

## Literature Survey

- Objectives
  - Identify topic of interest.
  - Literature survey: challenge and expectation.
  - Search, screen, analysis and synthesis.
  - Writing literature review.
- Main reference
  - A.J. Pickard, Research methods in information, Focet Publishing, 2007.

## Identify Topic of Interest

- Topic of interest significantly narrows down the scope of your research and literature survey.
- Basis of choice
  - Based on your personal interest.
  - Based on research project with external funding.
  - Based on your advisor's research program.
- Within a given topic of interest, there are plenty of rooms for a wide range of research questions.
  - Aspects of focus.
  - Theoretical vs experimental.
  - Generic vs domain-specific.

## Example Topic: Uncertain Reasoning

- Aspects of focus
  - Single agent vs multiagent paradigm.
  - Probabilistic vs decision-theoretic reasoning.
  - Bayesian nets, Markov nets, decision nets, etc.
  - Static vs dynamic environment.
  - Exact vs approximate reasoning.
  - Elicitation vs machine learning.

## Example Topic: Uncertain Reasoning (cont)

- Theoretical vs experimental
  - Design and analyze a new algorithm.
  - Classify problems into complexity classes.
  - Implement and evaluate a new algorithm.
- Generic vs domain-specific
  - Algorithm and software for a class of problems.
  - Algorithm and software for a specific application.

## Why Literature Survey?

- To advance the state of art, you must know it.
- Reinventing the wheel is to be avoided.
- Your research question must be formulated and refined in context.
- Literature can also assist you in selecting research methods.

## Expectations over Literature Review

- General expectation in higher degree research
  - No significant work is omitted.
  - Any such omission might jeopardize a submission's chance of success.
- MSc and PhD theses are expected to cover all of the major work in the field.
  - The Venn diagram analogy.
- Conference & journal articles should provide context to the research by presenting the current situation.
  - More extensive and elaborate for journals.

## Challenge of Literature Survey

- There exists an enormous amount of publications.
  - Books, journals, proceedings, and websites.
  - Online or in-library.
  - Relevance to your intended research differs.
  - Significance to your research field differs.
  - Reliability of the information differs.
- Each publication can lead to a tree of publications with large branching factors.
- Often multi-disciplinary.
  - Sometimes it has not yet been attempted.

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## The Literature Survey Process

1. Information search and retrieval
2. Source evaluation and screening
3. Critical analysis
4. Research synthesis

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## Information Search and Retrieval

- A paradox
  - Need survey to frame a worthwhile research question.
  - Need a question to investigate the literature.
- Iterative process
  - Start with a tentative question.
  - Generate keywords, phrases, etc. to drive the survey.
  - Adjust the research question as the survey progresses.

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## Information Search and Retrieval (cont)

- Identify all possible ways to describe the topic groups.
  - Synonyms and alternative phrases.
  - Terms in a concept hierarchy.
  - Use thesaurus, encyclopedias, Wikipedia, etc.
- Keep a search log.
  - Record key information and full reference.
  - Facilitate retrieval and referring.

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## Source Evaluation and Screening

- Before serious reading, the quality of the source needs to be identified.
- Authority
  - Authors' previous research, statures, affiliations, reputation among peers.
  - Publisher's reputation.
  - Journal/conference's reputation, peer review policy, acceptance rate, PCs, Editorial board, etc.
  - Citations.

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## Source Evaluation and Screening (cont)

- Scope
  - Has the source clearly set out its scope, objectives, methods, and results?
- Purpose
  - The purpose why a work was produced may give an indication of its reliability.
  - Ex Publisher's book review vs independent book review.

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## Critical Analysis

- A good work establishes an academic argument.
- Your research must be supported by relevant arguments.
- Reading should be active: identifying the arguments and analyze their validity.
- Any argument should consists of a claim, a reason, and evidence.
- Draw your own conclusion and formulate your own argument.

## Components of Argument

- Claim (conclusion): The essence of an argument.
  - Where: title, abstract, introduction, and closing.
- Reason: Justification of the claim.
  - Relevant and effective?
  - Ex Irrelevant: Author believed it with passion.
  - Ex Effectiveness: Theorem vs test outcomes.
- Evidence: Support of the reason.
  - Observation data, experimental setup, proof, etc.
  - Credible and verifiable?



## Research Synthesis

- Grow your theoretical framework by piecing arguments together.
  - Ex Logic and AI.
- Help refine the initial question into a well-defined research question.
- Select your research methods by extracting ideas.
- Writing a literature review.

## Writing Literature Review

- Common mistake:
  - List everything you have read with each entry made of a reference and a brief description.
- Objectives
  - Demonstrate familiarity with your field of research.
  - Justify your research question and method.
    - Allow comparison with other research.
  - Be a critical discussion of relevant work.

## Guidelines in Writing Literature Review

- Often placed in a separate section or chapter.
- Identify major theories and most prominent researchers in the world.
- Cover historical development of major advances.
- Describe main problems or issues that remain.
- Express your own critical judgment.
- Paint a coherent picture from the perspective of your research by organizing the sources logically.

## Take the Course

- A graduate course may be offered on a major technical subject in the thesis research.
- It is advantageous to take the course rather than studying the subject on your own.
  - Time factor.
  - Breadth factor.
  - Depth factor.