Reading Technical Papers

Reading:

> M. Hanson, "Efficient Reading of Papers in Science and Technology"

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Aside - How to Read a Technical Paper

▶ **Why isn't everything you need to know your book?**
  ▶ **Too much information!**
  ▶ **Technical practice changes quickly**
▶ **Other sources of technical information**
  ▶ **Random stuff you find on the internet (caveat emptor!)**
  ▶ **Advanced textbooks**
  ▶ **Technical notes from semiconductor vendors**
  ▶ **Reverse Engineering**
  ▶ **Patents (more about this later)**
  ▶ **Technical papers from the research literature**

Why Read Technical Papers?

▶ **Research literature reports recent results**
▶ **Research literature reports "in-depth" details**
▶ **Some research papers become "classics"**
▶ **Reading papers is a key activity in advanced design**
  ▶ **Learn how a system is designed**
  ▶ **Learn how other systems have been evaluated**
▶ **Reading papers is a key activity in research**
  ▶ **Learn about a research topic**
  ▶ **Learn about and evaluate the work of others**
  ▶ **Differentiate your research from prior research**

Types of Research Literature

▶ **Archival Journals**
  ▶ **Intended to record important contributions to the field**
  ▶ **Manuscripts peer-reviewed to ensure quality**
  ▶ **Publication time: 1-2 years common**
  ▶ **Examples:**
    • *IEEE Transactions on Computers*
    • *IEEE Transactions on VLSI Systems*
    • *Proceedings of the IEEE* - survey papers
    • *ACM Computing Surveys* - survey papers

Types of Research Literature

- ▸ **Conference Proceedings**
  - ▸ **Meant to describe recent research results**
  - ▸ **Manuscripts peer-reviewed by a program committee**
    - • **Some conferences review full papers**
    - • **Some conferences review abstracts**
  - ▸ **Paper orally presented at conference & appears in proceedings**
  - ▸ **Publication time: 6-9 months from submission**
  - ▸ **Vary in terms of acceptance rate* and quality**
  - ▸ **Examples:**
    - • *Proceedings of the Design Automation Conference*
    - • *Proceedings of the International Symposium on FPGAs*

*available for some conferences in IEEE Explore

Types of Research Literature

- ▸ **Magazines**
  - ▸ **Provide surveys of new & emerging technology**
  - ▸ **Acceptance process sometimes less selective than a journal**
  - ▸ **Sometimes written by magazine staff instead of researchers**
  - ▸ **Examples:**
    - • *IEEE Spectrum*
    - • *IEEE Computer*

The Importance of Skepticism

- ▸ **Not everything published is significant**
  - ▸ **The pressure to publish in academia - "publish or perish"**
  - ▸ **Some journals and conferences cater to this need**
  - ▸ **Result: many papers are irrelevant**
- ▸ **Not everything published is correct or true**
  - ▸ **Peer review doesn't always work**
  - ▸ **Some publications have little or no real peer review**
  - ▸ **Even when correct, authors may "spin" their results**
- ▸ **Papers must be read with a critical eye**
  - ▸ **Consider the source**
  - ▸ **Use your own judgment to evaluate credibility, relevance**

Goals of Reading a Paper

- ▸ **Decide whether a it contains information you need**
- ▸ **Decide whether it is credible**
  - ▸ **Peer review doesn't guarantee truth or correctness**
  - ▸ **Need to look past the "advertising" part of the paper**
- ▸ **Read the paper for information that will help you**
  - ▸ **What problem did they solve?**
  - ▸ **How is it useful to you?**
  - ▸ **What can you learn from their results?**

Structure of Technical Papers

- **Abstract - overall summary**
- **Introduction / Background**
- **Methods employed (often multiple sections)**
- **Results**
- **Discussion / Conclusions**
- **Bibliography**

Reading a Technical Paper - See Hanson's Brochure

- **Start with the title and abstract**
- **Read for breadth**
  - **What did they do?**
  - **Skim introductions, headings, graphics, definitions, conclusions, bibliography**
  - **Consider the credibility**
  - **Decide whether to read in depth**
- **Read in depth**
  - **How did they do it?**
  - **Consider the work critically - arguments, assumptions, methods, statistics**
  - **Consider how work is useful to you**
- **Take notes**

Case Study: the "Ethernet Paper"

- **R. Metcalfe & D. Boggs "Ethenet: Distributed Packet Switching for Local Computer Networks, *Communications of the ACM*, July 1976**
- **Describes the design of the original ethernet**
  - **Based on earlier work on radio-based packet switching networks (i.e. AlohaNet)**
  - **Physical network based on cable TV technology (coax) to get economy of scale**
  - **Original data rate: 3Mbps later upgraded to 10Mbps**
  - **10Mbps Ethernet the basis for IEEE Standard 802.3**

Why Read the Metcalfe & Boggs paper?

- **To learn about Ethernet**
- **To gain experience reading technical papers**
- **To examine a networking breakthrough in its original context**
- **Assignment - using Hanson's brochure:**
  - **Read the title and abstract**
  - **Read for breadth**
  - **Read for depth - focus on key concepts of Ethernet**

Dark Side Case Study: SCIgen

▶ **SCIGen: a "paper generator"**
  - ▶ **Constructs bogus papers by assembling randomly selected "buzzwords" using a context-free grammer**
  - ▶ **Developed by some grad students at MIT**

▶ **As a prank, students submitted a paper"**
  - ▶ **"Rooter: A Methodology for the Typical Unification of Access Points and Redundancy"**
  - ▶ **accepted as a "non-reviewed" paper at the *9th World Multiconference on Systemics, Cybernetics and Informatics* (WMSCI 2005)**

▶ **Students go public; great hilarity results for all except WMSCI conference organizers**

For more info, see: http://pdos.csail.mit.edu/scigen/