Qual Mentoring Session
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Overview

This talk is broken into four sections

- Purpose
- Structure of a formal presentation
- How to deliver a formal presentation
- Handling the Q&A

There will be time for discussion
PURPOSE OF THE QUAL

Joseph Fernandez
What it is

A model conference

- Write and submit a paper
- Present the research
- Respond to questions

A test of your confidence and ability to present

- They want to know you can represent CMU
What it isn’t

A review of your research

• You don’t even have to present original work ★

• That happens at your proposal & defense

A chance for profs to make you look dumb

• Your committee is not out to fail you
What do they want to see?

• Demonstrate understanding of research

• Know the fundamentals of your area

• Ability to speak in front of an *adversarial* audience
Research

That you understand what research is

- Clear statement of your contribution

- Understanding of the *strengths and weaknesses* of your work 🌟

- Understanding of how your work relates to the three background papers
Results
PER vs. Distance

Note: 95% confidence intervals
Fundamentals

That you know the fundamentals of your area

- Exactly what this is depends on your research area
- Demonstrate both breadth across your area and depth of knowledge
- The ability to solve simple problems and work through difficult ones
- The process is more important than the solution

My experience with this

- Style of questioning
- Topics of questions
- 3 hours goes by fast!
Speaking

That you can speak in front of an adversarial audience

• Clear presentation of your ideas

• The ability to think on your feet and respond to questions

• Stand up to scrutiny, they want to see how you react when someone is critical of your work 🌟
Do I need good results?

No, but it helps

• If your work has a clear and meaningful result, then presenting it is easier.

If your result is negative

• an understanding of why it did not work is critical

• if possible, have an idea for fixing it
Do I need good results?

What about preliminary work?

• You must have *some* result, you need a conclusion

• Have a clear plan of action for continuing the work

• Say what you expect to see...and why
So...what’s the purpose?

The exam is designed for you to pass

- Don’t let yourself get intimidated.

Practice! Practice! Practice!

- in front of an audience

Study! Study! Study!

- don’t memorize, understand the concepts

At least it’s not a Scantron
Joey’s Quick Tips

Before the qual:

1. Study! Brush up on your fundamentals.
2. Work problems on a whiteboard.
3. Know classic/typical problems in your field.
4. Study your presentation and paper. Know EVERY word. This is what you will get asked about.
5. Practice your presentation to friends and get feedback. Have them ask you questions and work them out on the whiteboard.
6. Confidence is the MOST important thing. Know what you did, and don’t get flustered.

After the qual:

1. Tell your advisor how it went (email them if they are out of town)
2. Forget about it!
3. Go home, relax, and don’t think about it.
Nicholas O’Donoughue

PREPARING YOUR SLIDES
The Importance of Quality Slides

You are presenting your work & **yourself**

A good presentation requires preparation

Slide idea from Markus Püschel, ETH Zürich
Organization

How you arrange your content is crucial

Typical organization

• Motivation and problem statement
• Background and related work
• Contribution/Results
• Validation
• Conclusion

Use slide numbers
Motivation

Explain your problem.

• What? Why? Why is it important?

A precise problem statement will help

You want your committee to care.

• If they care, they will pay attention.

After Motivation: Organization Slide
Motivation: Rapid Detection of Malaria

Malaria caused one million deaths in 2008

• 20% of all child fatalities are caused by Malaria
• Source: World Health Organization

Diagnostics

• Rapid, low-cost tests are needed
• Early treatment is needed for control of the disease
Background

Get everyone on the same page

- 1-3 slides
- Discuss the state of the art
- Briefly describe any assumptions or models
The clutter contains both direct and multipath contributions of the various scattering elements. We assume a **WSSUS** (Wide Sense Stationary, Uncorrelated Scattering) model.

\[ y_c(f) \sim \mathcal{CN}(0, R_{y,c}(f)) \]
Contribution

This section describes your work

• This should be the majority of your slides

Don’t be tempted to copy your paper into slides

• Pick one concept and focus on that.

If they only remember one sentence, what do I want that to be?

• Build your slides around conveying this one sentence.

• Repeat the idea
Time Reversal Mirror (TRM)

Signals are received by the array

Channel scatters waves

Transmit a time-reversed echo

Waves retrace their paths

Validation

You must verify your claims

- Experiments
- Simulations

Help your committee visualize the test

- Photograph the lab setup
- Avoid clutter

Plots/Viewgraphs

- Properly labeled
- Message should be clear
- Avoid clutter
Test Scenario

Bi-static detection

Channel statistics are known

\[ H(\omega) \sim \mathcal{CN}(\mu(\omega), \sigma^2(\omega)) \]

We will compare three detectors

WF – Water Filling
TR – Time Reversal
Ideal TR – Time Reversal with ideal channel knowledge
Detection Results

![Probability of Detection vs. SNR graph]

- **WF**
- **TR**
- **Ideal TR**
Conclusion

If it makes sense, repeat your problem statement

Remember that one idea you wanted to convey?

  • Repeat it here!

Thank your committee
Text versus Images

You cannot read and listen at the same time
Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.
Use graphics

Block diagrams
Combinatorial Signaling Pathways

Source: Nature Reviews Molecular Cell Biology
Vol. 6, no. 11, pp. 872-881, 2005
Equations

Use equations sparingly

• They can bog down a talk, especially if they’re complex

Explain them

• Make sure your committee knows what every variable is

• This can get cumbersome with large equations

\[
\ell_{CDCMF}(R) = \Re \left\{ \frac{(H^T s)_H^H}{\sigma_w} \sum_{m=1}^{M} r_m \right\}
\]

\[
\ell_{CDGLRT}(R, Y) = \frac{1}{\sigma_v^2 \sigma_w^2} \sum_{m=1}^{M} \left\{ 2\Re \left\{ \beta \sigma_v^2 s_B^H \hat{H}^* r_m + \sigma_w^2 y_T m \hat{H}^* s_A^* \right\} \right. \\
-\sigma_w^2 \left\| \hat{H} s_A \right\|^2 - \beta^2 \sigma_v^2 \left\| \hat{H}^T s_B \right\|^2 \right\}
\]
Equations

Sometimes boxes can help to simplify large equations

\[
\ell_{CDGLRT}(R, Y) = \frac{1}{\sigma_v^2\sigma_w^2} \sum_{m=1}^{M} \left\{ 2\Re \left\{ \beta\sigma_v^2 s_B^H \hat{H}^* r_m + \sigma_w^2 y_m^T \hat{H}^* s_A^* \right\} - \sigma_w^2 \|\hat{H}s_A\|^2 - \beta^2\sigma_v^2 \|\hat{H}^T s_B\|^2 \right\}
\]

But this is still dangerous...

- Distracting
- They may ask you to derive it
Take Home Message

• Make your committee care

• Try to convey one idea
  • Tell them what you’re going to say
  • Say it
  • Tell them what you said

• Use visuals

Markus Püschel’s Small Guide to Giving Presentations

• Download and read this guide!
DELIVERING YOUR SLIDES
Delivering Your Slides

There are three ways to look unprepared...

- talk too long
- forget what you want to say
- get too technical

All of these can be solved with preparation
Timing

Timing is very important

• You are allotted 30 minutes to talk
• Set aside at least 5 minutes of this, you will be *interrupted* by the committee
• Practice your talk until you can consistently finish in less than 25 minutes
• Do this in front of an audience, a *minimum* of two times
Timing

Don’t rush your talk

• If you find yourself rushing to finish on time, you’re cramming too much in
• It’s a tough choice, but something must go

Supplemental Slides

• After the end of your talk, create a supplemental section
• Treat this like an appendix
  • Derivations
  • Supplemental experiments
  • Detailed background explanations
• Don’t rely on your supplemental slides, though!
Stammering

Umm..err....well.....

- A little is okay, but this will get out of hand if you haven’t practiced

- If you *practice repeatedly*, this will go away
Technicallity

Unlike a conference

- Your committee members may not all be familiar with your field

It is easy to lose them

- Clean slides and clear visuals help
- Keep it simple!
- Spell out major conclusions, even if they seem obvious
Practice Quals

Schedule at least two

- Invite your lab
- Invite your friends in other areas
- Attend other practice talks

When you get your committee

- Invite the students of your committee members

Logistics

- Book the room for 90 minutes
- Bring food (and mention this in the invite email)
Handouts

Print note page handouts
  • Do this for practice & the qual

In PowerPoint
  • Select “Handouts”
  • And select 3 slides per page

Don’t print supplemental slides

Make sure there are slide numbers!
At the qual...

Dress

- Business casual
- You want to look professional
- Comfort is important
- Bring a bottle of water
At the qual...

Body language

- Maintain eye contact
- If you lose your train of thought, take a sip of water

Speaking

- Speak deliberately and slowly
- Don’t just read the slide
- Pause briefly between slides
  - This projects a sense of control
At the qual...

Laser pointer

• Use it sparingly (if at all)
• Don’t just underline the words as you read them
• Don’t leave it pointed at the screen as you talk
  • It will jitter, making you look nervous

Clarification Questions

• When interrupted, respond clearly and concisely
• Don’t spend a lot of time on the question, there will be time at the end
Before the qual...

- Check out your room beforehand to make sure it has markers, or BYO
- Get up a few days beforehand at the same time as your qual
- Dress in layers
- The room may be too hot or too cold
Before the qual....

Have some fun

“Oh God...don’t even tell me it’s noon”

But not too much
Conclusion

Practice! Practice! Practice!

• It will calm your nerves, and improve your presentation

Simplicity is king

• It is better to ignore a detail than to have the committee miss your basic point
DO IT LATER

The Early Worm is for the Birds.
Q&A SESSION
What will they ask?

Anything in your paper or talk is fair game

Background material related to your paper

• You define the scope of this with your three references
Know every word in your presentation
Answering the question

Take a deep breath and count to three

- If you have water, it’s good to start with a sip
- You want a moment to collect your thoughts

If you are uncertain of the question, say that immediately

- Ask for clarification
- So what I think you’re asking is...

Tell them how you plan to solve it

- Explain your approach
- Pretend you’re a TA, take it step by step
Thinking out loud

The committee wants to see how you think

Staring at the board will not help them

Think out loud and talk through the problem

- Even if you’re wrong, it will demonstrate to them that you know how to attack a problem
When you don’t know

This will happen

• The faculty want to find the *boundaries of your ignorance.*

Ask questions

• By asking them questions, you demonstrate what you’re thinking.
Stay Calm

Be respectful of the committee

• Arguing with them (especially yelling at them) will not help you
• If you believe them to be incorrect, try to calmly make your case

Don’t get defensive

• A critique of your work is not a personal assault

Handle Interruptions

• You must respond well to interruptions
• The faculty may guide you in a collaborative way
Stay Confident

It is easy to get rattled and begin to act nervously

If you feel that you need a break, say so!

Remember, they want you to pass!
Wrapping Up

Don’t procrastinate

Sign up for the Practice Qual announce List

- ece-qual-practice-announce@lists.andrew.cmu.edu

Good Luck!