COE589: Digital Forensics

Reading Research Papers

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Outline

- Types of Research Papers

- Structure of Research Papers

- Quality of Papers

- Reading Process

- Efficient Reading
  - Keshav's Approach

- Reading Exercise

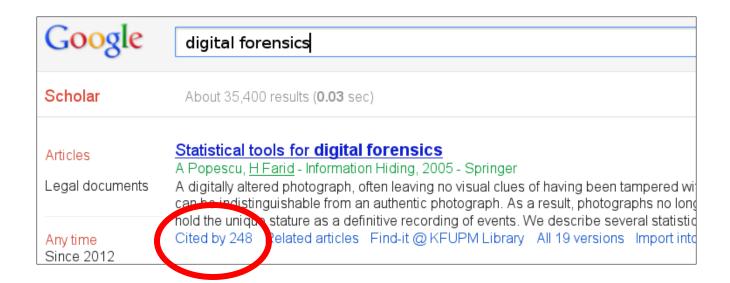# Types of Research Papers *(Schulzrinne)*

- Two main categories:
  - survey paper
  - original research paper
    - related work section is a brief/narrow survey
- Original Research Papers: reports novel technical results
  - Algorithm
  - System construct: such as hardware design, software system, protocol, etc.;
  - Performance evaluation: obtained through analyses, simulation or measurements;
  - Theory

Paper Structure *(Schulzrinne)*

- Abstract (100-150 words)
- Introduction
  - introduce problem, outline solution; why the problem is important (motivations)
- Related Work
  - Include most relevant work from literature
  - How your work relates or differs
- Body of paper: meat of the paper
  - problem
  - approach, architecture
  - evaluation: results and discussions
- Bibliography
- Appendices (if needed)

Quality of Papers

- Papers/Journals are judged by citation counts
  - How many times a paper has been cited
  - the more citations the better
- Google Scholar shows citation counts

Reading Process *(Fong 2009)*

Comprehension
- understand what a paper says

Evaluation
- critic of scientific claims

Synthesis
- generating novel research

Reading Process *(Fong 2009)*

1 **Comprehension:** understand what a paper says

- don't focus solely on the technicalities
- Ask yourself
  - What is the research problem the paper attempts to address?
  - What are the claimed contributions of the paper (understanding, method, algorithm, ..)?
  - How do the authors substantiate their claims (methods, argument, simulations, ..)?
  - What are the conclusions?

Reading Process *(Fong 2009)*

2 **Evaluation:** be critical of scientific claims

- – Ambitious claims are easy to make but difficult to substantiate
- Ask yourself
  - – Is the research problem significant?
  - – Are the contributions significant? real surprises?
  - – Are the claims valid? correct evaluation?
- caveats:
  - – Be fair: Consistently, evaluating papers negatively gives a false sense of being critical
  - – Requires a comprehensive understanding of the research field as a whole

Reading Process *(Fong 2009)*

3 **Synthesis:** generating novel research
- reading research papers is one of the most effective ways for generating novel research
- Ask yourself:
  - What is the crux of the research problem?
  - What are some alternative approaches to address it?
  - Is there an alternative way to substantiate the claim of the authors?
  - What is a good argument against the case made by the authors?
  - Can the research results be strengthened?
  - Can the research results be applied to another context?
  - What are the open problems raised by this work?
  - Bottom line: If you were to do the research, how would you do differently?

Efficient Reading (Keshav 2007)

- Keshav's Approach is to read a paper in three passes
- Each pass accomplishes specific goals and builds upon the previous pass:
  - First pass gives you a general idea about the paper.
  - Second pass lets you grasp the paper's content, but not its details
  - Third pass helps you understand the paper in depth

Keshav's Approach: Pass 1

- <u>Quick scan of a paper (10 minutes)</u>
  - Title, abstract, and introduction
  - headings of section and sub-section
  - Conclusions
  - References
- Should answer the five C's
  - Category: What type of paper is it?
  - Context: What body of work does it relate to?
  - Correctness: Do the assumptions seem valid?
  - Contributions: What are the main research contributions?
  - Clarity: Is the paper well-written?
- Decide whether to read further…

Keshav's Approach: Pass 2

- <u>More careful reading (1 hour)</u>
  - Read with greater care, but ignore details like proofs
  - Pay special attention to figures, diagrams, and illustrations
  - Mark relevant references for later reading
- should be able to
  - grasp the content of the paper
  - summarize the main thrust of the paper to someone else
- Decide whether to
  - Abandon reading the paper in any greater depth
  - Read background material before proceeding further
  - Persevere and continue on to the third pass

Keshav's Approach: Pass 3

- <u>Virtual re-implementation of the work(5 hours)</u>
  - Making the same assumptions, recreate the work
  - Identify the paper's innovations and its failings
  - Identify and challenge every assumption
  - Think how you would present the ideas yourself
  - Jot down ideas for future work

Reading Exercise

- Practice Kashec's 3-Pass Appraoch