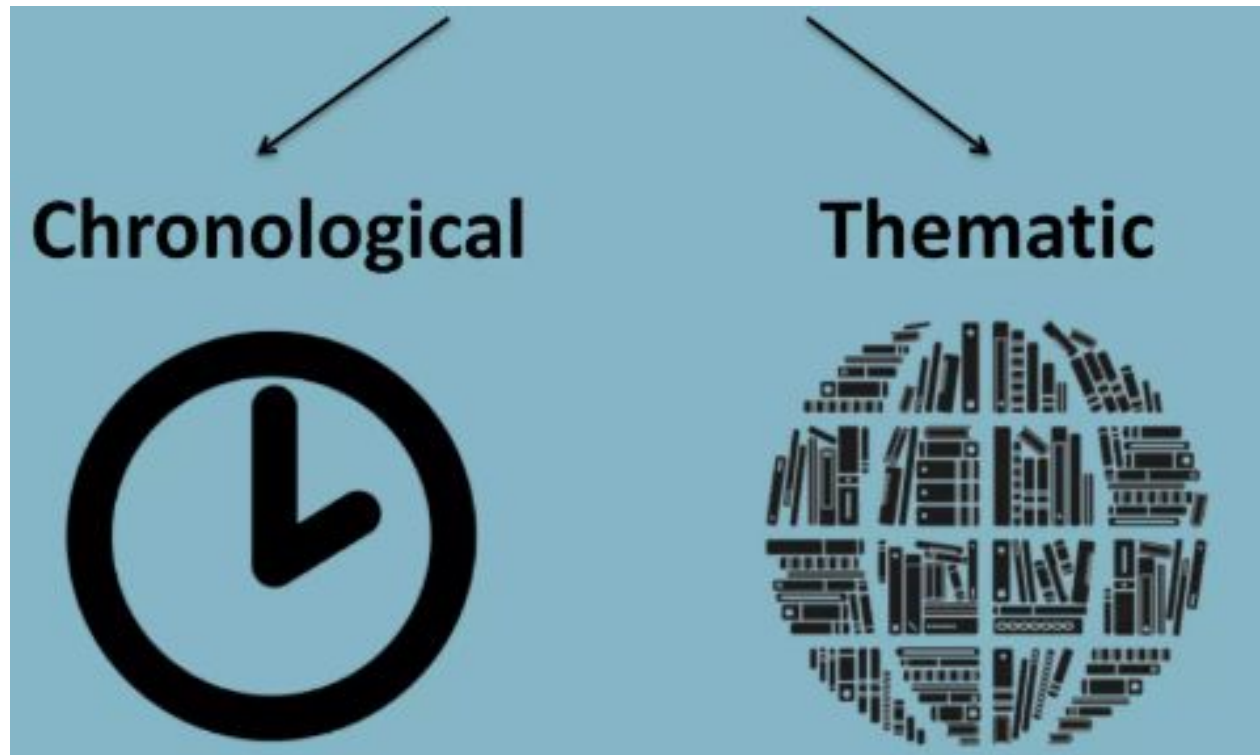- Decide whether to read each article individually

Scientists are able to:
- Learn about developments in the field
- Find gaps in research
- Identify new topics of research

What is literature review?

You can write literature review using one of the following approaches

Chronological   Thematic

The chronological approach

Describe each work in succession, starting with the earliest available information

TIPS for using the chronological approach

✓ Use this structure when you want to focus on how ideas or methodology have progressed over time.

✓ Group and discuss your sources in order of their publication date.

✓ Record the research and developments in each group.

✓ Check how the field has developed over the years. Do all studies discuss a common topic?

✓ Example: how models for treatment methods for skin cancer in children have developed over a specific period

The thematic approach

- Organize and discuss existing literature based on themes or theoretical concepts you feel are important to understand the topic

TIPS for using the thematic approach

✓ Remember that you need to do much more than summarizing each study.

✓ Analyze existing knowledge on the topic with regard to certain important issues.

✓ Draw the readers' attention to new angles or perspectives.

✓ Start listing citations you may include in your paper.

Writing the Literature Review (LR) Section

- What to write
    - Write few liner summary of each paper.
        - Background on what they have done: 2 Lines
        - How they solve the problem: 3-4 Lines
        - Strength and Weaknesses of their proposed work: 3-4 lines
    - Once written, divide your shortlisted papers into various categories based on their aim/goal or approach to solve the problem
    - Paste the written material into respective categories
    - Create a table to categorize the papers.
        - Sample paper: Liu, Yike, Tara Safavi, Abhilash Dighe, and Danai Koutra. "Graph summarization methods and applications: A survey." *ACM Computing Surveys (CSUR)* 51, no. 3 (2018): 1-34.

Writing the Literature Review Section

- Sample Literature review sections

Tools used for Research Article Writing

- Latex

- Overleaf: https://www.overleaf.com/

- Papeeria: https://papeeria.com/

- Cocalc: https://cocalc.com/features/latex-editor

Latex

- It is a document mark-up language which is used to create technical documents
- Requirements
  - Latex Distribution which turns our code into read-able documents
  - Latex Text Editor to write our code
- Distributions
  - For Windows : "MiKTex"
  - For Mac OS: "MacTex"
- Editor
  - Texmaker or any other of your choice

Overleaf

- collaborative, online LaTeX editor that *anyone* can use

Write like a rocket scientist with Overleaf
—the collaborative, online LaTeX editor that *anyone* can use

[G] **Sign up with Google**   [iD] **Sign up with ORCID**

OR

Enter your email   Enter your password

Sign up for free

Bibliography vs References

- A "bibliography" lists all sources consulted during research, including those not directly cited in the text, while "references" only include sources that were explicitly cited within the paper, essentially documenting the specific sources used to support claims made in the writing; a bibliography is broader than a reference list.

Key points:

- **Bibliography**: Includes all sources reviewed during research, even if not directly cited in the text.

- **References**: Only includes sources that were directly cited within the paper.

- Example: If you read several books to research a topic, your bibliography would list all of them, but your reference list would only include the books you specifically mentioned in your paper.

Citations

- **What is a citation and citation style?**
  - A **citation** is a way of giving credit to individuals for their creative and intellectual works that you utilized to support your research.
  - It can also be used to locate particular sources and combat plagiarism. Typically, a citation can include the author's name, date, location of the publishing company, journal title, or DOI (Digital Object Identifer).

  - A **citation style** dictates the information necessary for a citation and how the information is ordered, as well as punctuation and other formatting.

Citations

- **How to do I choose a citation style?**
  - There are many different ways of citing resources from your research. The citation style sometimes depends on the academic discipline involved. For example:
    - APA (American Psychological Association) is used by Education, Psychology, and Sciences
    - MLA (Modern Language Association) style is used by the Humanities
    - Chicago/Turabian style is generally used by Business, History, and the Fine Arts

MLA Neamtu, Rodica, et al. "Interactive time series exploration powered by the marriage of similarity distances." *Proceedings of the VLDB Endowment* 10.3 (2016): 169-180.

APA Neamtu, R., Ahsan, R., Rundensteiner, E., & Sarkozy, G. (2016). Interactive time series exploration powered by the marriage of similarity distances. *Proceedings of the VLDB Endowment, 10*(3), 169-180.

Chicago Neamtu, Rodica, Ramoza Ahsan, Elke Rundensteiner, and Gabor Sarkozy. "Interactive time series exploration powered by the marriage of similarity distances." *Proceedings of the VLDB Endowment* 10, no. 3 (2016): 169-180.

Harvard Neamtu, R., Ahsan, R., Rundensteiner, E. and Sarkozy, G., 2016. Interactive time series exploration powered by the marriage of similarity distances. *Proceedings of the VLDB Endowment, 10*(3), pp.169-180.

Vancouver Neamtu R, Ahsan R, Rundensteiner E, Sarkozy G. Interactive time series exploration powered by the marriage of similarity distances. Proceedings of the VLDB Endowment. 2016 Nov 1;10(3):169-80.

BibTeX   EndNote   RefMan   RefWorks

Citation Style to Use for Computer Science

- **The ACM citation style**
- **The APA citation style**
- **The IEEE citation style**

Citation Style to Use for Computer Science

- **The ACM citation style**
  - Format needed for a full citation in the reference list

    [1] Simone Porru, Andrea Pinna, Michele Marchesi, and Roberto Tonelli. 2017. Blockchain-Oriented Software Engineering: Challenges and New Directions. In 2017 IEEE/ACM 39th International Conference on Software Engineering Companion (ICSE-C), IEEE.

  - In-text citations

    In recent years, much debate has been stirred regarding the power of peer-to-peer systems [1].

Citation Style to Use for Computer Science

- **The APA citation style**
  - Usually associated with the humanities, APA has now become a prominent citation style within the computer science field.

    Wallace, A., Dietz, V., & Cairns, K. L. (2009). Integration of immunization services with other health interventions in the developing world: what works and why? Systematic literature review. Tropical Medicine & International Health, 14(1), 11–19.

  - In-text citations

    Presence of a strong immunization service prior to integration is considered as one of the two characteristics of success (Wallace et al., 2009).

Citation Style to Use for Computer Science

- **The IEEE citation style**
  - Mainly targeted at engineering, computer science, and information technology

    [9] I. Bashir, Mastering Blockchain: Distributed ledger technology, decentralization, and smart contracts explained, 2nd Edition, 2nd ed. Birmingham, England: Packt Publishing, 2018.

  - In-text citations

    Blockchain is an emerging technology holding significant promise [9].

Difference between ACM and IEEE citation style

- while both use numerical in-text citations, ACM tends to prefer full author names in the reference list, whereas IEEE often uses initials

ACM

- **Focus on computer science:**
- Primarily used in publications related to computer science by the Association for Computing Machinery

IEEE

- **Engineering focus:**

- Primarily used by the Institute of Electrical and Electronics Engineers, often in engineering fields including computer science/engineering.

Citation Style to Use for Computer Science

- **The Chicago citation style**
    - In the 17th edition, there were two distinct styles of referencing: notes and bibliography, and author-date. We'll be focussing on author-date here.

        Chassignol, Maud, Aleksandr Khoroshavin, Alexandra Klimova, and Anna Bilyatdinova. 2018. "Artificial Intelligence Trends in Education: A Narrative Overview." Procedia Computer Science 136: 16–24.

    - In-text citations

        Artificial intelligence will soon be an internal part of our digital lives (Chassignol et al. 2018).

"et al."

- "et al." is short for the Latin term "et alia," meaning "and others." It is used in academic citations when referring to a source with multiple authors:

<div style="text-align:center; color:#2a5d7c;">

Hulme et al. (2019) argue that

…

</div>

- **Punctuation**

       ✖ et al

       ✖ et. al

       ✖ et. al.

       ✔ et al.

"et al."

- "et al." may be directly followed by other punctuation where necessary, but the period always comes first:

<div align="center">(Smith et al., 2013)</div>

- When "et al." comes right at the end of a sentence, only one period is used:

<div align="center">This is a time-intensive process, as shown by Davies et al. [1]</div>

"et al." vs. "etc."

- "et al." should not be confused with "etc."; it is used for lists of people, whereas "etc." is used for lists of things and concepts:

McDonnell et al. (2012) discuss various identity considerations (gendered, racial, etc.) that may bias the results.

How to use "et al."

- **Using et al. in APA Style**
  - When a source has two authors, list both.
  - When there are three or more authors, cite the first author followed by "et al."

Number of authors	In-text citation
1–2 authors	(Anderson & Singh, 2018)
3+ authors	(McDonnell et al., 2019)

Quotation and Paraphrase

- **Quotation** reproduces a statement word-for-word as it appears in its original source

- **Paraphrase** explains a statement by using your own words and sentence structure

Quotations

- Direct quotations can be useful when the exact wording of a statement is important. The exact wording of a quotation may be significant to your claim.

- Direct quotation may be important when you want to make sure you are being precise in representing the author's position.

- Finally, you might choose to use a direct quotation when the original statement is particularly well written or structurally persuasive

Paraphrasing

- Paraphrasing is usually expected in research and argumentative essays.
  - These type of papers benefit from paraphrasing because it shows that you understand the source and are therefore a reliable voice on that source.
  - Paraphrasing can make the evidence more straightforward.
  - Another reason to paraphrase is to adjust your tone for your audience.

https://louisville.edu/writingcenter/for-students-1/common-writing-questions-1/what-is-the-difference-between-quotation-paraphrase-and-summary

Paraphrasing - Example

- Original quotation:
  - "In the case of Facebook, it has changed its format multiple times, and merged other literacy practices – email, instant messaging, games – into its structure in an attempt to keep users on the site" (Keller 2014, 74).

- Paraphrase:
  - Facebook has tried to hold on to its users by incorporating new functions like games and email (Keller 2014).

https://louisville.edu/writingcenter/for-students-1/common-writing-questions-1/what-is-the-difference-between-quotation-paraphrase-and-summary

Paragraph Structure

- Sentence
  - A sentence in English is the basic unit of grammar and thought. However, the paragraph is the basic unit to organize that thinking.
  - without paragraphs, there is only grammar, not really writing.
  - A sentence can be perfectly correct grammatically but may not be the right sentence for that Generally,.

- Paragraph
  - In research and professional writing, we don't communicate in sentences, but in paragraphs.
  - Generally, have one clear main idea per paragraph in the form of a topic sentence

Paragraphs and flow

- **Paragraph**
  - Topic sentence
  - Discussion of topic
  - Closing sentence

- **Thematic and grammatical links**
  - Logical progression from one paragraph to the next
  - Demonstrate links in your language

Components of a Paragraph (1/2)

- Transition sentence (Optional)
  - The paragraph may open with a transition from a previous paragraph.
  - Transition sentences or clauses may also occur between the controlling ideas that elaborate the topic sentence in the paragraph.

- Background information
  - Before the main point of the paragraph is given, there may be some background information on the topic that provides some context for the reader before the topic sentence is introduced.

- Topic sentence (recommended)
  - The topic sentence gives the main point of the paragraph that must be explained, defined, proven, or analyzed
  - It is almost always at the beginning of the paragraph.

Components of a Paragraph (2/2)

- Elaboration of the topic sentence (optional)
  - The topic sentence may be a very general statement. The elaboration sentence gives more specific details of the structure of the paragraph that follows.

- Supporting sentences (required)

  - This is the standard type of sentence that develops the topic sentence.
    - All of the sentences in the paragraph should support the topic sentence.
    - If a new topic is introduced, a transition or a new paragraph should also be introduced.

- Conclusion (optional)

  - A sentence that summarizes the key points of the paragraph

Exercise 1

- Create a sample Article in overleaf
- Create an account on overlead
- Login
- Create a new project
- Set project name
- Use the following steps to create a simple document

Writing first piece of Latex

- \documentclass{article}
- \begin{document}
- First document. This is a simple example, with no
- extra parameters or packages included.
- \end{document}

The preamble of a document

- Document content was entered after the \begin{document} command
- Everything appearing before that point is preamble (document setup)
- Within preamble you define document class (type) along with different specifics, loading packages you would like to use
- Example preamble
- \documentclass[12pt, letterpaper]{article}
- \usepackage{graphicx}

Including title, author and date information

- \title{My first LaTeX document}: the document title

- \author{Ramoza Ahsan}: here you write the name of the author(s) and, optionally, the \thanks command within the curly braces:

- \thanks{Funded by the Overleaf team.}: can be added after the name of the author, inside the braces of the author command. It will add a superscript and a footnote with the text inside the braces. Useful if you need to thank an institution in your article.

- \date{March 2025}: you can enter the date manually or use the command \today to typeset the current date every time the document is compiled

```latex
\documentclass[12pt, letterpaper]{article}
\title{My first LaTeX document}
\author{Ramoza Ahsan\thanks{FAST NU}}
\date{March 2025}
```

- To typeset the title, author and date use the \maketitle command within the body of the document

\begin{document}

\maketitle

We have now added a title, author and date to our first \LaTeX{} document!

\end{document}

Resulting preamble and body

\documentclass[12pt, letterpaper]{article}

\title{My first LaTeX document}

\author{Ramoza Ahsan\thanks{FAST NU}}

\date{August 2022}

\begin{document}

\maketitle

We have now added a title, author and date to our first \LaTeX{} document!

\end{document}

Basic document structure

- Abstracts

\begin{abstract}
This is a simple paragraph at the beginning of the document. A brief introduction about the main subject.
\end{abstract}

Paragraphs and new lines

- how a new paragraph is created by pressing the "enter" key twice, ending the current line and inserting a subsequent blank line;
- how to start a new line without starting a new paragraph by inserting a manual line break using the \\ command, which is a double backslash; alternatively, use the \newline command

- If writing a Book chapter

\chapter{First Chapter}

For the research papers

\section{Introduction}

\subsection{Motivating Example}

\bibliography{Name of file}

\bibliographystyle{IEEEtran} or \bibliographystyle{abbrv}

Thank you

Questions?