Part II: Asking Questions, Finding Answers

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Reference:

- Wayne Booth, George Colomb, Joseph Williams, Joseph Bizup, and William FitzGerald, **The Craft of Research**, 4th Edition, The University of Chicago Press, 2016.

Outline

3. From Topics to Questions

4. From Questions to a Problem

5. From Problems to Sources

6. Engaging Sources

Outline

3. From Topics to Questions

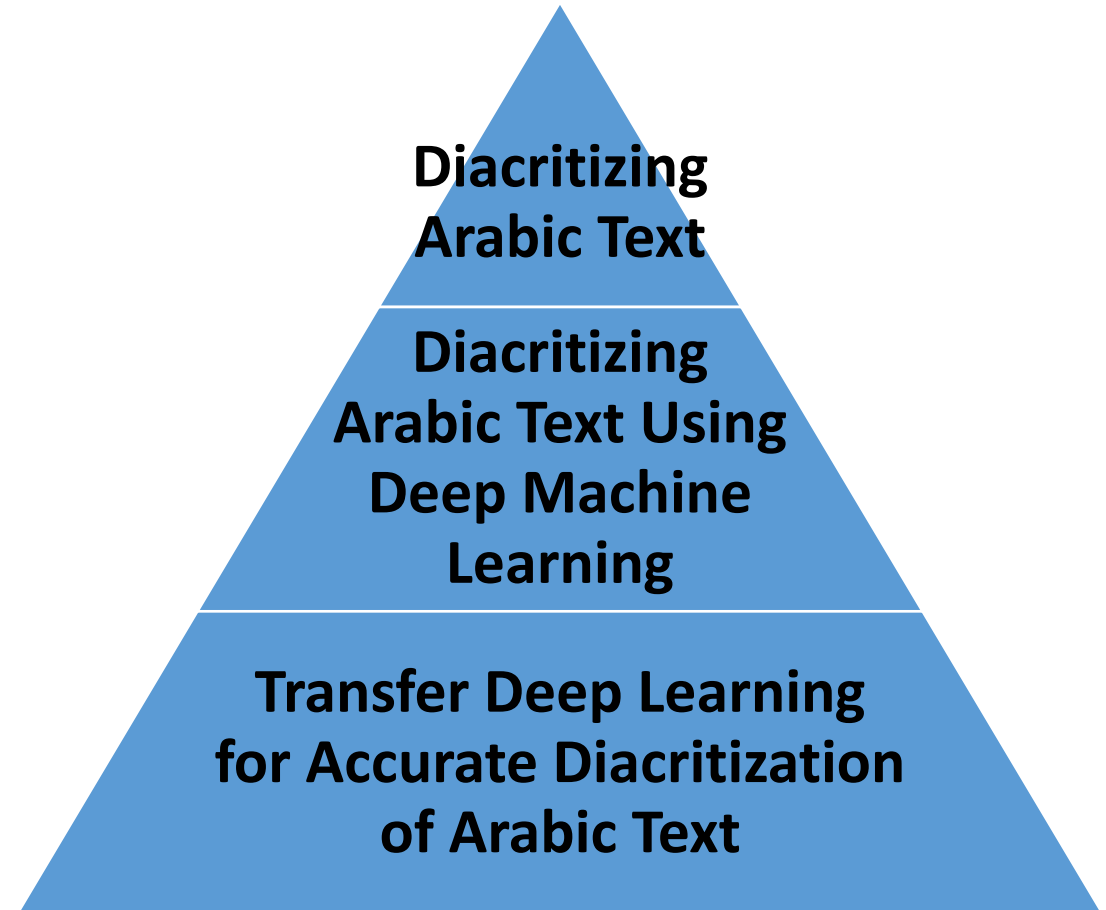The process of choosing what to research:

1. **Interests**: Choose an interest in a broad subject area
2. **Topics**: Narrow the interest to a plausible topic
3. **Questions**: Question that topic from several points of view
4. **Problems**: Define a rationale for your project

3.1 From an Interest to a Topic

- A **research topic** is an interest stated specifically enough for you to imagine becoming a local expert on it.
- Finding a topic for a first research project in a particular field:
  - Start by listing topics relevant to your particular class and that interest you, then narrow them to one or two promising ones.
  - If the topic is general, read and search using Google Scholar to find out how other researchers narrowed their topics.
- Finding a topic for an advanced project:
  - Topics find you as you become immersed in a field.
  - Find what interests other researchers in journals, conferences and CFPs.

3.2 From a Broad Topic to a Focused One

- A topic is probably too broad if you can state it in four or five words.

- If it is too broad, you need a lot of reading.

- So, narrow it down.

Diacritizing Arabic Text

Diacritizing Arabic Text Using Deep Machine Learning

Transfer Deep Learning for Accurate Diacritization of Arabic Text

3.3 From a Focused Topic to Questions

- Do not document information for its own sake, but to support the answer to a question that you think is worth asking.

- Formulate questions that direct you to just that information you need to answer them.

- Finally, evaluate your questions and focus on most interesting ones.

- What are the basic solutions …?

- What are the state-of-the-art solutions …?

- How to combine Solutions A and B?

- What is suggested future work?

- What if …?

3.4 The Most Significant Question: So What?

- *So what?* Beyond your own interest in its answer, why would others think it a question worth asking?

- What will be lost if you *don't* answer your question? What do we lose?

- Steps to find answer to so what:
    1. Name Your Topic
    2. Add an Indirect Question
    3. Answer So What? by Motivating Your Question

Example 1
1. I am studying the causes of the disappearance of large North American mammals
2. because I want to find out whether the earliest peoples hunted them to extinction,
3. in order to help my reader understand whether native peoples lived in harmony with nature or helped destroy it.

Example 2
1. I am studying applying deep learning and transfer learning to Arabic poetry
2. because I want to find how to automatically diacritize poetry accurately,
3. in order to help my reader enjoy readying and chanting poems.

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Outline

4.1 Understanding Research Problems

4.2 Understanding the Common Structure of Problems

4.3 Finding a Good Research Problem

Research Proposals

4.1 Understanding Research Problems

- Practical problems lead to research problems, and the answers are intended to help solve the practical problems.
- **Practical problems**
  - Originate in the world
  - Are based on some cost to society
  - Are solved by taking action in the real world
- **Conceptual problems**
  - Originate in your mind
  - Are based on incomplete knowledge or flawed understanding
  - Are solved by gathering useful information

4.2 Understanding the Common Structure of Problems

- Common Structure
  1. a situation or *condition*
  2. undesirable *consequences* caused by that condition, costs that don't want to pay

Structure of Practical Problems

Part	Practical Problems	Example
A situation or condition	Condition in the real world	The ozone layer is thinning.
Undesirable consequences caused by that condition	Tangible cost you don't want to pay	Many will die from skin cancer.

Structure of Conceptual Problems

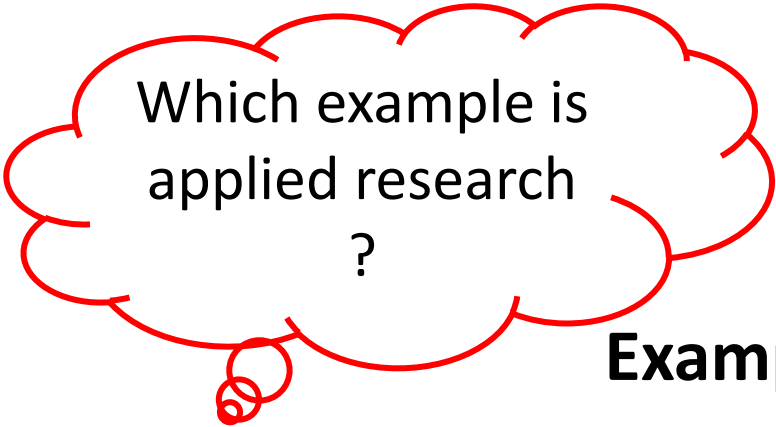| Part	Conceptual Problems	Example
A situation or condition	Not knowing or not understanding something. The second part of the three-step sentence	I don't know whether the earliest peoples hunted them to extinction.
Undesirable consequences caused by that condition	Ignorance, lack of understanding. The third part of the three-step sentence	Not understanding whether native peoples lived in harmony with nature or helped destroy it.

Distinguishing Pure and Applied Research

- **Applied Research**
  - The rationale for the research defines what you wish to DO
  - The consequences of the research are tangible
  - The research is *applied* because knowledge gained will be applied to solve an immediate practical problem
- **Pure Research**
  - The rationale for the research defines what you wish to KNOW
  - The consequences of the research are conceptual
  - The research is *pure* because knowledge is pursued for its own sake

Examples

Which example is applied research?

Example A

1. **Topic**: I am studying how readings from the Hubble telescope differ from readings for the same stars measured by earthbound telescopes

2. **Question**: because I want to find out how much the atmosphere distorts measurements of electromagnetic radiation,

3. **Significance**: so that astronomers can *use* data from earthbound telescopes to measure more accurately the density of electromagnetic radiation.

Example B

1. **Topic**: I am studying the electromagnetic radiation in a section of the universe

2. **Question**: because I want to find out how many galaxies are in the sky,

3. **Significance**: in order to help readers *understand* whether the universe will expand forever or eventually collapse into a point.

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Examples

Applied Research

1. **Topic**: I am studying how readings from the Hubble telescope differ from readings for the same stars measured by earthbound telescopes

2. **Question**: because I want to find out how much the atmosphere distorts measurements of electromagnetic radiation,

3. **Significance**: so that astronomers can *use* data from earthbound telescopes to measure more accurately the density of electromagnetic radiation.

Pure Research

1. **Topic**: I am studying the electromagnetic radiation in a section of the universe

2. **Question**: because I want to find out how many galaxies are in the sky,

3. **Significance**: in order to help readers *understand* whether the universe will expand forever or eventually collapse into a point.

4.3 Finding a Good Research Problem

- Ask for help
  - Teachers want you to use their suggestions to start your thinking, not end it.
- Look for problems as you read
  - Where do you see contradictions, inconsistencies, incomplete explanations?
  - What suggested future work?
- Look at your own conclusion
  - Have you answered a question that you have not yet asked, and thereby solved a problem that you have not yet posed.

Research Proposals

- A research proposal is a document proposing a research project, generally constitutes a request for approval or sponsorship of that research.
  - Research question(s) and how they will be addressed
  - Time and expense required for the research
  - Prior research done on the topic
  - How the results of the research will be evaluated
  - Research benefits
- مشروع خطة رسالة جامعية لطلبة الماجستير (إصدار قسم هندسة الحاسوب)

Outline

5.1 Three Kinds of Sources and Their Uses

1. **Primary**: Materials that are directly writing about *data*

2. **Secondary**: Books and articles in which others report their research (*literature*)

3. **Tertiary**: Books and articles that describe or synthesize the research of others (*textbooks*, *survey papers*)

Cite carefully

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5.2 Navigating the Twenty-First-Century Library

- Libraries are dead? Long live virtual libraries!
- Ask a librarian, or read directions
- For new researchers, start by consult reference works
  - Wikipedia and encyclopedias
  - Books, survey papers and literature reviews
- Explore online databases
  - Need access to specialized libraries and databases
  - Can get abstracts or full articles (fees may be needed)

Finding Specific Sources

- **Search** your library catalog using keywords. Narrow your search using more keywords, date of publication, language, subject, resource type.
- **Browse** your library catalog using library subject headings (such as Library of Congress Subject headings for books) or call numbers.
- **Prowl** the stacks
- **Follow** bibliographic trails (forward citation)
- **Use citation indexing** (backward citation). *The more a given source is later cited, the greater its reputation and its impact factor.*

The University of Jordan Library (library.ju.edu.jo)

- **Horizon Search**: Jordanian Public Universities Network
- **Thesis Search**
- **Electronic Library** (elibrary.ju.edu.jo)
  - Request buying an article
  - EBSCO eBooks
  - ACM Digital Library
  - IEEE Xplore Digital Library
  - Springer Link
  - Science Direct
  - Scopus   (Article and Journal Index)
  - Web of Science   (Article and Journal Index)

5.3 Locating Sources on the Internet

- Google.com
- Be careful the Internet is unmonitored, sometimes unreliable and has ads.
- Useful for:
  - To get our bearings with respect to a new topic
  - To explore potential keywords to use in a more systematic search
  - To remind ourselves of dates or facts
  - To locate the authors of sources whom we might wish to contact
- Google Scholar
- Wikipedia
- Respecting authors' rights, e.g., cite the book, not the online version.

5.4 Evaluating Sources for Relevance and Reliability

- You'll often find more than you can use, so evaluate their usefulness.
- **Evaluate sources for relevance**: read abstracts, introductions an summaries.
- **Evaluate Sources for Reliability**
  - Is the source published by a reputable organization?
  - Was the book or article peer-reviewed?
  - Is the author a reputable scholar?
  - Is the source current?
  - Does the source have notes and a bibliography?
  - Has the source been well reviewed and cited?
  - In all cases, *read critically*.

Outline

6.1 Recording Complete Bibliographical Information

- **Record** the bibliographic information for your sources.
- The **details** are in the book and can be summarized by:
  - Authors
  - Dates
  - Titles
  - Publication details

6.2 Engaging Sources Actively

- **First**, read your secondary sources to appreciate and understand them.
- **Then**, read them critically and record your notes.
- **Be careful** of and check what you conclude about its arguments.

6.3 Reading for a Problem

- **Use your research problem** to guide your search for evidence, models, and arguments to respond to.
- **If you believe what a source claim**, try to extend it by:
  - Offer additional support
  - Confirm unsupported claims
  - Apply a claim more widely

Look for Creative Disagreement

1. Contradictions of kind, e.g., *Smith says that graffiti is merely vandalism, but it is better understood as a form of public art.*
2. Part-whole contradictions, e.g., *Source claims that _____ is a part of _____, but it's not.*
3. Developmental or historical contradictions, e.g., *Smith argues that the world population will rise, but it won't.*
4. External cause-effect contradictions, e.g., *Smith claims that legalizing marijuana will increase its use among teenagers, but evidence shows that it doesn't.*
5. Contradictions of perspective, e.g., *Smith assumes that advertising has only an economic function, but it also serves as a laboratory for new art forms.*

6.4 Reading for Arguments

- **Arguments have developments** and **verdicts**, e.g., *The internet is a source of endless information. It is a hub of entertainment. It is a good invention.*
- An argument responds to the readers' predictable questions and disagreements.
- **Read for arguments to respond to**. Acknowledge what opposes yours and respond to what contradicts yours.
- **Read for models of reasoning and analysis**. To adopt, but not copy.

6.5 Reading for Data and Support

- **Read for data to use as evidence**, e.g., statistics, measurements.

- **Read for claims to use as support**. To use such claims as evidence, you have to report not only the conclusion of the source but its reasoning and supporting evidence as well.

6.6 Taking Notes

- Once you find **something that you may use** in a source, **take notes**.
- Check the **reference book** for note taking ideas.
- Some **good ideas**:
  - Google Docs as a journal with text, links, tables and images.
  - **OneNote**
  - **Highlighting**
  - **Reference management system**
- Decide whether to **quote**, **paraphrase**, or **summarize**.

6.7 Annotating Your Sources

- **Marginal Annotations**: Annotate paper, pdf document, or image.

- **Annotated Bibliography**: A list of possible sources featuring both a citation and a brief descriptive summary of each source.

Summary

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