



Writing the Thesis/Dissertation Proposal: STEM fields

Yan Huang

*Professor of Computer Science and Engineering
Associate Dean for Research and Graduate Studies
College of Engineering*

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DEPARTMENT OF COMPUTER SCIENCE &
ENGINEERING
College of Engineering



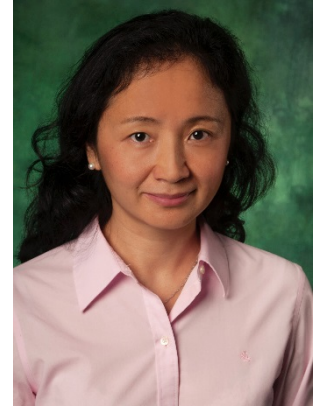
Instructor Bio

Prof. Yan Huang

- Ph.D. Computer Science and Engineering, University of Minnesota, 2003
- B.S. Computer Science, Peking University, China, 1997

Employment history:

- 14 years as a faculty at UNT
 - Professor (2014 – now)
 - Associate Professor (2009-2014)
 - Assistant Professor (2003-2009)
- Associate Dean for Research and Graduate Studies (2016-now)
- Visiting research scientist:
 - Fudan University China (May – Aug. 2011)
 - Microsoft Research Asia (Sep – Dec. 2011)



Goals of this workshop



- To introduce strategies to identify research problems that are coherent for a thesis proposal.
- To provide a structure of a common thesis proposal.
- To introduce guidelines for writing a thesis proposal.
- To introduce practical rules to reduce frustration on writing a proposal.

What is a thesis

“A thesis or dissertation is a document submitted in support of candidature for an academic degree or professional qualification presenting the author's research and findings.”

Usually is judged by whether or not it makes an original and unique contribution to scholarship.

Keep the end in mind

<https://en.wikipedia.org/wiki/Thesis>

Purpose of Thesis/Dissertation Proposals

- Demonstrate that you understand how to conduct discipline-specific research.
- Create a road map for your research.
- Give your committee material to review, challenge, and advise your plan.

Audience:

- Your academic advisor and committee

When is a proposal submitted/defensed

Various by program

UNT CSE example:

PhD Milestone Chart - Time to Completion

	Committee Appointment	Degree Plan	Qualifying Oral Exam	Topic Proposal	
Completion	18 schs	18 schs	18 schs	36 schs	w/Master's
Expectation	36 schs	18 schs	39 schs	60 schs	w/o MS



Parts of a Proposal

- Title
- Abstract
- Introduction/Background
- Overall Research Theme
- Research Questions
- Bibliography
- For Each Research Question:
 - Review of Literature
 - Significance/Implications
 - Plan of Work
 - Possible Methodology
 - Plan for Result Validation
 - Anticipated Timeline

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Approaches of writing the proposal

- Top down 
- Bottom up 
- Back-and-forth

A Typical Process

- Decide a general area of interest with you advisor
- Start literature review to narrow down and sharpen the problem definitions
 - For a Ph.D. thesis, usually multiple related problems under one broader theme
- Write the problem statements
- Justify potential innovation
- Design methods

A Typical Process (continued...)

- Plan for validation
 - Experimental?
 - Theoretical proof?
- Estimate a timeline
- Overall Research Theme
- Introduction/Background
- Abstract
- Title

Topics of Interests

- Topics are general constrained by your interests and your advisor's interests
- Sometimes can be defined to large extent already by a project
- Once agreed:
 - Write down a tentative title
 - Write down a tentative research theme
 - Overall background
 - Ask feedback from your advisor for general consensus



Literature Review

Why start with literature review?

- What is a good problem
- Why the problem is important
- What have been done and how
- What else need to/can be done and how
- What is your potential **innovation**



Literature Review

Literature Review

Writing the literature review allows you to understand:

- How other scholars have written about your topic.
- The range of theories used to analyze materials or data.
- How other scholars connect their specific research topics to larger issues, questions, or practices within the field.
- The best methodologies and research techniques for your particular topic.



Literature Review

An Effective Literature Review should

- Flesh out the background of your study.
- Critically assess important research trends or areas of interest.
- Identify potential **gaps** in knowledge.
- Establish a need for current and/or future research projects.



Problem Statement

- What is given
- What are the constraints
- What are the objectives/hypothesis
- What are the rationales



Innovation

- Innovation has to be in the back of your mind all time
 - When you pick a topic
 - When you perform literature review
 - When you design your methods
 - When you think about your results



Innovation

- Innovation varies by domain
- Is it a proof?
- Is it a new algorithm?
- A new theory?
- A known theory/system applied to a new domain?
- A new interdisciplinary approach to a known problem?
- An experiment that considers new factors/make use of new data/tool?



Methodology



- Varies for different domains and problems
- Can be identifying possible theory to prove a theorem
- Experimental approach:
 - Hypothesis formulation->Experimental design-> Data Collection-> Data interpretation->Insights and conclusion
- Method-based:
 - Design a new approach/algorithm to solve a hard problem

Validation



- Prove theoretically for correctness
- Experimental approach:
 - Find the most related work in literature
 - Compare results
 - Metrics
- Method-based:
 - Most related current approach in literature
 - Compare: fast? Better? In what sense?



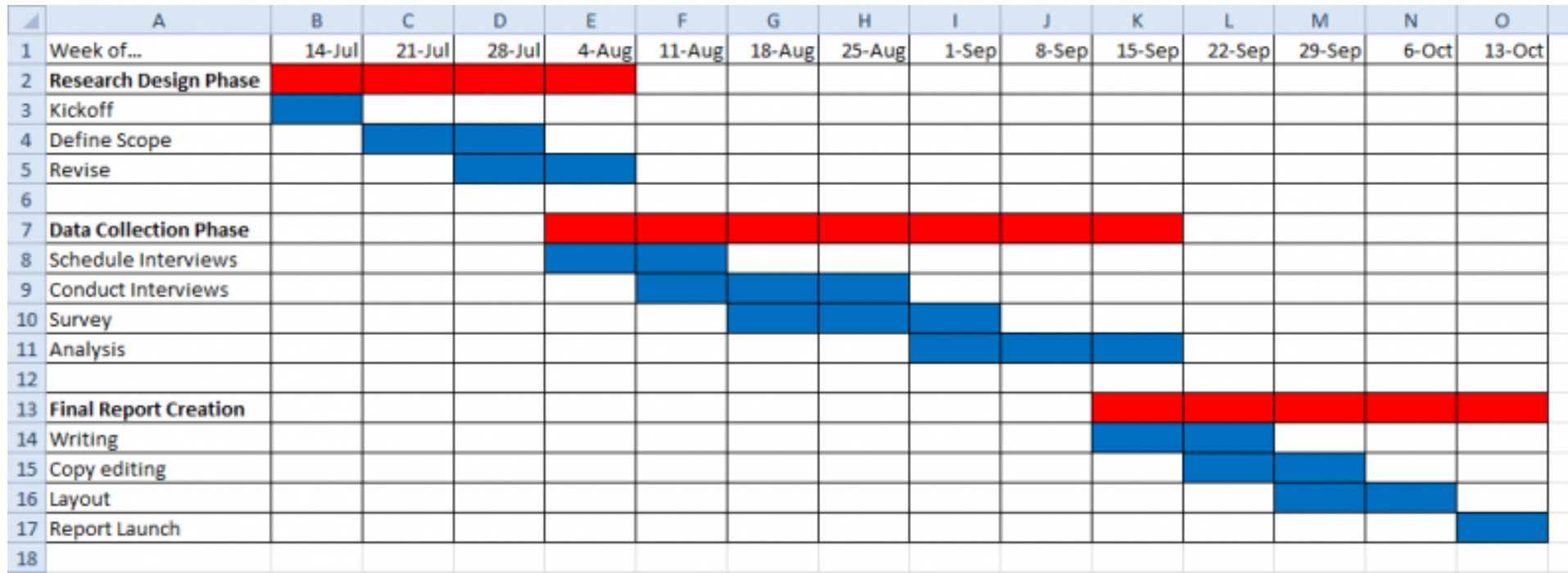
Timeline



Some things to keep in mind:

- Consult your advisor.
- Check important dates for submitting and defending dissertations.
- Take various factors into consideration: IRB approval, travel; design, testing, and length of experiments; negotiation of entry into the study site; purchase of necessary equipment; drafting; redrafting).
- Timeline is not always respected but writing it helps you to avoid potential pitfalls
- Do a Gantt chart.

Gantt Chart



<http://hatmisaini.blogspot.com/2015/08/individual-design-project-gantt-chart.html>

Research Theme

- You have a tentative one and it needs to be frequently revised.
- Usually this is a summary of a broader research topic covering the research problems being addressed by the thesis
- Example:
 - Research Theme: Location Based Privacy
 - Research problems:
 - K-anonymity
 - Trajectory privacy
 - Group privacy

Introduction and Background

- Overview of the scope of the broad area of the thesis
- Why the research is important
- Who will benefit
- Technology trend/scientific development
- Summarize current state-of-the-arts
- Given an overview of research problems and contributions

Abstract

- 200-400 words
- Summarize introduction and background section of the proposal
 - Statement of the Problem
 - Background of the Study
 - Research Questions or Hypotheses
 - Methods and Validation Plan

Title

- Summarize abstract
- Consider a catchy and easy-to-remember abbreviation
 - SINA: Scalable incremental processing of continuous queries in spatio-temporal databases
 - Lars: A location-aware recommender system
- Reflect the main research theme of the proposal

Practical Considerations

- Proposal is a proposal and not a final contract
- Ideas may not work and will be revised
- Talk to your advisor constantly
- Start writing once you reviewed some literature and have certain confidence about a research problem
- Writing should happen together with reading and thinking, not at the end
- Write as often as possible, link, organize, and re-organize
- Your proposal will serve as the basis of your thesis





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Thank You!

Prof. Yan Huang

Department of Computer Science and Engineering

College of Engineering

University of North Texas

(940) 565-4302

kuruvilla.john@unt.edu