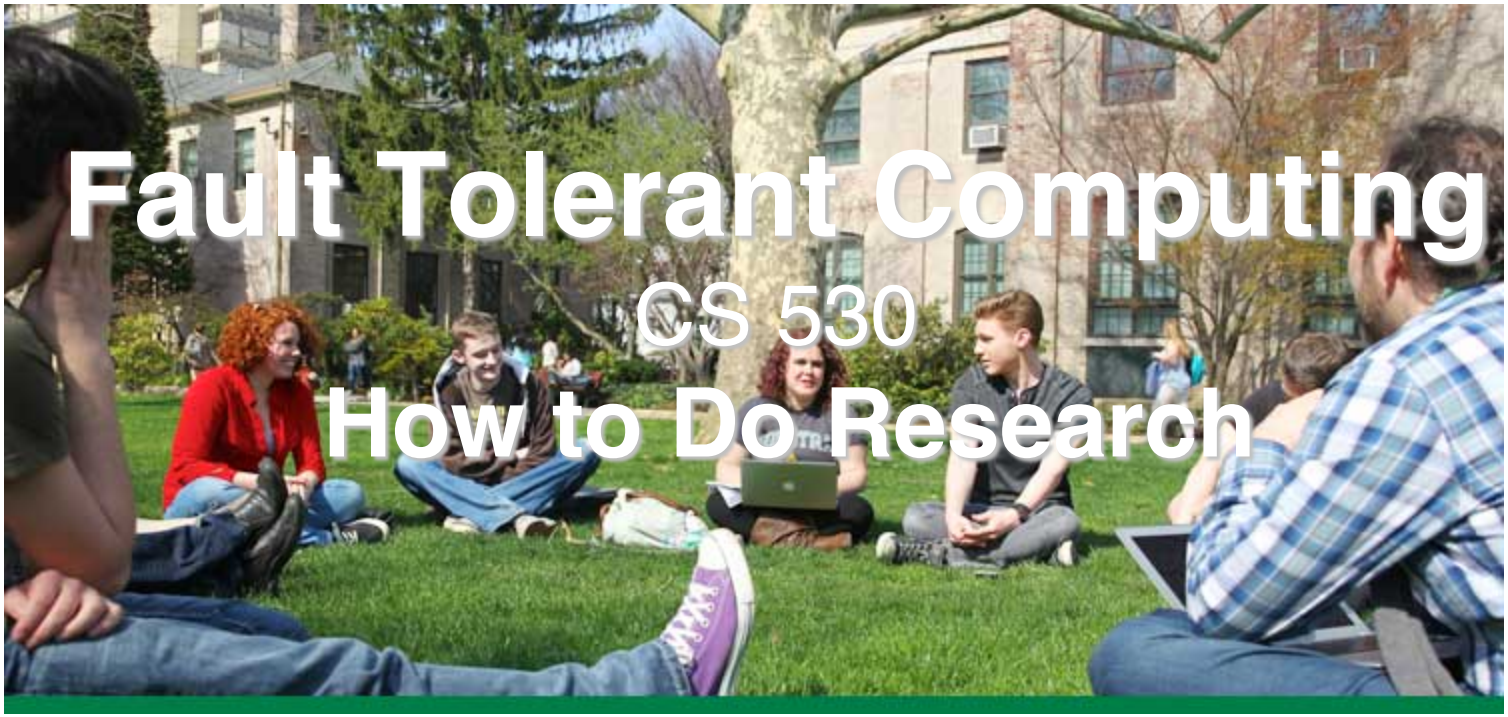


Fault Tolerant Computing

CS 530

How to Do Research

Yashwant K. Malaiya

Colorado State University

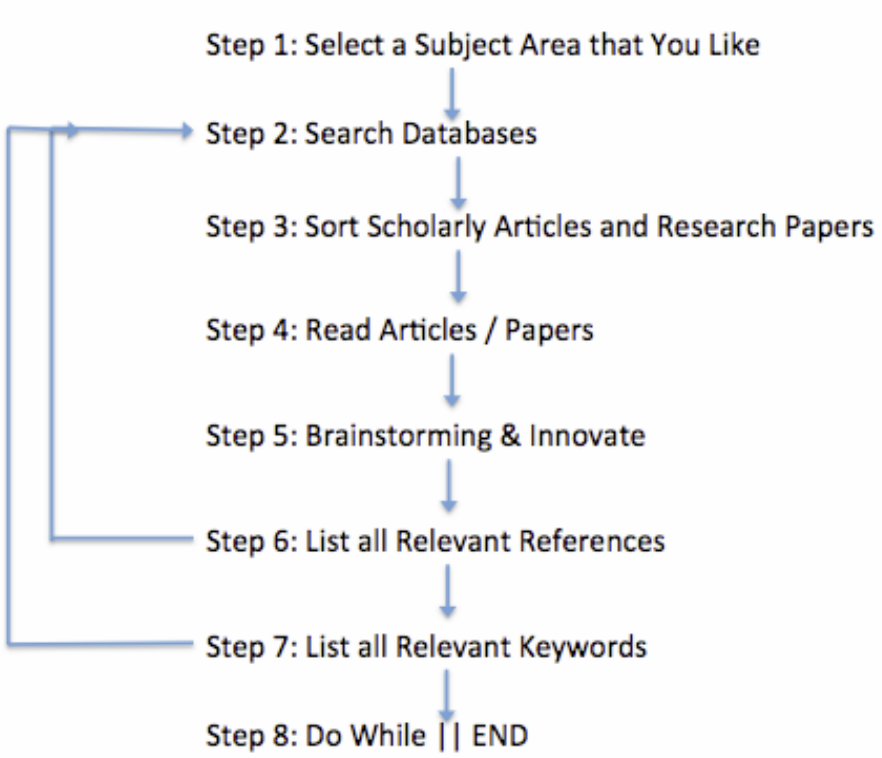
Research Objective

- **Become familiar with technical topic of current interest**
  - **Current state of the art**
  - **Where the field is going (thus what to expect next)**
- **Become an expert in the field**
  - **Should be able to answer important questions**
- **Original contributions**
  - **What needs to be done**
  - **Suggest how it would be addressed**
- ***Do it (if your expertise and time allows)***
- **Present your work**
  - **Briefly (presentation) and in detail (paper)**

Project type

- A thorough survey of a topic, with original insight
- A development of a new scheme
  - or a fresh implementation of an existing scheme
- Modeling and analysis of an existing scheme.

Steps for Identifying Sources



How to Start a Research Work in Computer Science:

A Framework For Beginners Somdip Dey

Search Databases

Secondary sources: database indexes

- **Google Scholar**
  - **Forward links: Paper X Cited by (example)**
  - **Backward Links: Paper X cites (example)**
- **DBLP**
- **CSU Library etc.**

Primary (*accessible through CSU Library*)

- **ACM Digital Library**
- **IEEEXplore Digital Library**
- **ScienceDirect etc**

Source types

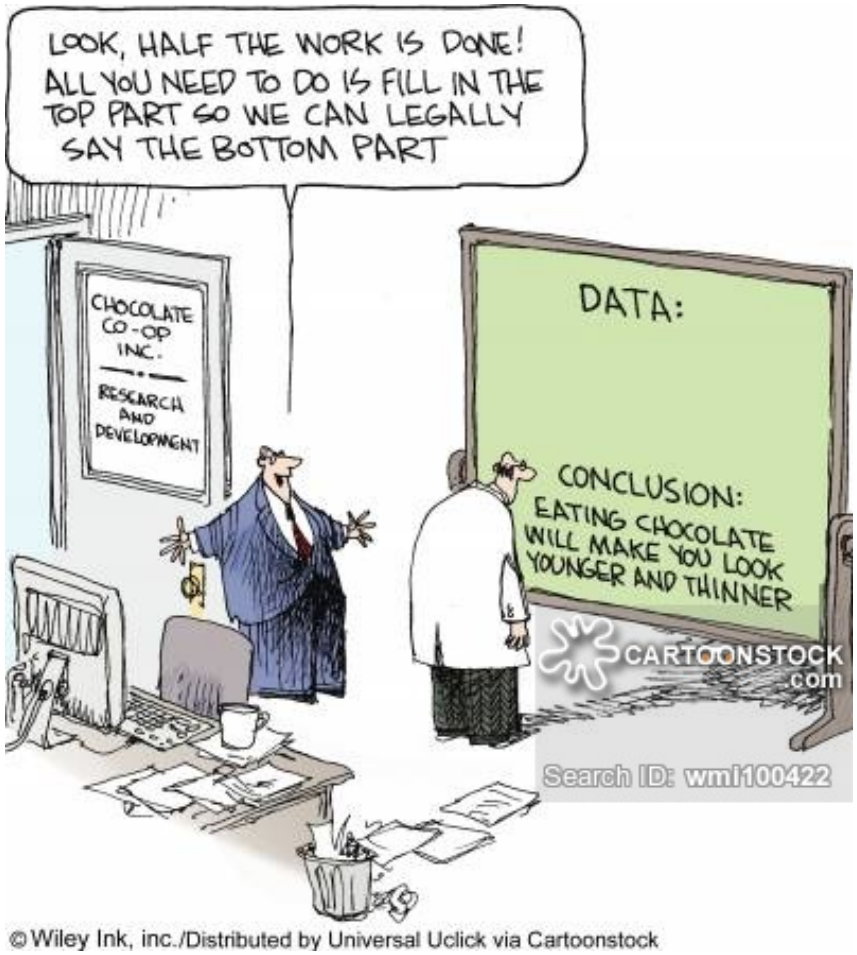
- Journals: published several times a year
  - Rigorously reviewed, long publication delay
  - Journal, Transactions, …
- Conferences: held once a year, proceedings published
  - Conference, Symposium, …
- Research groups
  - Industry, academic, consultants: web site
- Industry publications
  - Magazines, blogs, white papers, product website
- Books: often well known stuff
- News reports

How to Read a Paper: THE THREE-PASS APPROACH

- The first pass: Read
  - the title, abstract, and introduction
  - section and sub-section headings, but ignore everything else
  - the conclusions
- The second pass: Read
  - figures, diagrams and other illustrations
  - mark relevant unread references for further reading
  - Do you need to read it in detail?
- The third pass: Read critically
  - identify and challenge assumption and views
  - Loop up references needed

Keshav, S., How to Read a Paper, ACM SIGCOMM, http://ccr.sigcomm.org/online/files/p83-keshavA.pdf

Avoid Prior Bias



Key Questions

- What problem are you trying to solve?
  - Why is it important?
- What recent advances or interesting ideas are there?
  - what have others done?
  - what have others not done yet?
- What have you done (so far)?
  - What is your next step?
  - how does it relate to your goal?
  - why is it important?
- How will you know when …
  - you've made progress?
  - you're done?

William J. Rapaport, How to Write

Deliverables

- a *one page* proposal
  - motivation, brief scope of study and *some specific references*.
- Progress report: should have completed a major part of the project.
- slides based on findings thus far
  - Post in Canvas Discussions and present in class
  - Should demonstrate
    - thoroughness of literature search
    - Understanding of the key technical concepts
  - Peer review required
- final report (two column format, vericite)

Progress report

- **Documentation:** http://www.cs.colostate.edu/~cs530dl/f18/project
- **Progress report (3-5 pages)** It should indicate that you have finished at least half of the work.
- Partial version of the final report
- Abstract, Background
- Summary of the findings
- What the final report will contain , any refinements of the objectives as a result of the recent study,
- Applicable references in proper format.

Proper formatting

- Proper citations: IEEE/ACM format
  - Including authors, title, publication, page numbers, date.
- Two column IEEE/ACM format
  - Title, name(s) of the author(s),
  - Name of the class and professor (for CS530 reports)
  - Abstract
  - Your contribution and what is new
  - Introduction (background & related work, objectives & methods),
  - Assumptions/schemes/models/problem-formulation
  - Comparison/discussion/derivation etc. of the results,
  - Conclusions and suggestions for improvements
  - References.
  - Appendixes (if need)

Must have diagrams and hard technical info (equations/tables/plots/screen-shots etc)

Citing Sources

"IEEE" "ACM" etc:

- **These are professional organizations that organize numerous conferences and published journals**
- **You must specify the author, title of paper, specific names of conference/journal, associated details, date, page numbers**
- **URL not needed for conference, journal publications. Needed for on-line publications (Organizational reports, Industrial white-papers, News etc)**

Omar H., Alhazmi and Yashwant K. Malaiya, "Application of vulnerability discovery models to major operating systems", IEEE Transactions on Reliability, Volume: 57 , Issue: 1, pp. 14-22, March 2008,

Ambrose Andongabo, Ilir Gashi, "vepRisk - A Web Based Analysis Tool for Public Security Data", 13th European Dependable Computing Conference (EDCC) 2017, pp. 135-138, 2017.

You must include

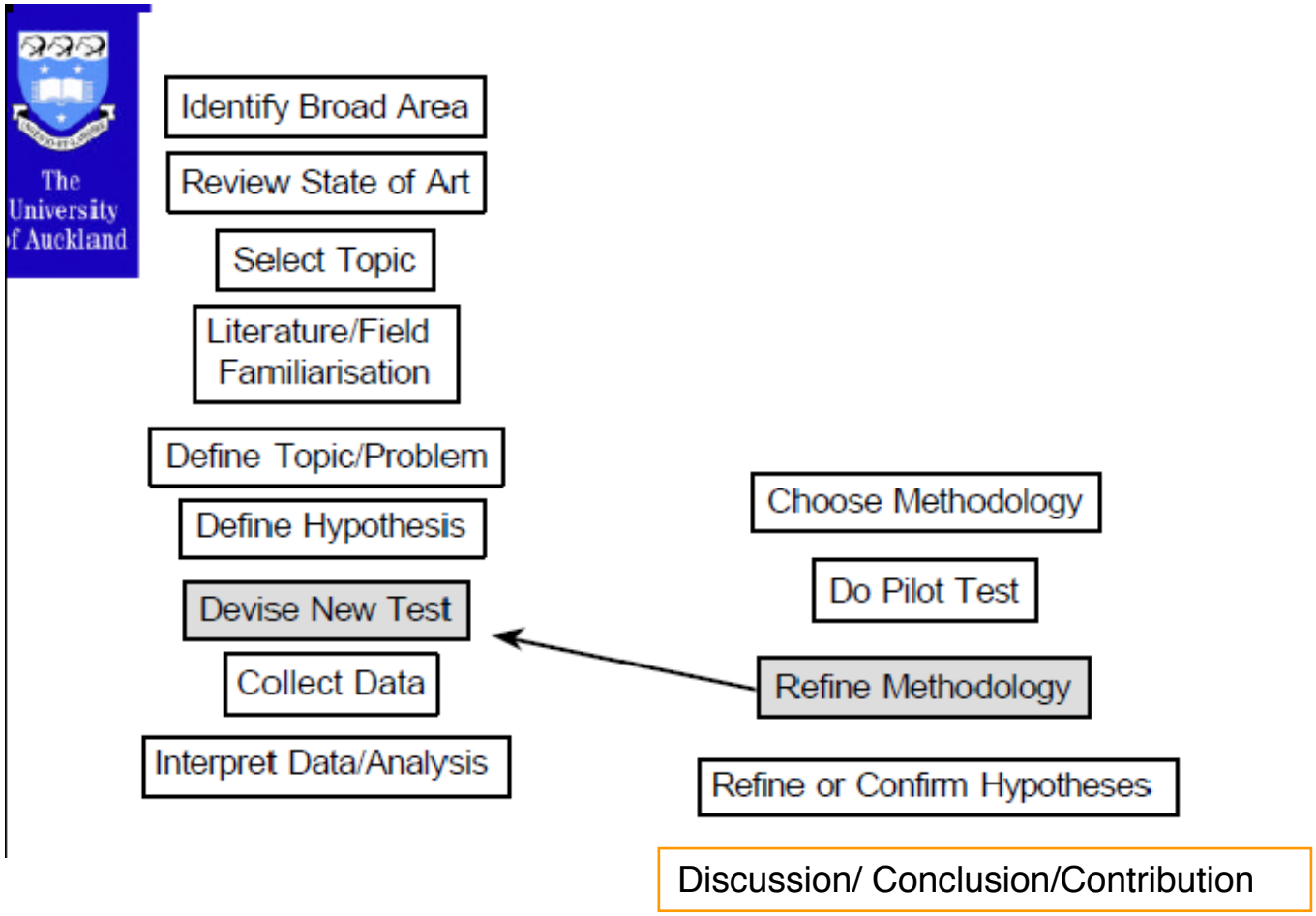
- Title, your name, class, year, professor's name
- Abstract: What does it include and why is it important
- Background: Other existing work and background ideas
- Technical discussion: detailed discussion of findings with non-text material (charts, plots, tables. algorithms etc)
- Discussion & Summary
- References

Evaluation of CS530 Project Reports

Similar to paper review for conferences/journals

- **significance and originality**
- **thoroughness of research**
- **depth of understanding displayed**
- **Presentation**
- Final report is submitted through Vericite using Canvas
  - Checks for overlap with other documents (plagiarism)
  - Some overlap OK
  - Cite sources of definitions, ideas, data, figures etc.
  - Any text copied and pasted must be enclosed in quotes and cited
    - Exception: references (cite only those you have seen)

Typical Original Research Process



Introduction to Research in Computer Science - Ian Watson