CSE@UTA REU 2008

How to Conduct Research
Some Rules of Thumb

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CSE@UTA How to Conduct Research

- **Research Method**

- **Reading**

- **Programming**

- **Writing**

- **Talks**

CSE@UTA Research Method

- **The best way to conduct research depends on the specific project and the individual. We will introduce some useful tools here and give some rules of thumb. Depending on the type of project methods can be**
  - **Formal and theoretical or**
  - **Experimental**
  - **Find the right balance.**

Preparing and Conducting Research
CSE@UTA

- **Formulate the problem carefully**
  - **Make sure you understand the bigger picture**
- **Get informed what other people have done**
  - **Literature search**
- **Use the right tools**
  - **Look if there are tools available that could make your work easier**
- **Keep notes**
  - **Put down ideas that come up and that you can't pursue right away**
  - **Keep track of things that worked and things that didn't work**

CSE@UTA Literature Search

- **Tools for literature search**
  - **University libraries have good searchable databases to full text research articles.**
  - **Web searches can turn up many papers but in particular people and places that work on related projects. Google scholar is a great tool.**
  - **Citation indices permit to find papers more efficiently. Moreover they give access to the references in the paper and the papers that cite the paper.**
    - **E.g.** http://citeseer.nj.nec.com/cs
  - **Technical report indices provide access to reports often on preliminary or otherwise unpublished work**
    - **E.g.** http://ncstrl.mit.edu/

CSE@UTA Reading Papers

- **Read papers keeping your goals in mind**
  - **How can you use the results of the paper ?**
  - **Do the things in the paper actually do what the authors claim ?**
- **Keep a bibliography**
  - **Keep track of papers that you have read**
    - **Correct citation: Author, Title, Publication, Pages, Year, etc.**
    - **Put down a paragraph (not more !) about the content of the paper even if you thought it was a bad paper.**
    - *Refworks* **(see your library) may be a good tool for all that.**

CSE@UTA Programming

- **Take sufficient time to design your code**

  - **What interfaces do you need ?**

  - **What will a given routine be used for ?**

- **Look to see if there are tools available that could help**

- **Follow the coding standards**

  - **Familiarizes with coding how-tos (e.g., "Developing Software with GNU")**

  - **Comment your code (e.g., Doxygen)**

  - **Test early and often**

CSE@UTA Writing

- **Reading papers is very important for writing papers**
  - **Gives insights in structures of good papers**
  - **Ask yourself what makes some papers better than others**

- **Keeping notes can be a good start for writing a paper or report. All content is there.**

- **Spend time first deciding what you want to be the central idea of the paper (Keep in mind that for research papers you often have a page limit).**

  - **Write for the particular readership**

  - **Try to be concise and to the point**

CSE@UTA Writing

Computer science papers often have a common structure:
- **Title, authors, affiliations**
- **Abstract**
- **Introduction:**
  - **Motivation, motivation, motivation**
  - **Describe the bigger picture and what you are doing**
  - **Provide a roadmap**
- **Related work:**
  - **May be part of the introduction**
  - **How have other people addressed the problem and how is your work different**
- **Technical description:**
  - **The details of what you are doing. Ideally a reader should be able to use this to reproduce your results**
- **Experimental or formal results:**
  - **Show that your work achieves the objectives**
- **Conclusions (and future work)**
- **References (bibliography)**

CSE@UTA Talks and Presentations

- **Talks are often organized in a similar way as papers**
- **Aim your talk at the particular audience**
  - **What is their technical background ?**
  - **How much detail is necessary ?**
- **Adjust your talk to your own goals**
  - **What kind of feedback do you want to get ?**
  - **Talks at conferences are often aimed at presenting your research to a wider audience (your goal when giving such a talk is to motivate your audience to read your papers.**
  - **Talks in research group meetings are often aimed at getting others involved in discussion or to get help overcome problems.**

CSE@UTA Talks and Presentations

- **Presenting your work is often a good way to test your understanding in your research**

  - **Explaining is frequently the best way to understanding and to finding and solving problems**

- **Giving good talks requires practice**

  - **Give a practice talk to friends**

  - **Get critical comments and incorporate them**

  - **Don't be afraid of constructive criticism**

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CSE@UTA Resources

- **Our textbook is a great starting point on instructions about performing research. Use bibliographic references therein for further reading**
  W.C. Booth, G.G. Colomb, J.M. Williams, "The Craft of Research," third edition, The University of Chicago Press, 2008 978-0-226-06566-3

- **Your library should have online subject guides to help you, e.g.,**
  http://libguides.uta.edu/content.php?pid=3622

- **You can look at online resources on performing research**

- **Useful book: Justin Zobel, "Writing for Computer Science," http://www.justinzobel.com/**

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