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

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<thead>
<tr>
<th>Google</th>
<th>digital forensics</th>
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<tr>
<td>Scholar</td>
<td>About 35,400 results (0.03 sec)</td>
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<tr>
<td>Articles</td>
<td>Statistical tools for digital forensics</td>
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<td>A Popescu, H Farid - Information Hiding, 2005 - Springer</td>
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<td>Legal documents</td>
<td>A digitally altered photograph, often leaving no visual clues of having been tampered with, can be indistinguishable from an authentic photograph. As a result, photographs no longer hold the unique stature as a definitive recording of events. We describe several statistical techniques for analyzing digital images.</td>
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<td>Any time</td>
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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

• **Quick scan of a paper (10 minutes)**
  – 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

• **More careful reading (1 hour)**
  – 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

- Virtual re-implementation of the work (5 hours)
  - 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 Approach