

PREPARING YOUR THESIS PROPOSAL AND BECOMING A PHD CANDIDATE

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COMPUTER SCIENCE**



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About this session

- The slides will be online.
- Please ask questions or share ideas throughout!



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Maria Gini

Professor, University of Minnesota

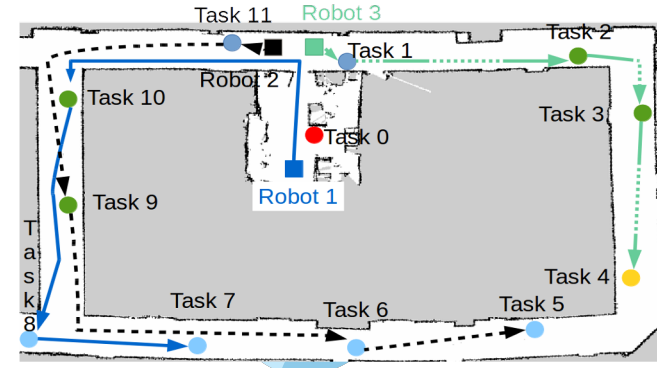
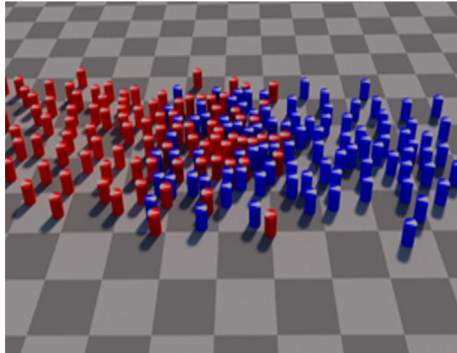
- Graduated in Italy
- Postdoc at Stanford (1976-1977) in the AI Lab
- Faculty at University of Minnesota since 1982

Research:

- multi-agent systems, robotics, conversational agents

Service:

- Chair, AAIL Diversity and Inclusion Committee, 2019-
- Member, CRA-WP, 2007- (DREU and Grad Cohort)
- Member, CRA CCC, 2019-2022

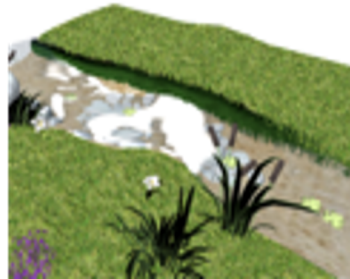
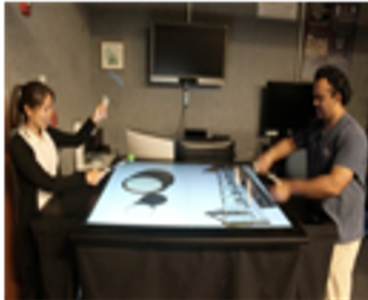
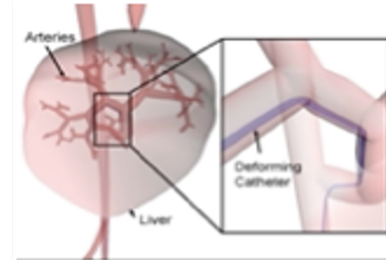


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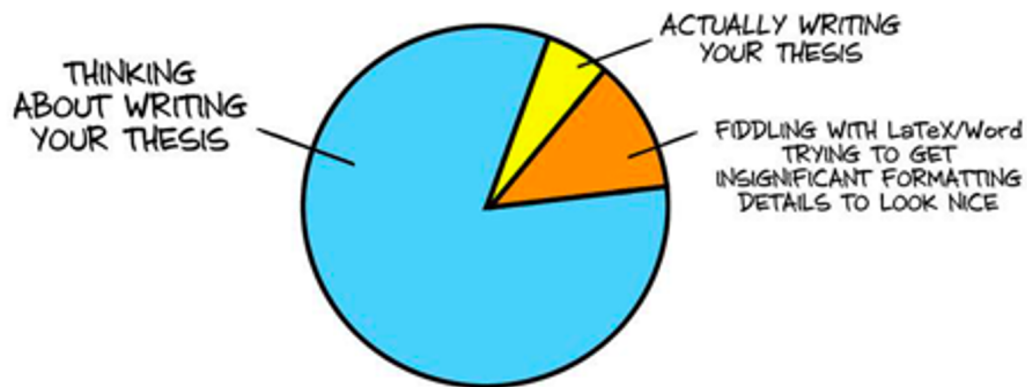
- B.S., M.S. Ph.D. In EECS, University of California, Berkeley
- J.R. & L.S. Parker Distinguished Professor Emeritus, UNC-CH
- Barry Mersky & Capital One Endowed Professor, University of Maryland at College Park

Research:

- ***ML/AI/Robotics***
- ***Virtual Reality***
- ***Human-Computer Interaction***
- ***Physically-based Modelling, Simulation & Animation***



WRITING YOUR THESIS:



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What is a PhD Proposal really?

- A brainstorming and planning process
- A succinct write-up of your proposed research goals, strategies, justification, & foreseen contributions
- A good time to get feedback & direction from experts
- Sometimes a stressful period of graduate school



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When should I write and present my PhD Proposal?

When you have

- completed the rest of your PhD requirements
- a clearly defined problem
- some preliminary work to demonstrate promise of your approach
- some notion of the major subproblems
- an advisor who recommends you are ready



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- Prepare for hard questions – reread proposal as a committee member
- Present and defend proposal
- Celebrate this big milestone!
- Thank committee, meet with advisor (and committee members) to discuss questions and directions
- Move forward on research



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The Committee



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What is the role of the Committee?

Throughout the process ...

- Guidance and understanding of what to expect
- Feedback
- Eventually, reference letters

At the proposal, they...

- Make sure you know what you're talking about
- Make sure you know the state of the art



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Selecting the PhD Committee

- Know your department rules
- Ideally
 - PhD advisor
 - Faculty in the related topic area to provide useful direction
 - Faculty outside topic to provide high-level, broader perspectives
 - External member: potentially someone in research area who could write a reference letter



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The Written Proposal



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Skit on Ph.D. Proposal

**A a Ph.D. student, and her
faculty advisor will talk
about how to prepare her
thesis proposal.**



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In Summary...

The proposal should clearly answer:

1. What is the problem you are studying?
2. Why is it important?
3. What results have you achieved so far and why matter?
4. How is this substantially different from prior work?
5. How will you systematically evaluate your work?
6. What do you need to do to complete your work?
7. What is your timeline?



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To answer these questions, how do you organize a proposal?

- Introduction
 - *Problem statement and importance*
- Background and State of the Art
- Preliminary Work
- Proposed Research
 - *Subsections on each research contribution*
- Evaluation Plans
- Research Plan
- Summary of your Contributions and Timeline



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Think about the Audience

Your Committee

- Not necessarily all in your general topic area
- Not familiar with your specific problem
- Not aware of your prior work
- Not aware of your skills, infrastructure

Implications

- Background: terminology, problem,...
- State of the art related to your problem
- Convincing motivation for importance
- Demonstration of feasibility/promise of success



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How long should a proposal be?

Your presentation?

- Check your department rules/Ask for examples.
- Examples:
 - **University of Minnesota**
 - Proposal: 20-25 pages
 - Presentation: 30-35 min plus Q&A
 - Last about 2 hours
 - **University of Maryland & UNC Chapel Hill**
 - Proposal: 15-20 pages
 - Presentation: 35-45 min with Q&A
 - Last 2-3 hrs in general



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What would help BEFORE I start writing?

- Think about what YOU want to accomplish
- Write a succinct thesis statement/hypothesis
- Discuss your ideas with others
- Present parts of the research at seminars, workshops, PhD workshops, conferences
- Think about 3-4 major contributions/papers
- Formulate these contributions in writing



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Challenges, Frustrations, Misconceptions

- “The proposal is just a hurdle. I can just propose ideas off the top of my head now and then figure out what I really want to do later.” – **the lazy path**
- “How can I propose something when I don’t know the details yet?” – **the unknown path**
- “I don’t know how to organize the different parts of the research on the page.” – **writer’s block**
- “I’m not ready yet. I might as well solve the problems and then present them.” – **postpone, postpone, postpone....**



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How do I GET STARTED writing?

- Examples in your department, with same or different advisor(s), in your area
- Break it down into manageable chunks?
 - Subprojects
 - Writing style: problem statement, hypothesis
 - Organization
 - Overall outline and flow
 - Within each proposed project section



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The Proposal Defense



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Proposal Defense Format

Presentation + Questioning

Presentation mirrors writing highlights



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Proposal Presentation Tips

- Attend others' proposal defenses in your area
- Thank committee, introduce yourself and background
- Practice presentation many times
- Be polite during interruptions with questions
- Have someone take notes of questions
- Be open to suggestions
- Prepare for questions
- Don't be afraid to say 'I don't know' but ask for direction/help on those questions
- Be confident. Don't look to advisor for answers.



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Skit on Oral Presentation

A student, Danni Ma, who is planning for the presentation of her proposal, will talk with Maria Gini about the oral presentation.



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Some Sample Questions

- Topic too large? too small? doable in the timeframe? Focused? What problems haven't you foreseen? What happens if your planned experiments fail (backup plans)?
- Evaluation (plan, statistics, validity)
- Related work missing?
- Practicality/scalability
- Vision of where this can go...



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Last Tips on Defense

- Make sure you know the tough issues and have some answers
- Make sure your plan is reasonable, especially the timeline
- Certain people have go-to questions
 - Watch your committee members on other proposal defenses
 - Especially if your thesis touches on work they have done or know a lot about
- Ask your advisor



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So now you know why....



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Questions?



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More Details on Proposal Sections



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The Introduction

- General, high level problem for people outside area to appreciate
- Quick overview of what state of the art ***does not*** address
- Thesis statement – specific open problem and proposed strategy
- Brief overview of key insights and why your approach is promising
- List of your likely contributions



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Proposed Research

- Overview of project – maybe a figure
- Specific project in steps
- For each –
 - Problem
 - Strategy
 - Details known now
 - Plans for remaining challenges
 - Evaluation plan



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Evaluation: Experimental Design

- Questions you will ask to judge success of your approach
- Independent variables – what is being varied/compared
 - Eg, your technique versus other techniques
- Dependent variables and measures – what is being measured
 - Effectiveness – precision and recall, f measure
 - Cost – efficiency



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Evaluation Methodology continued

- What actions are you going to perform to conduct the experiment?
- Human subjects?



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Research Plan

- What steps do you plan to take next?
- What will you save for post-thesis work? Why?



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Conclusion

- Summary of contributions to the state of the art – intellectual merit
- Repetition of broader impact on society



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