Scientific reading and writing

Lecture and workshop

DAT147 - Technical writing in computer systems and networks

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Today's agenda

- Introduction to scientific writing (EB)
  - how to read papers
- Discussion and analysis of texts (EB & EL43)
  - group workshop
- Follow up lecture
- Reviewing strategies

Paper instructions

Pay attention to upcoming deadlines

- 7 Sept - Abstract submission
  - **Send your text to your supervisor by email, cc Erland, Linda and Iosif**
- 18 Sept – Share your paper draft with another group
  - **Read the other group's paper for class 21 Sept. In class we will work with peer response**

Your task

- Make a contribution to a given research area by reading a set number of papers. (More than compilation of data and facts.)
- 5000-7000 words in ACM format, double-column

Purpose of survey article

An attempt by one or more writers to sum up the current state of the research on a particular topic

Guidelines on research modules, University of Texas at Austin

A critical, constructive analysis of the literature in a specific field through summary, classification, analysis, comparison

Plant Science Center, Universität Zürich

A scientific text relying on previously published literature or data

A stand-alone publication

Function and audience of survey article

- Organize and evaluate literature
- Identify patterns and trends in the literature
- Synthesize literature to identify research gaps
- Make recommendations of further research

- Geared at a broad audience of both experts and novices within a specific research area

The 3 papers analyzed for today

- Survey papers
  - Nicol et al
  - Rossow et al
  - Riloff

- Different in many respects
- They are all accepted and published
- They are cited a great number of times, particularly Nicol et al

A. Layout of survey articles

Layout of survey articles

- Basic report structure as foundation
  - Title page (title + author information)
  - Abstract
  - Introduction
  - Main part/s with sub-sections
  - Ending (frequently called Conclusion and Discussion)
  - References

Title page

- The essence of a smart and clear title
- Name, university, email below the title

- The title
  - Is it clear? What does it promise?
  - How long should it be?

Titles from the example texts:

1. *Model-Based Evaluation: From Dependability to Security*
2. *Prudent Practices for Designing Malware Experiments: Status Quo and Outlook*
3. *Little words can make a big difference for text classification*

Abstract

Generally containing

- Background, Introduction, Objectives, Methods, Results, Conclusion

  -- (though, not necessarily in this order)

Abstract example

The abstract from Nicol et al.

Abstract— 1) The development of techniques for quantitative, model-based evaluation of computer system dependability has a long and rich history. 2) A wide array of model-based evaluation techniques is now available, ranging from combinatorial methods, which are useful for quick, rough-cut analyses, to state-based methods, such as Markov reward models, and detailed, discrete-event simulation. 3) The use of quantitative techniques for security evaluation is much less common, and has typically taken the form of formal analysis of small parts of an overall design, or experimental red team-based approaches. 4) Alone, neither of these approaches is fully satisfactory, and we argue that there is much to be gained through the development of a sound model-based methodology for quantifying the security one can expect from a particular design. 5) In this work, we survey existing model-based techniques for evaluating system dependability, and summarize how they are now being extended to evaluate system security. 6) We find that many techniques from dependability evaluation can be applied in the security domain, but that significant challenges remain, largely due to fundamental differences between the accidental nature of the faults commonly assumed in dependability evaluation, and the intentional, human nature of cyber attacks.

background, introduction, objectives, methods, results, conclusion

Introduction

Function

- provide information about context
- indicate motivation for the paper
- define focus
- explain document structure

In papers, results and conclusions are commonly included in the end of the introduction

Further analysis of introductions in separate document!

Main part/s with sub-sections & ending

- Let us compare how our 3 example papers label sections (next slide)
- You will see that this can be ”solved” differently. How you label and divide sections depends on the content of your text

Headings and sub-headings in our example texts – a comparison

Nicol et al (10 pages)	Rossow et al (15 pages)	Riloff (7 pages)
1 INTRODUCTION	I. INTRODUCTION	Introduction
2 MEASURES OF DEPENDABILITY AND SECURITY	II. DESIGNING PRUDENT EXPERIMENTS	Relevancy Signatures Information Extraction Relevancy Signatures
3 MODEL REPRESENTATION/ANALYSIS TECHNIQUES 3.1 Combinatorial Methods 3.2 Model Checking 3.3 State-Based Stochastic Methods] 3.4 Applications to Security Modeling 3.5 Simulation	III. METHODOLOGY FOR ASSESSING THE GUIDELINES IV. SURVEY OBSERVATIONS V. EXPERIMENTS VI. RELATED WORK	Experimental Results for Similar Expressions Singular and Plural Nouns Verb Forms Prepositions Negation
4 CHALLENGES AND CONCLUSIONS	VII. CONCLUSION AND DISCUSSION	Conclusions
ACKNOWLEDGMENTS	VIII. ACKNOWLEDGMENTS	References
REFERENCES	REFERENCES	

Ending

- The concluding part sums up and reasons around the findings
- Usually refers to the opening arguments, and examines how the area's challenges were answered in the surveyed research papers

References

Purpose of referencing

- Helping reader judge whether your statements are reliable
- Pointing to further background reading
- Demonstrating your knowledge in the research area

Note:

- A reference should be relevant and reasonably accessible
- All in-text references must be given in the list of references and vice versa

Referencing

- For your paper, use ACM (= Association of Computing Machinery)
  Sample in-text citation: [Phillips 2001]
  -- List References alphabetically, using the author's last name.

  Dalhousie University has a table with comparisons between ACM, APA and IEEE

Check carefully

- The syntax of the referencing system to use
- Where to state a source in the text

Note:

- Nicol et al. and Rossow et al. use IEEE
- Riloff uses ACM

On citation and plagiarism

- Chalmers academic integrity document
  - *Academic integrity and honesty*
- Functions of citation and using a source:
  - Acknowledging a source
    - copyright, intellectual effort, ethics
  - Respecting previous work (knowing the area)
  - Authority arguments (using the area)
  - Credibility (knowing the area and belonging to it)

Use your own words at all times to avoid plagiarism when writing!

B. Structure

- what characterizes technical writing

Structural items in technical writing

support clarity and readability

Pay attention to:

- Transitions in text
- Linking devices
- Paragraph development, text building, general to specific, topic sentences
- Style and language
- Definitions and explanations
- Data commentary

read more in Zobel, 2004, *Writing for Computer Science*

Transitions in text

- Purpose: facilitates reading, increases coherence
- E.g. Linking devices and clarifications
- Let us have a look at an example from Nicol et al

3.5 Simulation

***As just argued**, the state space of a system model may be too large to be analyzed in its entirety. **Nevertheless**, in principle, we can construct statistical estimators of all the system … etc*

Examples of linking terms

Example / Explanation	**Addition**	**Result / Reason**	**Attitude**	**Contrast / Comparison**
For example,	Moreover,	So,	Naturally,	However,
For instance,	Furthermore,	Consequently,	Certainly,	Nevertheless,
That is,	In addition,	Thus, As a result,	Fortunately,	On the contrary,
In other words,	Additionally,	For this reason,	Undoubtedly,	In contrast,
	And,	Owing to this, . . . therefore . . . Therefore, Accordingly,	Strangely enough, Of course, Predictably,	One the one hand, . . . On the other hand, In comparison,
Time / sequence	**Summary**	**Order**	**Back reference**	Still,
At first, Next, Then, Later, In the end,	Finally, In conclusion, In short, To sum up,	First(ly), Second(ly), Third(ly), Last(ly), Finally,	This, That, These, Those, Such,	Yet, But,

Paragraph development

The paragraph unit holds one idea starting with a topic sentence.

The topic sentence is developed in many ways:

- Exemplify, specify, concretise, modify, define, describe, answer, object to

Engineers have long used models to evaluate system designs*. The models employed typically focus on the questions that are most pressing to an engineer… etc*

(Example of a paragraph starting with a topic sentence in bold. The connection between the two sentences displays how we move from general (”models”) to specific (”The models”). From Nicol et al, p. 49)

Coherent paragraphs

The topic sentence

- *A statement of the main idea (central theme) of the paragraph*
- Purpose:
  - Gives the paragraph direction
  - Tells the reader what is coming
  - Is focused enough to be covered in one paragraph

- Topic sentence = topic + controlling idea

Careful sentence building

- Purpose: facilitates reading, increases logic. Keeping the topic in focus and developing it
- E.g. order and organization of sentences, general to specific, short sentences & long sentences with subordinate clauses

A mix of short and long sentences is recommended for enhanced reading

Sentence building

- From general to specific. This example shows a clear transition

1) COMPUTER system and network security is an issue of increasing practical concern and research attention. 2) As a research discipline, computer security is a venerable one with its own culture, assumptions, and language. 3) The increased emphasis on system security has brought new researchers from different backgrounds to the field, bringing different perspectives and different skillsets. 4) All of this is for the good since new viewpoints can lead to new insights.

Nicol et al, Introduction

Style and language I

- Proofread your text carefully for any errors

- Vocabulary
  - apply the terminology you find in the papers you read
- Definitions
  - what concepts need definition and clarification?
- You may use British English or American English (but be consistent!)

The meaning of some common latin used in papers:

- e.g.,(exempli gratia, lat = for example)
- i.e., (id est, lat = that is)

Style and language II

- Be consistent in style throughout your text, aiming at a more formal style

- Here is an example of how two different styles clash, from Riloff, p. 130. The first sentence is more formal and the next one is informal:

One benefit of stopword lists and stemming algorithms is that they significantly reduce the storage requirements of inverted files. But at what price?

Style and language III

- Passive or active voice – Aim at an active voice, though it is common with a combination of both verb forms:

- Active: **This paper surveys** concepts and methodologies for the evaluation of system dependability.
- Passive: Concepts and methodologies for the evaluation of system dependability **are surveyed**.

- Active: **We define experiments as prudent** if they are correct, realistic etc
- Passive: **Experiments are defined as prudent** if they are correct, realistic etc

- The EngOnline programme has exercises on the active /passive voice. https://learning.portal.chalmers.se/ Log on with your CID. If you have further questions, contact linda.bradley@chalmers.se

Data commentary - building blocks

- Location statement (*Figure 1 shows survey respondents' self-reported involvement in online misbehavior during the previous 12 months* etc …)
- Highlighting statements (*As can be seen, just over three out of four* etc …)
- Interpretations and implications (*It is worthwhile to note that these different forms of online misbehavior* etc…)

Data commentary example

Explanatory text, figure number and descriptive figure text

Figure 1 shows a sample sentence and instantiated concept nodes produced by CIRCUS. Two concept nodes are generated in response to the passive form of the verb "murdered". One concept node, $murder-passive-victim$, extracts the "three peasants" as murder victims, and a second concept node, $murder-passive-perpetrator$, extracts the "guerrillas" as perpetrators.[1]

Sentence:
Three peasants were murdered by guerrillas.

$murder-passive-victim$
victim = "three peasants"

$murder-passive-perpetrator$
perpetrator = "guerrillas"

Figure 1: Two instantiated concept nodes

Riloff, p. 131

Workshop in groups

- Each group will engage in discussion and analysis of Rossow et al & Riloff
  - Focus mainly on introduction, which is representative of how the rest of the text is written
  - Handout with discussion points

- Please hand in the outcomes of your discussions to Linda (mail linda.bradley@chalmers.se or piece of paper) who will synthesize incoming suggestions

How to summarize texts you read

1. Thesis statement and main argument
2. Summary for whom / what purpose?
3. Careful reading, making notes
   - relevant facts and points
   - a mind map or other visualisation
   - paragraph structure (organisation and balance)
4. Arranging information
   - structure of three points (frame + three)
5. Assessment (self and peer). Can you use this text?

How to turn from summarising to a commentary (review)

- Ask yourself these questions:
  - Who is the audience?
  - What is the purpose of the article?
  - What research questions(s) is/are addressed?
  - What conclusions are drawn?
  - What evidence is offered to support conclusions?
    - Missing evidence? Invalid evidence?
  - Are the conclusions valid/plausible? (why/why not?)
  - Are there important assumptions underlying the article? How do they affect the conclusions?
  - Is there an original contribution to the field?

On reviews (getting started)

- Zobel on reasons to doubt papers
  - Merely presentation of new work - considered explanation
  - Issues unexplored due to deadlines
  - Aspects superseded or irrelevant; false or limited technical assumptions
  - Snapshot of a project in time – limited knowledge at the time

Organizing a review - architecture

Any sequence of articles in a reading list can be arranged differently in the review and this structure affects the impact of the review

Rhetorical patterns

Recurring rhetorical patterns

- Generic to specific
- Cause and effect
- Situation – problem – solution – evaluation
- Problem – method - solution
- Chronology
  - step-by-step procedures
  - instructions
- Classification and or definition
- Comparison and/or contrast
- Advantages and disadvantages
- Dialectic / thematic

Situation-Problem-Solution-Evaluation (SPSE)

- **Situation:**
  Background information on subject, statement that will draw your reader into the text.
- **Problem:**
  Clear description of the problem. Be as specific as possible.
- **Solution:**
  Choose one possible solution, either your own or someone else's. Why have you chosen it?
- **Evaluation:**
  How far does this solution work? How certain are you that this is the answer? Does your language reflect this?

Verb tense in reports

- Some flexibility, but be consistent **within** sections

Tendencies to Allocate Verbal Forms and References in Technical Report Writing (Adapted from Swales & Feak: 223)

	Introduction	Method	Result	Discussion	Conclusion
Present tense	high	low	varying	high	high
Past tense	low	high	varying	low	low
Passive form	low	high	low	high	varying
Active form	high	low	high	low	varying
Reference	high	varying	varying	high	low

Present tense (I)

- Used:
  - with a named researcher and a discourse verb (verbs related to stating or saying something, e.g. *suggest, conclude* and *maintain*) to indicate a generalized statement or inference from previous research

"Powell [28] **suggests** that regular, sub-maximal exercise programs may improve cognitive function..." (Hawes & Thomas 1997:404 [my bold])

Present tense (II)

- Also used:
  - To signal that the writer agrees with a particular type of previous research by taking the role of claiming something at the same time as backing that claim with previous research:

    "An operant conditioning programme **results** in the reduction of complaints, improvement of mood, lower medication dependence and increased physical activity, through the restructuring of behavioural consequences [6-10]." (Hawes & Thomas 1997:405 [my bold])

Past tense

- Particularly used to refer to *particular* studies in the form of results of those studies or methods or procedures employed. Sentences or passages in the past tense often used to serve as background or support to an argument that is carried out (so not necessarily negative). Example:

  "The mean apgar **was found** to be significantly lower in the high anxiety group (Table 1). Drages and Brendes [11] **showed** that there was a higher than average incidence of neurological abnormality at one year of age, associated with lowered five-minute apgar scores. Although the exact mechanism underlying this association **is** at present unknown, it **would seem** reasonable to **suggest** that..." (Hawes & Thomas 1997)

Today's class connected to course aims

- develop awareness of the underlying structure of scientific and engineering research papers
- improve proficiency in reviewing and writing scientific research papers

- the student examines and surveys current state of the art in a specific field and writes an analytical survey paper in this field
- ethical issues in connection with scientific writing, e.g. plagiarism and authorship

Next text class

- Lecture / workshop on critical reviewing and peer response (21 Sep)
  - Building on ongoing papers
  - How to give feedback and make use of feedback, critical reviewing

Further writing support - CHOCS

- Chalmers Open Communication Studio (CHOCS)

- Online writing resources
- Tutors
- Fellow students
- Language teachers

- Good luck with your projects!


READING IS DANGEROUS.
HEAVY READING
SPEED READING
OVERREADING
ACCELERATED READING
PROOFREADING
GRANT SNIDER