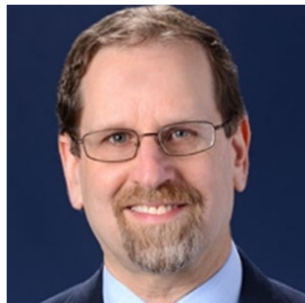# GETTING STARTED: COMPUTER SCIENCE INDEPENDENT WORK

SPRING 2024
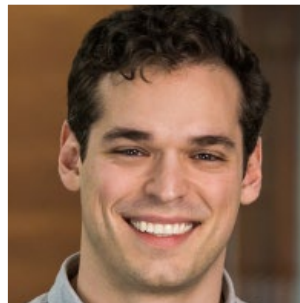
DR. ROBERT FISH, DR. ZACHARY KINCAID, MIKKI HORNSTEIN, & KOBI KAPLAN

WELCOME!

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OUTLINE FOR THIS SESSION

- Outstanding IW Awards – Fall 2023

- Overview of independent work in Computer Science

- Details of important steps and deadlines

- Resources for more information and help

CONGRATULATIONS!

Fall 2023 Outstanding Independent Work

Brandon Cheng
Business Resilience: Investigating Changes in Company Language During Crises

Adviser: Christiane Fellbaum

Jessica-Ann Ereyi
Python for the Java Programmer

Adviser: Robert Fish

Meghan Harrington
Visualization Tool for Space- and Time-Oriented Phylogenetic Trees

Adviser: Ben Raphael

Arnav Kumar
ViewDiff: Generating Novel Views for Complex Scenes with a 2D-only Diffusion-Based Approach

Adviser: Felix Heide

Sarah Pedersen
Does Gen Z have a "privacy paradox?" Surveying Cross-Generational Understandings of Online Privacy

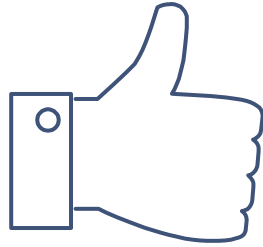Adviser: Mihir Kshirsagar

Evan Wang
CompGPT: Probing the Compositional Understanding of Visual Language Models

Adviser: Felix Heide

LET'S GET STARTED!

What Is Independent Work?

■ Independent Work (IW):
An individual project to study an idea in depth.

■ Examples:

➤ Algorithm

➤ System design

➤ Problem formulation

➤ Benchmark suite

➤ Proof of a theorem

➤ Application

➤ Investigate a dataset

➤ Etc…

Why Do Independent Work?

- Study a topic in depth
  - Dive into much more detail than is possible in a course
- Learn important skills
  - Technical writing, speaking, project management
- Work closely with faculty
  - Meet weekly, get advice, get to know them, etc.
- Do something interesting to talk about in…
  - Grad applications, job interviews, etc.
- Have fun!!

Types of Independent Work

- Spring One-Semester Project
  - All AB juniors and some BSE juniors/seniors
  - Designed for one term, but can be followed by a related project in a later semester
  - IW seminar, or one-on-one/individual advising

- Two-Semester/Thesis
  - All AB seniors and some BSE juniors/seniors
  - Designed for a full year
  - One-on-one/individual advising

IW Seminars

- Same as one-on-one projects, but students work on related topics and meet with an advisor together.
    - ➤ Enables collaborative projects
    - ➤ Enables sharing of infrastructure
    - ➤ Enables feedback to/from other students
- Targeted at first-time IW students
    - ➤ Provides more help on how to choose good projects, how to manage time, how to design talks, how to write papers, etc.

Important Steps and Deadlines: Spring 2024 Projects

February 15:   SEAS Funding Application due by 5:00pm

February 22:   Written Project Proposal due, 11:59pm

March 9:   Checkpoint Form due, 11:59pm

March 26:   Attend How to Give an IW Talk

April 9:   Attend How to Write an IW Paper

April 14:   Oral Presentation Slides & Link to Video due, 11:59pm

April 28:   Written Final Report due, 11:59p

https://www.cs.princeton.edu/ugrad/independent-work/important-steps-and-deadlines

QUESTIONS SO FAR?

Onto the specifics…

Written Project Proposals

- Submit a written description of your project plan
- Logistics:
  - ▷ Due February 22, 11:59pm Eastern
  - ▷ 1-2 page paper
  - ▷ Submit PDF document via IW portal

Written Project Proposal (Continued)

- Motivation and goal
  - "The goal of my project is…"
- Related work
  - Survey of prior work with similar goals
- Approach
  - Key novel idea
- Implementation plan
  - Things you plan to implement
- Evaluation Plan
  - Experiment design, data, metrics, comparisons

Checkpoint Form

- Write a short summary of what is done in the first half, and what is planned for the second half
- Logistics:
  - Due March 9, 11:59pm EDT
  - Write two paragraphs
  - Submit via IW portal
  - Get feedback from advisor

Oral Presentation

- Give a **nine-minute** talk about what you've done over the whole semester
  - ► Required for all seminar students, and any first-time BSE students.
- Logistics:
  - ► Attend "How to Give an IW Talk" on March 26
  - ► Submit slides and video link via IW portal by April 14 at 11:59pm
    - ► Note: You must submit your FULL slide deck by the deadline above

Oral Presentation (Continued)

- Video-recorded oral presentations
  - Record your oral presentation via Zoom, or
  - Select another way to record your oral presentation (Loom, etc.)
- Save your recording either on Zoom or in Google Drive
  - Submit a **link** to your recording to the IW portal
- Submit a pdf of your slides to the IW portal
- Seminar students: your instructor may ask you to practice or present in your group meeting, as well
- One-on-one students: your adviser may ask you to present to their research group, as well

Oral Presentation (Continued)

- Motivation and goal
  - "The goal of my project is…"
- Related work
  - Survey of prior work with similar goals
- Approach
  - Key novel idea
- Implementation plan
  - Things you implemented. How did you do it? What remains to be done?
- Evaluation
  - Experiment design, data, metrics, comparisons, qualitative results, quantitative results, further results needed
- Discussion
  - Conclusions, limitations, future work

Written Final Report

- Submit a written description of your project, including results and conclusions

Logistics

- Due April 28 by 11:59pm
- Attend "How to Write an IW Paper" on April 9
- Submit PDF via IW portal
- 20-25 pages, double-spaced, plus appendix

Final papers submitted after 11:59pm on the due date will be assigned a 1/3 grade deduction.

Written Final Report (Continued)

- Motivation and goal
  - "The goal of my project is…"
- Related work
  - Survey of prior work with similar goals
- Approach
  - Key novel idea
- Implementation
  - Things you built. How did you do it? ~~What remains to be done?~~
- Evaluation
  - Experiment design, data, metrics, comparisons, qualitative results, quantitative results, ~~further results needed~~
- Discussion
  - Conclusions, limitations, future work

Additional Important Information

https://iw.cs.princeton.edu/portal

Manage your independent work

Spring 2024

Advisor	Fish, Robert
Written Proposal Due: 2/22/2024 11:59 pm	➜ Submit File
Checkpoint Form Due: 2024-03-09	➜ Click to complete form
Oral Presentation Due: 4/14/2024 11:59 pm	➜ Submit File
Oral Presentation Video Link Due: 4/14/2024 11:59 pm	➜ Click to complete form
Written Final Report Due: 4/28/2024 11:59 pm	➜ Submit File

Funding

- Project-related expenses:
  - Unusual hardware, software, data sets, etc.
- Available funds:
  - School of Engineering and Applied Science
    - Requires an adviser signature, **don't procrastinate!**
  - Support up to ~$500 or more with justification ($300 max for cloud computing services)
  - Open to ANY computer science student
  - Student Activities Funding Engine (SAFE)
    - http://www.princeton.edu/studentfunding

Collaboration

- **INDEPENDENT** Work
  - ➤ Every student must do their own project
- Collaboration
  - ➤ Multiple IW projects can be synergistically part of a larger effort, either with other IW students, or grad students
  - ➤ Each student must carve out a distinct part with a clear goal, novel idea, evaluation methodology, etc.
  - ➤ Each student must submit their own work
  - ➤ Each student will be graded separately

Grading

- IW must be taken for a grade
- Grades are recommended by instructor, confirmed by IW Coordinators

- Grades will depend upon:
  - Student initiative and contribution: the creativity and originality of student ideas and/or degree of technical challenge undertaken
  - Student progress: content, amount of work accomplished to date, clarity and polish of presentations
  - Student presentation and paper: content, eloquence, organization and clarity

Grading (Continued)

- Majority of grade will depend upon quality of work
  - But, poor presentation and/or missing checkpoints will also have an impact

- **Final papers submitted after 11:59pm on the due date will be assigned a 1/3 grade deduction.**

Grading (Continued)

- A-level
  - ➢ Clear contribution – interesting, creative
  - ➢ Solid execution and results – refined and tested
  - ➢ Excellent talks, papers – thoughtful, thorough
  - ➢ Student has taken initiative and led project
- B-level
  - ➢ Not-so-innovative – possibly obvious from previous work
  - ➢ Working execution and results – not fully refined and tested
  - ➢ Complete papers and talks – limited insights

Grading (Continued)

- C-level
  - Not innovative
  - Unfinished or not working implementation
  - Report looks like workbook or lab report

- D-level
  - Nothing interesting attempted, nothing gained
  - Report is stream of consciousness

Common Mistakes

🚫 Mistake: Delaying project planning until last minute

➤ Instead: Get started right away

🚫 Mistake: Postponing meetings with your advisor

➤ Instead: Try to meet once a week, even if it's a brief meeting

🚫 Mistake: Allowing yourself to get stuck

➤ Instead: Talk to your advisor; don't avoid them when you are stuck

➤ TA's are assigned to every seminar. Use them!

Common Mistakes (Continued)

🚫 Mistake: Putting off work until the end of the semester

➤ Instead: Work consistently during the semester (10 hours per week, minimum)

🚫 Mistake: Preparing papers and presentations at the last minute

➤ Instead: Iteratively refine. Get feedback from your advisor.

If You're Having Trouble…

- Examples:
  - If you expect to miss a deadline
  - If you have problems with your advisor
  - If you have problems with your project
  - Other factors in your life (e.g. illness, death in the family, etc.)
- If you tell us early, we might be able to help you
  - We can direct you to the right person
- Fixing problems post facto may be much harder
  - Often involves Deans, etc.

LET US KNOW!

Who/What You Can Ask

- Your Advisor:
  - Anything research related
  - Not: "Can I skip the project proposal or final paper?"
- IW Coordinators (Dr. Fish, Dr. Kincaid)
  - Anything about mandatory requirements
  - Not: "Is this research interesting?"
- IW Administrator (Mikki Hornstein)
  - Anything about dates, forms, funding, etc.
  - Not: "Can you give me an extension?"

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How to Ask Questions

- Canvas/Ed – Primary Resource
  - https://princeton.instructure.com/courses/14676
  - Ask IW staff and other students questions about logistics, advice, toolkits, data sets, etc.
- Email Mikki
  - mhornstein (@princeton.edu)

Where to Find More Information

- IW Website:

  - http://www.cs.princeton.edu/ugrad/independent-work

    - Important Steps and Deadlines

    - Guidelines and Useful Information

- Note: These slides will also be available on the website and Canvas

That pretty much covers it.

Let's summarize the key points…

Immediate Next Steps

- Look over the IW website, and be aware of important upcoming deadlines
  - ➤ Important Steps and Deadlines
  - ➤ Guidelines and Useful Information
- One-on-one students: Schedule weekly meetings with your advisor

What to Do in January/ February?

Work diligently to develop your project plan

- ➤ Work hard to define a specific goal

- ➤ Understand all related work

- ➤ Articulate what makes your project novel

- ➤ Know what software and data you will use

- ➤ Have a good idea of what you need to implement

- ➤ Have a specific plan to evaluate your results

Write your project proposal early, get feedback, and refine multiple times.

But the Semester Just Started!

- The first few weeks are really important…

  - A good project plan is key to success

  - It takes time to understand related work, relevant software, and available data sets

  - It take iteration and refinement (multiple meetings with your advisor) to define a good project goal and novel approach

  - Working hard in the first few weeks greatly reduces the chances of ending up with a weak project

My Thoughts on IW at Princeton

- This is your chance to do an in-depth project on a novel topic of your own choosing
  - It doesn't get better than this
  - It's probably why you came to Princeton
  - It's certainly what you'll remember most from your academic career at Princeton
- Take the initiative and BE AWESOME!

THANKS!

Any questions?