

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



Research 101



How to Read a Research Paper

Tamer Elsayed

College of Engineering
Computer Science and Engineering Dept.

Oct 13th, 2014



A Typical Researcher ...

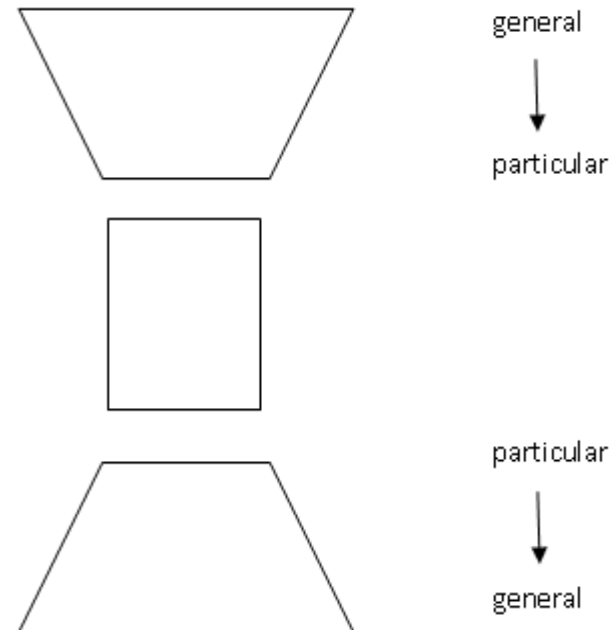
- Will likely spend **hundreds of hours every year** reading papers 😊
- A “**good**” graduate student or researcher should read (in average) **a paper a day**



Structure of a Research Paper

- Title & author list
- Abstract
- Introduction-Motivations
- State of the art (related work)
- Proposed Method
- Experiments & Evaluation
- Discussion
- Conclusion and future work

These can vary in content/order depending on the journal /conference/type of work



Let's have a look!

Why reading research papers?

Why?

- You were asked to 😊
- For a literature survey of a new field/problem
- Be up-to-date on current research in the field
- Allows you to replicate/extend the results
- Provides you with useful data
- Gives you “pre-digested” thoughts
- To decide whether (and where) to publish
- Teaches you how to write
- Review for a conference or a class
-

Roadmap

- ✓ *Why reading research papers?*
- **Types of research publications**
- **Finding Research Publications**
- **Three-pass approach for reading a paper**
- **How can I remember the papers I have read?**

Types of Research Publications

From venue, content, and peer-review perspectives ...

Venue?

Conference Papers

Most recent, “hot off the presses”, information

Technical Reports

Expands on the information in a conference paper.

Journal Papers (or Articles)

Expand and combine results from several conference papers

Others

Book chapters, MSc theses, PhD dissertations, posters, workshop papers

Content?

Theoretical

- Describe/prove a **theory**
- Describe new **algorithms**

Engineering

- Describe an **implementation** of an algorithm, or part or all of a computer **system** or **application**

Empirical

- Describe an **experiment** designed to test some hypothesis

Survey

- **Review** current results in a field of research

Peer-Review?

- Conference papers and journal papers are “peer-reviewed”
 - “Double-blind” review
- Technical reports are typically not peer-reviewed
 - but are still excellent sources of detailed information .

Finding Research Publications

Google Scholar

<http://scholar.google.com/>



☒ Articles ☒ include patents ☐ Case law

My updates: recommended based on My Citations [Learn more](#)

Big Data Storage

M Chen, S Mao, Y Zhang, VCM Leung - Big Data, 2014

Asylter: tolerating computational skew of synchronous iterative applications via computing decomposition

Y Zhang, X Liao, H Jin, BB Zhou - Knowledge and Information Systems, 2014

[See all updates](#)

Stand on the shoulders of giants



Scholar

About 4,230,000 results (0.03 sec)

Articles

[\[book\] Software architecture: perspectives on an emerging discipline](#)

[M Shaw, D Garlan](#) - 1996 - [acme.able.cs.cmu.edu](#)

Case law

Abstract This book examine architectures for software systems as well as better ways to support software development. We attempt to bring together the useful abstractions of systems design and the notations and tools of the software developer, and look at patterns ...

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Any time

[Cognitive Radio---An Integrated Agent Architecture for Software Defined Radio](#)

[J Mitola](#) - 2000 - [citeulike.org](#)

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Abstract This dissertation addresses the intersection of personal wireless technology and computational intelligence. The primary research issue addressed is the organization of radio domain knowledge into data structures processable in real-time that integrate ...

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[\[book\] The architecture of cognition](#)

[JR Anderson](#) - 2013 - [books.google.com](#)

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Now available in paper, The **Architecture** of Cognition is a classic work that remains relevant to theory and research in cognitive science. The new version of Anderson's theory of cognitive **architecture**--Adaptive Control of Thought (ACT*)--is a theory of the basic ...

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[\[book\] Computer architecture: a quantitative approach](#)

[JL Hennessy, DA Patterson](#) - 2012 - [books.google.com](#)

The computing world today is in the middle of a revolution: mobile clients and cloud computing have emerged as the dominant paradigms driving programming and hardware innovation today. The Fifth Edition of Computer **Architecture** focuses on this dramatic shift, ...

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[\[HTML\] An architecture for differentiated services](#)

[S Blake, D Black, M Carlson, E Davies, Z Wang...](#) - 1998 - [hjp.at](#)

Rfc, 2475. Title, An **Architecture** for Differentiated Services. Author, S. Blake, D. Black, M. Carlson, E. Davies, Z. Wang, W. Weiss. ... All Rights Reserved. Abstract This document defines an **architecture** for implementing scalable service differentiation in the Internet. ...

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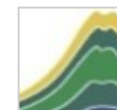
Top authors in engineering

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Visualization

Visualize [publication trends](#) in engineering
with this interactive stacked area chart.



All Fields of Study

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Jan Swevers
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Paris Dauphine University



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University of Manchester

- 4 Fields of Study
- ☐ Search in all fields of study
 - ☒ Limit my searches in the following fields of study
 - ☐ Agriculture Science
 - ☐ Biology
 - ☒ Computer Science
 - ☒ Engineering
 - ☐ Geosciences
 - ☒ Mathematics
 - ☒ Physics
 - ☐ Multidisciplinary
 - ☐ Arts & Humanities
 - ☐ Chemistry
 - ☐ Economics & Business
 - ☐ Environmental Sciences
 - ☐ Material Science
 - ☐ Medicine
 - ☐ Social Science



Advanced Search

Organizations


Engineering

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<http://library.qu.edu.qa/>

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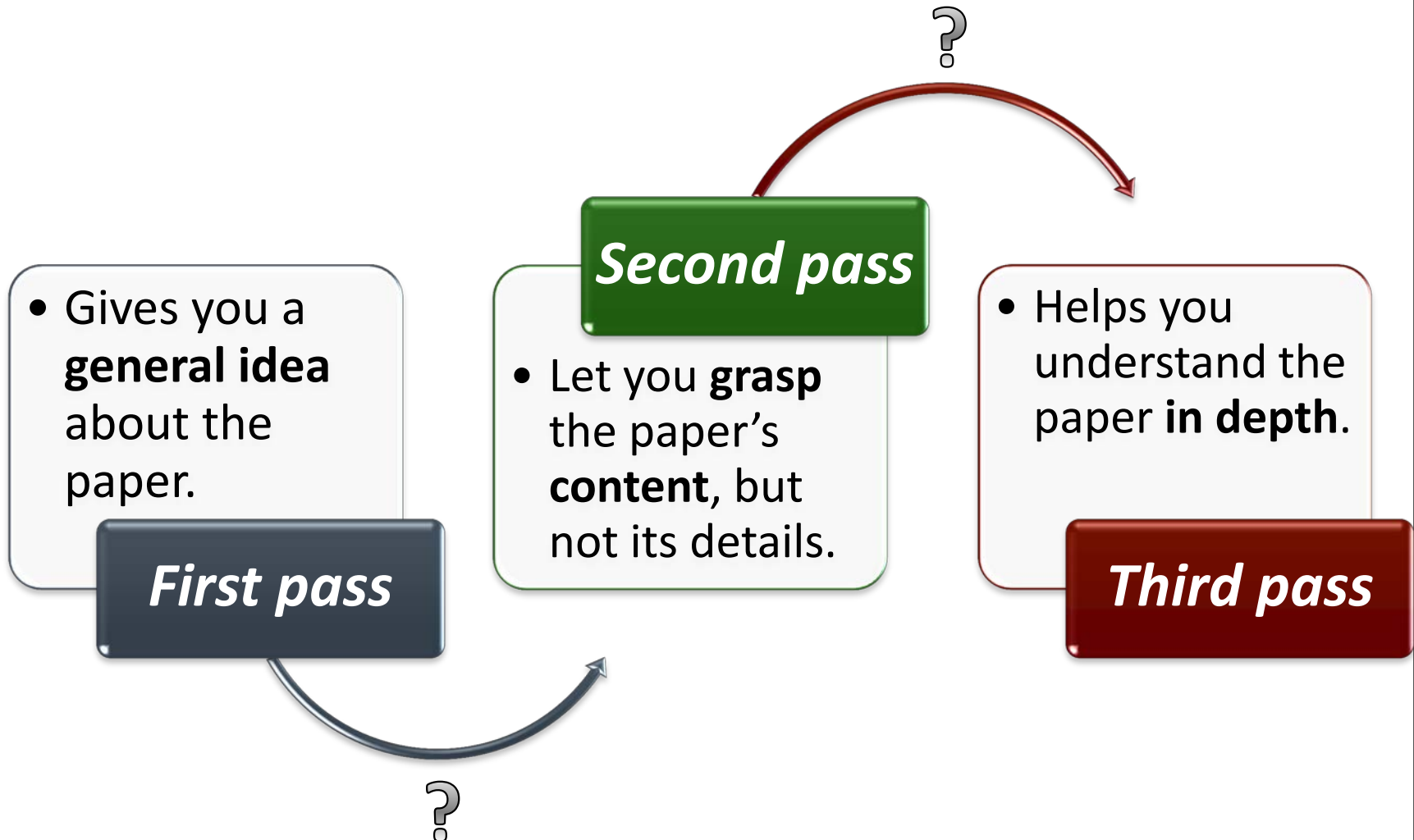
A tool to help researchers, faculty and students with research projects. The platform links over 100,000 pages of SAGE book, journal and reference content with advanced search and discovery tools. Researchers can explore method concepts to help design research projects and write research. Since this platform focuses on methodology rather than disciplines, it can be used by researchers from the social sciences.



A Three-pass approach for reading a research paper

Each pass accomplishes specific goals and builds upon the previous pass ...

Three-Pass Approach



The First Pass



- A **quick scan** to get a bird's-eye view of the paper.
- *Decide whether you need to do any more passes.*

1. Carefully read the **title, abstract, and introduction**
2. Read the **section and sub-section headings**, but ignore everything else
3. Read the **conclusion**
4. Glance over the **references**, mentally ticking off the ones you've already read

Let's try it now!

1

At the End of this Pass ...

You should be able to answer the *five Cs*:

1. **Category**: type of paper?
2. **Context**: problem?
3. **Correctness**: valid assumptions?
4. **Contributions**: main contributions?
5. **Clarity**: well written?

More passes?



The Second Pass



- Read with greater care, but ignore details such as proofs.
- **Identify main idea** and key points
- **Make comments** in the margins.
- Look carefully at the **figures, diagrams**.
- Remember to **mark relevant unread references** for further reading
 - this is a good way to learn more about the background of the paper.

Let's try it now!

1

2

After this Pass ...

- Sometimes, you won't understand it even at the end of the second pass 😊
 - **subject is new** to you, with unfamiliar terminology.
 - **proof** or so that you don't understand.
 - **poorly written**
 - it's just **late at night** and you're **tired**!
- You can now choose to:
 - a) **set the paper aside**, hoping you don't need it to succeed
 - b) **return to the paper later**, perhaps after reading background material or
 - c) persevere and **go on** to the third pass.

The Third Pass

4-5
hours

1
hour

- To **fully understand** the paper (e.g., reviewing)
- Requires **great attention to detail**.
- Attempt to **virtually re-implement** the paper
- **Identify and challenge every assumption**
- Write down **ideas for future work**.

1

2

3

At the End of this Pass ...

- Should be **able to reconstruct** the entire structure of the paper from memory.
- Should be able to identify its **strong and weak points**.
- Should be able to pinpoint **implicit assumptions**, **missing citations** to relevant work, and **potential issues** with experimental or analytical techniques.

How Can I Remember the Papers I Have Read?



Remembering Read-Papers

- Make an electronic file for your own bibliography.
 - A BibTeX file is a good idea.

[12] A. Oeldorf-Hirsch, B. Hecht, M. R. Morris, J. Teevan, and D. Gergle. To search or to ask: The routing of information needs between traditional search engines and social networks. CSCW'14, 2014.

- Add a 2-3 sentence description to summarize: **problem**, **solution proposed**, **results learned**, and **main contributions**.

Or you can use ...

zotero

<http://www.zotero.org/>

- It's free!
- Easily add references (by one click!) to your library
- Actually, it can store everything!
- Automatically extract metadata (e.g., title, authors, abstract, venue, etc.)
- You can add notes
- You can share your library with collaborators
- You can sync between your online and desktop app.

Let's try it now!

Other Resources

- **Reading** scientific papers (at Purdue)

<http://www.lib.purdue.edu/phys/inst/scipaper.html>

- **BibTeX**

<http://www.bibtex.org/>

- **Mendeley**

<http://www.mendeley.com/>

- **Comparison** of reference manager software tools available

http://en.wikipedia.org/wiki/Comparison_of_reference_management_software

References

- ◉ S. Keshav, *How to Read a Paper*, ACM SIGCOMM Computer Communication Review, 2007
- ◉ Philip W. L. Fong, *Reading a Computer Science Research Paper*, SIGCSE 2009
- ◉ Amanda Stent, *How to Read a Computer Science Research Paper*, Technical Report.
- ◉ Mihai Pop, *How to Read a Scientific Paper*, a Presentation at University of Maryland, College Park.

What's next?

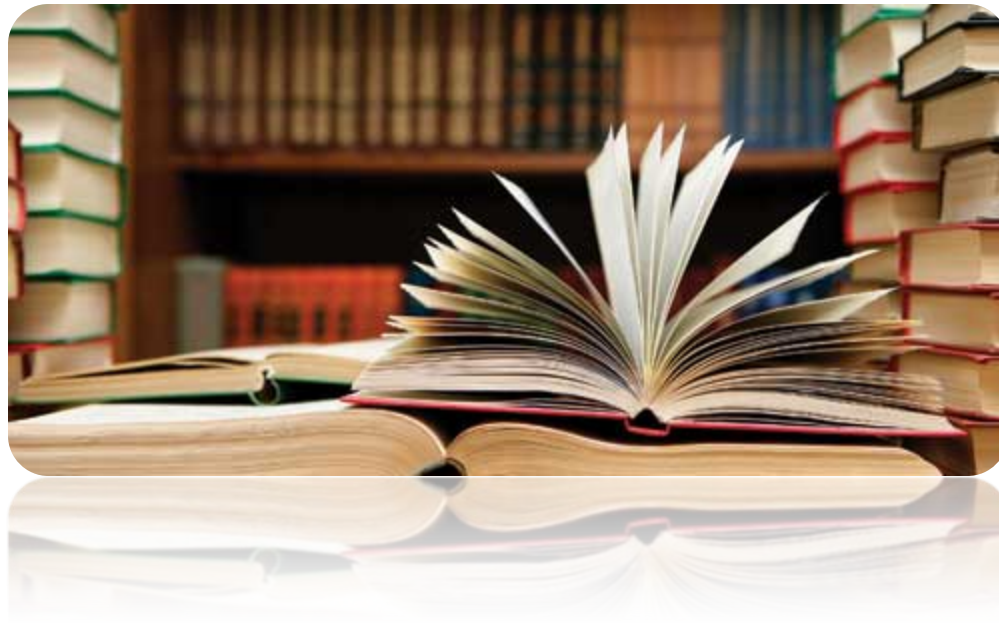
How to Pick a Good Research Topic

Tomorrow: 3:45pm-4:45pm

Engineering Bldg., I-110 (Corridor 9)



Research 101



Your feedback is appreciated!