# Research Methods

CSCI 8901:
What we've learned so far…

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# Mini Tutorials

Plan a **10-15** minute tutorial on a tool/topic

- Mixture of slides and hands-on examples
    - Try to involve class participation
- Practice presenting clearly and interacting with students
- Audience: 1st year CS PhD student
- https://docs.google.com/document/d/1LZPF3IQxqmr4tuyYwvg_cKvBQSDv7Pmi_BSvwkVitIQ/edit#

April 17 - 2x

April 24 - 3x

May 1 - 3x

# Mini Tutorial

Have a good introduction

Why should we care bout this topic / tool?

Follow our presentation skills

Try to be somewhat interactive with the class

# Topics so far…

Reading Papers

Selecting Projects

Treating CS as Science

Why Science is Hard

Papers and Conferences

Writing

Presenting

# 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

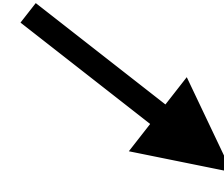4) Read the conclusion and any parts that stand out

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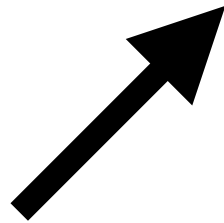- What evaluation the authors think is important

# 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: Starting a Paper

1. Write a 2 paragraph abstract
   - High level brain dump of problem and goals

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

Nancy Duarte on the structure of presentations

- https://www.ted.com/talks/
  nancy_duarte_the_secret_structure_of_great_talks?
  referrer=playlist-how_to_make_a_great_presentation#t-1078519

# 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