Research Methods

CSCI 8901:

What we've learned so far…

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GWU
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Topics so far…

Reading Papers

Selecting Projects

Why Science is Hard

Papers and Conferences

Productivity

Writing

Presenting

Visualizing / Graphing

Grants

Creativity

Jobs

Reading

Recipe: Skimming

1) Read the abstract and introduction
   - Highlight each contribution they claim
2) Look at the title of each section/subsection
   - Guess what it will be about, but don't read it carefully
3) Examine the figures and tables
   - Understand what metrics they will evaluate
4) Read the conclusion and any parts that stand out

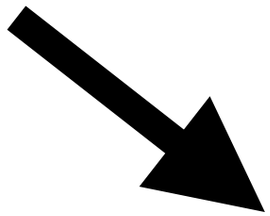
You now know:

- Paper type: theoretical, modeling, implementation, measurement
- The main goals of the paper
- What evaluation the authors think is important

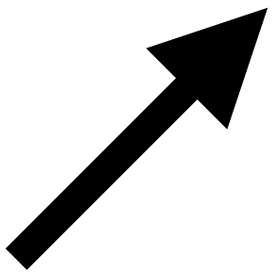
Writing

Recipe: Introduction

But imagine how wonderful it could be if we could figure out how to do X!



My work helps us get one step closer to the magical dream world!



The world is a terrible, terrible place.

Recipe: Introduction v2

There is something new and wonderful!

But everything is hard and terrible!

My work helps us get one step closer to the magical dream world!

Recipe: Starting a Paper

1. Write a 2 paragraph abstract
   - High level brain dump of problem and goals
   - Plan to rewrite this all later
2. Add titles for all sections and subsections
3. Outline key sections
   - One bullet point per paragraph
4. Sketch key figures
   - System design, algorithm flow
   - Predicted experimental results

Experiments

Recipe: Experimental Design

1. Have something to compare against
2. Consider and isolate the most important variables
3. Plan experiments to show:
   - How well your system does **compared** to a baseline
   - **Why** your system does well
4. Predict results and sketch graphs before starting
5. Run experiments
6. Ensure results are repeatable and significant
   - Think about threats to internal and external validity

(Throughout) Iterate and feedback as needed

Presenting

Recipe: Presentation Structure

1. Motivate your problem with an introduction
   - Analogies and stories are great!
2. Limit yourself to three key points
   - Use repetition and consistency to reinforce key ideas
3. Have ups and downs
   - Use pacing and delivery to draw the audience's attention

Bonus tip: have a conclusion/summary to wrap things up!

Recipe: Presentation skills

Speak clearly

Volume, Bad Words

Position your body

Gestures, Posture

Engage the audience

Voice Modulation, Smiles, Eye Contact

Poster

Next class: 12/7

Prepare a poster about your project

- Make a single 24x36 inch slide in a tool like Powerpoint
- Landscape format for easier display on screen

Give a 3 minute research pitch

- Overview the problem - why is it important? what is hard?
- High level description of solution / approach
- Preliminary results or experimental plans
- Conclusion that emphasizes key points

Can use poster slide directly, or break it into smaller zoomed in slides

- Don't make a separate set of slides, pretend that you are standing next to a physical poster and directing our attention to it

Final Report

Due: 12/19

Combination of all material so far:

1. Project Overview (~1 page)
2. Literature Survey (~1-3 pages)
   - Modify based on my feedback if necessary
3. Proposed Approach (~1-2 pages)
   - New text to explain your visual (~1 page)
4. Experimental Design/Results (1-2 pages)
5. Conclusion (0.5 pages)
   - Emphasize a few key points about your results or your design

Prepare this in a format fitting for your end goal

- Latex conference template, Python Notebook, etc

Class Survey

https://forms.gle/aNdUiSJLgHYvpPe58