

CS Independent Work Getting Started

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Outline

- What is independent work/research?
- Schedule and course work
- Tips for effective communication
- Summary
- Faculty presentations

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What Is Independent Work?

- Exposure to research
- Opportunity to work with faculty and grad students
- So, what is research?
 - Formally: advance state of art
 - Informally: tell people something new

What Is Research and What Is Not?

- Non-research
 - My advisor gave me this mpeg decoding algorithm
 - I implemented it
 - And it worked
- Research
 - I took two existing mpeg decoders
 - I took some sample movies
 - I studied the decoders qualitatively
 - I measured them quantitatively
 - I concluded why one is better

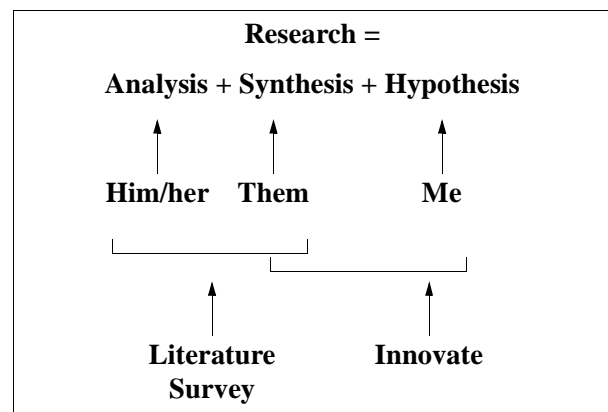
What Is Research and What Is Not? (cont.)

- Research
 - My advisor gave me this mpeg decoding algorithm
 - I implemented it
 - I measured it
 - I analyzed its bottleneck
 - I instrumented the code to prove the hypothesis
 - I recommend and conclude
- Research
 - I was given an mpeg decoding implementation
 - I identified its bottleneck as above
 - I proposed an improvement
 - I implemented the improvement
 - I measured it again to prove/disprove I'm right
 - I generalize and conclude

What Is Research and What Is Not? (cont.)

- Research
 - My advisor asked me to implement an mpeg decoder
 - I came up with 2 alternative designs
 - I analyzed qualitatively why one might be better
 - (I experimented to directly or indirectly deduce I was right)
 - I implemented the best design
 - I summarize and conclude
- Research
 - Many other possibilities...
- So, what is research?
 - Formally: advance state of art
 - Informally: tell people something new
 - Not necessarily much more work
 - Just need to "go the extra mile"

What Is Research?



Other Traits of a Good Project

- Interesting/important problem
- Non-trivial challenge(s)
- Exploration of new technology
- Can be finished in allotted time
- Effective communication (talks, reports)

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Who Does Independent Work?

- AB students
 - Junior independent work (JIW) for two semesters
 - Senior independent work (SRT) for two semesters
 - Automatically registered
- BSE students
 - At least one semester during junior or senior year
 - Encourage more than one semester (2nd semester counts a departmental)
 - Juniors: cs397 in fall, cs398 in spring
 - Seniors: cs497 in fall, cs498 in spring

Independent Work Schedule

(cs397, cs497, csJIW)

- By 10/6: Project plan
 - Find an advisor and a project
 - Fill out an “Independent Work Project Form”
 - Register on-line
- 10/13 to 10/15: Project proposal talks
 - 5 minute presentation to students and prof.
- During the project
 - Work 10-15 hours per week
 - Meet regularly with your advisor
- 11/17: Project checkpoint
 - 4-5 slides report progress and remaining plan
- 12/9 to 12/12: Project results talk
 - 13 minute presentation to students and profs.
- 1/5: Final written report

Independent Work Schedule (csSRT and BSE Thesis)

- By 10/13: Project plan
 - Find an advisor and a project
 - Fill out an “Independent Work Project Form”
 - Register on-line
- 10/20: Project proposal talks
 - 8 minute presentation to students and prof.
- During the project
 - Work 10-15 hours per week
 - Meet regularly with your advisor
- 11/21: Project checkpoint
 - 4-5 slides report progress and remaining plan
- 12/9 to 12/12: Project results talk
 - 13 minute presentation to students and profs.
- 1/5: Progress report

Find an Advisor and a Project

- Get info about profs’ research
 - Independent work page, home pages, research papers, word of mouth, ...
- Schedule meetings with several profs
 - email, office hours, appointments
- Choose a prof
 - Must be from CS dept.
 - Can be jointly advised by someone outside
- Profs on sabbatical: Perry Cook, Adam Finkelstein, Andrea LaPaugh

Find an Advisor and a Project (cont.)

- Decide on a project
 - Profs suggest choices
 - Students come up with their own
 - A combination
 - Mutual agreement, interest, enthusiasm
- Submit “Independent Work Project Form” and register on-line

Find an Advisor and a Project (cont.)

Past popular topics/areas that may not be obvious research areas of profs:

- Game playing (appel, schapire)
- Robots (chris.rogers @tufs.edu, rywang)
- Education aids (bwk, wayne)
- Language recognition/translation (bwk, schapire)
- Wireless (dpd, rywang)
- Display wall (benshedd, li)
- Cross-discipline (econ, history, math, psych, wws/politics, sociology, etc.) (**bwk**, ken, wayne)

Project Proposal Talk

- Problem description
 - What am I going to do
 - Why is it important
 - Why is it hard
- Approach
 - Previous approaches
 - My approach
 - Why is mine better
- Methodology, milestones, deliverables
 - Specific steps
 - What steps/deliverables will be done by checkpoint
 - What other steps/deliverables will be done by end of semester
 - What might be hard and what's the fall-back plan
- Summary

Project Proposal Talk

- Don't have to talk about everything
- But include everything (in "notes" section or other places)
- Be specific, give details of plan
- Tell me what's the new/clever/cool nugget
- Proposal talk is **not** your starting point: much preliminary work should have gone into the project by then

Project Proposal Talk and Beyond

- Scope
 - Not too little
 - Not too much (carve out a subpiece, limit functionality, reduce measurements)
 - If you're ambitious, have a longer term plan but the short term plan should still be doable
 - Don't be afraid of negative results
 - Have intermediate results
- Be conscientious
 - Start early
 - Define small milestones for yourself
 - Work continuously to meet milestones
 - Meet with your advisor regularly
 - Don't hesitate to get help

Project Checkpoint

- 4-5 slides
- What you proposed to have done by checkpoint
- What you have actually accomplished by checkpoint
 - Steps
 - Deliverables
- Difficulties/surprises/deviations?
- What more do you expect to do
 - Steps
 - Deliverables

End-of-Semester Talk

- Review the problem description and proposed approach---give “the theme”
- Give details (eg., of implementation) to support “the theme”
- Give key results to support “the theme”
- Summarize “the theme”

End-of-Semester Report

- Introduction
 - Background
 - Problem description: include goal
- Approach
 - Previous approach(es)
 - My approach
 - Why is mine better
- Detailed description of methodology or implementation
- Experimental results
 - Analyze/interpret data, don't just give numbers
 - What does this have to do with your theme?
- Conclusion
- Acknowledgements and bibliography

Grading

- Project form/registration: 1%
- Proposal talk: 7%
- Checkpoint: 7%
- End-of-semester talk: 15%
- End-of-semester report (may include “participation”, “draft”, general quality/difficulty of work, etc.): 70%

- No grade inflation!
- All steps count

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Effective Writing

- Concepts
 - Focus on key ideas
 - Expose, weave it in the body, conclude
 - Why, not what
 - Don't get trapped by details and artifacts
- Flow: be a good story teller
 - Pay attention to order, and smooth transitions
- Simplicity
 - Simple exposition, simple styles
 - Make it intuitive rather than formal
 - Be specific, use examples
- Pitfalls
 - Too vague: for example, no examples
 - Contributions none-obvious
 - Too much "what", not enough "why"

Ten Commandments of Giving a Bad Talk

- Thou shalt not be neat
- Thou shalt not waste space
- Thou shalt not covet brevity
- Thou shalt cover thy naked slides
- Thou shalt not write large
- Thou shalt not use color
- Thou shalt not illustrate
- Thou shalt not make eye contact
- Thou shalt not skip slides in a long talk
- Thou shalt not practice

Talk Tips - Edit

- Focus on key ideas
- Choose carefully a sub-story out of a full story
- Understand the nature of oral communication (no pause, no rewind)
- KISS (keep it simple, stupid)
- Repetition is useful
- Give outline: some amount of predictability is comforting
- Explain, interpret, justify, not just describe
- Write large
- Use color, but sparingly, consistently
- Use pictures (and even animations)
- No full sentences (just terse outline)
- Make the sub-story coherent and self-contained
- One corollary: no standalone graphs

Talk Tips - Preparation

- Practice
- Dry run followed by slide-by-slide analysis
- Pay attention to time and practice for time
- Practice for varying audience backgrounds

Talk Tips - Presentation

- Speak clearly, make eye contact
- Don't read slides
- Pay attention to posture
- Eye contact, shift gaze
- Plan on shedding slides
- Admit shortcomings, don't wait for questions
- Analogies and jokes can help

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Summary

- What is research?
 - Teaches people something new
- Course work
 - Be conscientious and stick to a plan
- Effective communication
 - Stick to a theme and tell a good story