Writing for

Computer Science & Engineering

Ki-Il Kim

Department of Computer Science and Engineering

CNU

Introduction

Writing

- Many roles in science
  - Record events and clarify our thinking
  - Communicate to our colleague
  - Explain concepts and discuss work
  - Add to scientific knowledge

Introduction

- Many scientist do not write well & communication well
  - A scientific paper presents new ideas and demonstrates their correctness - readability
  - Skills required for science and writing are different
  - Undervalue the importance of clarity and underestimate the effore required to produce a high-quality piece of writing
  - Impact of poor writing on their readers, own careers
- Poorly written paper
  - Ambiguity leads to misunderstanding
  - Omissions frustrate
  - Obscurity makes readers struggle to reconstruct the author's intention

Introduction

- Good writing and presentation
  - Persuade readers that work is of value
  - Beings with interesting questions and proceeds through a source methodology to clear results
  - Carries a strong subconsious message – poorly presented material (spelling error, layout issue such as font and spacing)

- Ability to write well is a key skill of science
  - Few scientists are natural writers and few people are instinctive researchers
  - Learnt through experience (early paers are often embarrassingly poor)

Introduction

- Necessary steps
  - Creates a logical organization
  - Use concise sentencses
  - Revise against checklists of possible problems
  - Seek feedback

Kind of Publications

- Scientific results
  - Book
  - A thesis, a journal article, a complete paper or extended abstract in conference or workshop proceedings, a technical report
- Book
  - Tend not to contain new results or prove the correctness of the information
  - Collect information and present it in an accessible, readable form
  - Generally better written than papers

Outcome of New Research

- A thesis
  - Deep or even definitive exploration of single problem
- Journal and conference proceeding
  - Consist of contributions that range form substantial papers to extended abstract
  - Journal paper : an end product of the research process, a careful presentation of new ideas, several iterative revision
  - A paper or extended abstract : conferences are used to report work in progress, limited iterative revision, length limits
  - Extended abstract : details of work is omitted. Review the results of a research program but not include enough detail to make a solid argument for the claims
- A paper or thesis should be an objective in addition to science knowledge, not a description of path that was taken to the result.

Writing

- A key aspect of writing
  - Discipline of stating ideas a logical
  - Organized text force you to formulate and clarify your thoughts
  - Concepts and idea are made concrete
  - The act of writing suggests new concepts to consider
- Writing is not the end of the research process, but instead shapes it
- Confronting the difficulties of writing
  - English
  - Describing research is less entertaining than actually doing it
  - No help from advisor

Writing

- New idea must be explained clearly to give them the best possible chance of being understood, believed, remembered, and used
- This begins with the task of explaining our ideas to the person at the next desk, or event to ourselves
- It ends with publication, that is an explanation of results to the research community.

Good writing is a crucial part of the process of good science

What we are going to learn

- Writing style
- Mathematical style
- Design of figures and graphs
- Presentation of algorithms
- Editing
- Writing and organization of papers and theses
- Referring

Style is not just about how to write,
but is also about what to say

What we are going to learn

- Broad guidance on science writing can be wrong or irrelevant for a specific area – Computer Science
  - Algorithm
  - Mathematics
  - Research method for computer science

The role of this book is to help computer scientists with their writing and research

Style is in some respects a matter of taste

Getting Started

Research Project

- Start of research project
  - Conversation with a colleague
  - General interest
  - Something learnt in a seminar
- Doing research project
  - Formation of precise question
  - Development of a detailed understanding
  - Gathering of evidence
  - Linking of the question and evidence with an argument
  - Description of the work in a publication

Beginnings

- The origin of a research investigation is a moment of insight
  - Why search engines do not provide better spelling correction
  - An advisor is frustrated by network delays and questions whether the routing algorithm is working effectively
- This first step is a subjective one
  - Choose to explore ideas that seem likely to succeed, or have the potential to lead to something new
- The final outcome is an objective scientific report, but curiosity and guesswork are what establish research directions

Shaping a Research Project

- Potential research topic -> defined project : context
- For students
  - Short-term and long-term goals

- At the beginning of a research program
  - What is the broad problem to be investigated
  - What is the specific initial activities to undertake and outcomes to pursue

Shaping a Research Project

- Choosing a topic
  - Is this the most interesting topic on offer
  - Is this project at the right kind of technical level

- Evaluating a problem
  - knowledge, infrastructure, required resource,
  - Research fields mature (the volume of background knowledge a new researcher must mast in increases, the scope for interesting question is narrowed)
  - Project scale (major breakthrough but to some extend incremental)
  - Clearly achievable outcomes

Research Planning

- Patterns of undergraduate study
  - Attending lectures, completing assignments, revising for exam
- Typical research project
  - One deadline: completion
  - Administrative requirements : submission of a project outline or progress report

Research Planning

- Strong approach to the task of defining a project and setting milestone
  - Explicitly consider what is needed at the end (thesis, paper or report)
  - Reason backward (what form the experiments will take, what will the experiments show, assuming the hypothesis to be true, how will the results be different if the hypothesis is false)
- Estimate the dates at which milestones should be reached

Students and Advisors

- Reading recommendation
  - Uploaded in the webpage for class

Checklist

- Is your proposed topic clearly a research activity? Is it consistent with the aims and purposed of research?
- How is your project different from, say, software development, essay writing or data analysis?
- Is the context of your project, what are the area, topic, and research question?
- Is the project of appropriate scale, with challenges that are a match to your skill and interests
- Is the project distinct form other active projects in your research group

Checklist

- Is it clear what skills and contributions you bring to the project and what will be contributed by your advisor
- What resources are required and how will you obtain them
- What are the likely obstacles to completion or the greatest difficulties
- Could you write down a road map, with milestone, that provides a clear path to the anticipated research outcomes
- Do you and your advisor have an agreed method for working together with a defined schedule of meetings

Personal Recommendation

- How to start research
  - A Personal Note on How to Start Research in Computer Networks: Seven Steps on the Road to Success (https://www.cise.ufl.edu/~helmy/cis6930/research-start.html)


Q
&
A