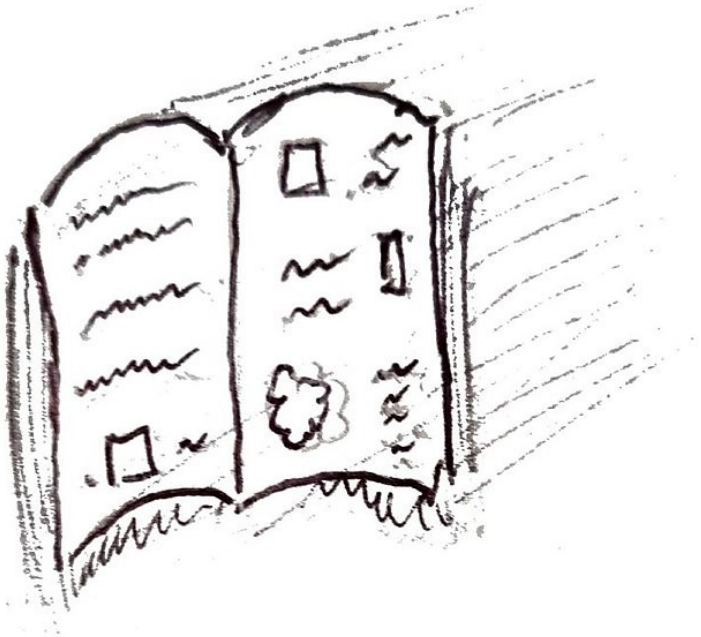
# Writing A Thesis



# Who Am I

**Privacy**|*Lx*

# Who Am I

# Research Interests

Anonymity

Privacy

Distributed Systems

Applied Cryptography

Access Control

Intersection of Democracy and Cybersecurity

# Writing A Thesis

# Agenda

What is a Thesis?

Dissertation vs Project

Thesis Phases

Scientific Method

How to do a Literature Review

How to Run Experiments

Writing Academic Work

Presenting Academic Work

# What is a Thesis?

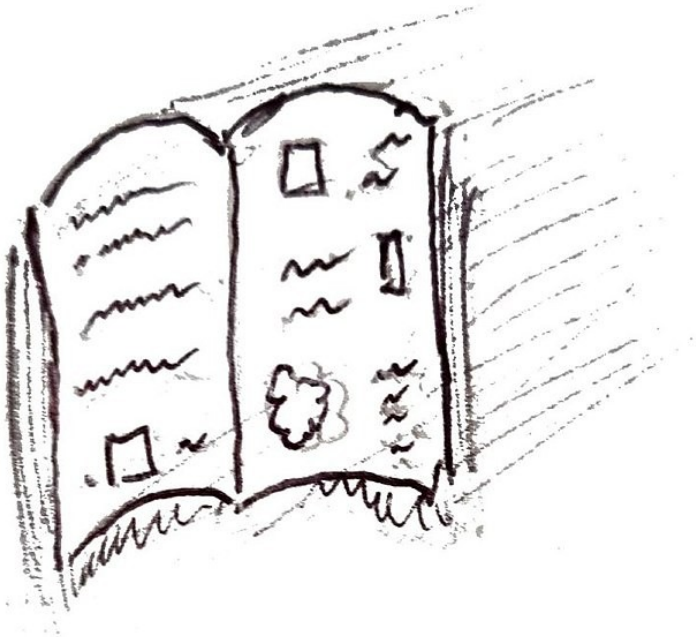
*A thesis is a dissertation advancing an original point of view as a result of research.*

*A dissertation is a formal or elaborate argumentative discourse, oral or written.*

*An argumentative essay expresses an extended argument for a particular thesis statement, which is a sentence that sums up the central point of your work.*

# What is a Thesis?

- Formal Document
  - Formal document means formal, precise language
- Original Research
  - Literature Review
  - Problem Identification
  - Thesis Statement
  - Scientific Method
  - Evidence based argumentation
- Argumentative Essay
  - Proves a point with evidence

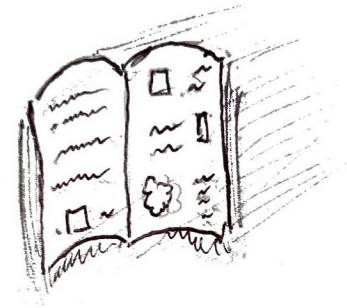


# What is a Project?

- Formal Document
  - Formal document means formal, precise language
- Feat of Engineering
  - Less Scientific
  - Difficult Implementation
  - Problem Solving in Implementation
  - High Quality Artifact
  - Reasonable Evaluation
- Argumentative Essay
  - Proves a point with evidence

# Project and Thesis

- Both Require Writing
  - One is more geared towards scientific writing while the other is more technical writing
- Different Focuses
  - Thesis requires more science, but has some implementation
  - Project requires more implementation, but has some science.
  - Both require problem solving
  - Both take a lot of time!
- Following stages are more useful for a thesis



# Thesis Phases

# Thesis Phases

Preparation

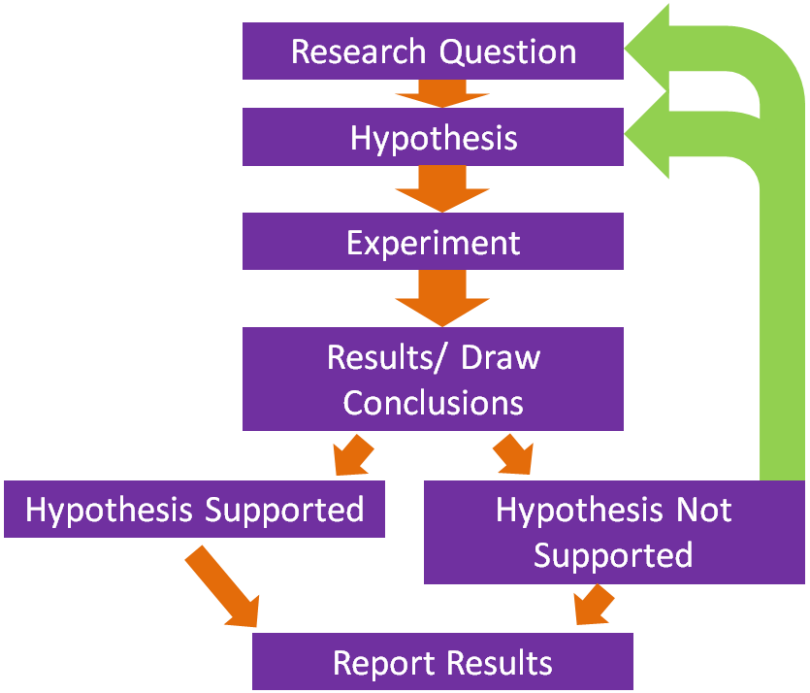
Defense

# Thesis Phases

Preparation

Defense

# Scientific Method



# Scientific Method

1. Define a topic area.
2. Review the Literature.
3. Find an open problem.
4. Formulate a research question.
5. Come up with a hypothesis.
6. Design an experiment to confirm or deny your hypothesis.
7. Analyze the results.
8. Report the results.

# Scientific Method - Example

1. Define a topic area – Deepfake Generation.
2. Review the Literature.
3. Find an open problem – Deepfake UX.
4. Formulate a research question – Can anyone easily generate a deepfake to malign others?
5. Come up with a hypothesis:
    1. Deepfake generation software does not have sufficient usability for non-experts to quickly generate a convincing deepfake.
6. Design an experiment to confirm or deny your hypothesis.
    1. Lab study asking non-experts to generate deepfakes.
7. Run the experiment, and analyze and report the results.

# Scientific Method

A bad deepfake of me.

# Scientific Method - Example

1. Define a topic area – Preparation.
2. Review the Literature – Preparation.
3. Find an open problem – Preparation.
4. Formulate a research question – Preparation.
5. Come up with a hypothesis – Preparation.
6. Design an experiment to confirm or deny your hypothesis – Preparation/Elaboration.
7. Run the experiment, and analyze and report the results – Elaboration.

# How To Do a Very Formal Literature Review

1. Develop inclusion/exclusion criteria.
    1. Inclusion criteria – less papers to read, more focused, less complete.
    2. Exclusion criteria – more papers to read, less focused, more complete.
2. Develop a list of Keywords related to the area.
3. Choose a Paper Database.
    1. ACM Digital Library
    2. IEEE Xplore
    3. Others
4. Search with the keywords from step 2.

# How To Do a Very Formal Literature Review

5. Read the title of each paper.
    1. Doesn't meet inclusion criteria – eliminate paper.
    2. Meets exclusion criteria – eliminate paper.
6. Read/Skim abstract of paper.
    1. Meets inclusion criteria – include paper.
    2. Doesn't meet exclusion criteria – include paper.
7. End when you run out of papers.
8. Read  included papers.
9. Write a literature review.

# How To Do a Less Formal Literature Review

1. Start with a seed paper.
2. Read seed paper.
3. Look at all papers the seed paper cites.
4. Look at all papers that cite the seed paper.
5. Repeat this process iteratively (with other papers discovered this way).
6. End when you no longer find papers you haven’t seen.
7. Write a literature review.

# How To Run an Experiment

1. Make sure your research question and hypothesis are well-defined.
2. Isolate variables.
    1. Know which variables you want to control, which you want to measure, and which you want to eliminate.
3. Create an experiment that allows you to control the independent variable and measure the dependent variable.
    1. Choose what metrics to measure and how. This is not always trivial.
    2. Create a careful way to isolate the variables to what you want to measure.
4. Perform the experiment.
5. Analyze and Report the results.
    1. This is complex enough to perhaps require another seminar.

# How To Write Academic Work - Structure

1. Introduction.
    1. Motivate and introduce the problem.
    2. Introduce your solution.
    3. State your requirements and contributions.
    4. Provide a layout of the document (optional).
2. Background (optional) and Related Work
    1. Provide the necessary background needed for people to understand your work.
    2. Discuss the currently existing work in the area.
    3. Always relate everything back to your problem and solution.

# How To Write Academic Work - Structure

3. Method/Design/System Description.
    1. Depends highly on your project.
        1. For systems, describe your system.
        2. For UX work, describe your survey/interview/lab study/cognitive walk-through.
        3. For theoretical work, describe notation, etc.
4. Evaluation.
    1. Describe how you tested your solution.
    2. Provide the results of your evaluation. Tie these back to the requirements in the Introduction.
    3. Compare to other solutions when possible.

# How To Write Academic Work - Structure

5. Discussion. (Optional)
    1. Discuss the implications of your work, if it is not obvious.
6. Limitations and Future Work.
    1. Describe the limitations of your work. This could be:
        1. Sample you collected.
        2. Features you couldn’t implement in your system.
        3. Simplifications or assumptions in the problem you wished to solve.
    2. Future work can address these limitations as well as apply your techniques to other areas.
7. Conclusions.

# How To Write Academic Work - Tips

1. Write formally.
    1. “There’s a lot of problems in John Doe’s paper.” → “The work of Doe et al. [1] has several limitations.”
2. Use concise and precise language.
    1. “Although any signature scheme could be used for these purposes, it was decided to use the elliptic curve digital signature algorithm” → “We use the Elliptic Curve Digital Signature Algorithm (ECDSA) with Curve25519.”
3. Avoid any and all marketing speech.
    1. “We use state-of-the-art algorithms to provide top-notch performance and offer military grade security.” → Eliminate entirely.

# How To Write Academic Work - Tips

4. Use the active voice.
    1. “Whenever a packet is received by AwesomeSystem it prints ‘Awesome.’” → “When AwesomeSystem receives a packet it prints ‘Awesome.’”
5. Any claim that is not common knowledge or proved in your paper must be cited.
    1. “Curve21559 grants 128 bit security.” → “Curve21559 [1] grants 128 bit security [2].”
6. Define acronyms before using them.
7. Have others read and critique your work.
    1. Especially if they know CS but don’t know your thesis area.
    2. Peer review with other people in this room.

# How To Present Academic Work - Tips

1. Practice, practice, practice.
    1. Practice with other people, not just alone.
2. Don’t memorize a script.
    1. It looks false and makes you appear less confident.
    2. Memorize bullet points instead.
3. Your presentation is meant to aid you, not replace you.
    1. Less text is better!
4. Speak with confidence!
    1. Uhm → “Therefore,” or “However,” etc.
    2. Eye contact is key!

# How To Present Academic Work - Tips

5. Movement should be well considered.
    1. Move to emphasize a point.
    2. Move to make a transition in thought.
    3. Don’t sway!
6. Use inflections in your tone of voice.
    1. Sometimes these can convey a message better than actual words.
    2. See: https://www.youtube.com/watch?v=8S0FDjFBj8o

# Thank You

# Questions?