



Summary & wrap-up

Research Methods for Human-Centered Computing



Summary & wrap-up

Today's goal:

Wrap up the course

Outline:

- Summary and place in the HCC curriculum
- Go over the course materials once more
- Revisit the pre-test
- Course evaluation
- Time for questions



Summary

And the place of this course in the HCC curriculum



Summary

The goal of the course was to introduce you to:

- the scientific method of answering questions
- the evaluation of information from a scientific perspective
- the design of experiments
- non-experimental methods of HCC research
- how HCC research is conducted
- how HCC findings are communicated



Summary

Very broadly, we covered:

- The scientific process (from an HCC perspective)
- Conducting experiments
- Using other research methods
- Writing (and reviewing) papers



Skills

You should now be able to:

- Consume and critique scientific research in HCC
- Use tools of HCC research (e.g., ACM database, Zotero)
- Work in an HCC lab
- Write a scientific research proposal
- Propose and conduct a scientific evaluation of an HCC system



HCC curriculum

M&E part II

M&E part I

TBD

HCI

Quantitative (experiments)

Qualitative

TA / CI

Summative

Formative

Research Methods



HCI

Course contents (roughly):

- Week 1-3: HCI principles and guidelines
- Week 4-6: Contextual Inquiry and Contextual Design
- Week 7-9: Human-Centered Software Design methods
- Week 10-11: Prototyping and heuristic evaluation
- Week 12-13: Think-aloud testing
- Week 14-15: Communicating results

Focus on formative methods (industry perspective)



M&E part I

Course contents:

- Week 1-3: review “experiments” part of research methods
- Week 4-7: correlation, regression, t-test and ANOVA
- Week 8-16: non-linear and multilevel statistics

Practical approach:

Very few formulas

Andy Field’s book on “Discovering Statistics using R”

Homework, midterms and class examples with real data



M&E part II

Course contents:

- Week 1-2: review of M&E part I
- Week 3-4: path models (mediation analysis)
- Week 4-8: psychometrics and factor analysis (CFA/EFA)
- Week 9-13: structural equation modeling (SEM)
- Week 14-16: advanced topics (clustering, Rasch modeling)

Very few people are knowledgeable about this stuff

Gives you a competitive advantage



The scientific process

A final synopsis



Research questions

While doing research:

Derive your research question from your interests and related work (fill a “gap” in the scientific body of work)

When writing a paper:

Put the research question(s) at the end of your introduction

When reviewing a paper:

Was the research question clear? Did it get answered?



Research questions

Review: PICO

P =

I =

C =

O =



Ethics

While doing research:

Submit an IRB proposal for any study involving human subjects

When writing a paper:

Discuss authorship, avoid plagiarism, be honest in reporting your results

When reviewing a paper:

Does the paper meet ethical standards?



Ethics

Review: exempt vs. expedited

Exempt: participants are not at risk; consent not needed

Expedited: participants are at minimal risk (you'll have to describe the way you minimize the risk); consent required, but can be waived



Literature review

While doing research:

Build upon the state-of-the-art in terms of research questions and research methods

When writing a paper:

Discuss the literature in relation to the current paper

When reviewing a paper:

Are important references missing? Does the paper indeed fill a “gap”?



Literature review

Review: ways to cite papers

Types of papers to cite

Avoiding “string citations”

Contextualizing the literature



Experiments

A final synopsis



Hypotheses

While doing research:

Ceteris paribus, select independent and dependent variables

When writing a paper:

Describe them carefully in your intro, related work, or methods section

When reviewing a paper:

Are the hypotheses tested correctly? Are only confirmed hypotheses interpreted?



Hypotheses

Review: mediation and moderation

Most research is more complex than a simple $X \rightarrow Y$

Mediation: $X \rightarrow M \rightarrow Y$ (explains the effect of X on Y)

Moderation: $X * W \rightarrow Y$ (the effect of X on Y is different for different levels of W ... also called an “interaction effect”)



Experimental design

While doing research:

Develop manipulations, choose a within or between subjects design, develop procedures that minimize noise

When writing a paper:

Carefully describe and motivate your design... use screenshots!

When reviewing a paper:

Does the design make sense for the proposed research questions / hypotheses?



Experimental design

Review: within- and between-subjects designs

Benefits and downsides

When to use which?

Also: multiple manipulations (factorial designs)



Measurement

While doing research:

Operationalize your dependent variables and covariates
(may involve scale development!)

When writing a paper:

Describe your measurements (especially scales); motivate
them with related work

When reviewing a paper:

Are the measures accurate and valid?



Measurement

Review: scale development

What are good vs. bad items / scales?

Accuracy and validity

Benefits/drawbacks of behavior vs. subjective measures



Participants

While doing research:

Recruit from the target population

When writing a paper:

Provide demographics, comment on / solve any mismatches

When reviewing a paper:

Given the participants, are the results generalizable to the intended target population?



Participants

Review: power analysis

You don't have to be able to *conduct* one, but you should understand the general principles



Statistics

While doing research:

Plan ahead: think about which statistical evaluations you will conduct

When writing a paper:

Show results in graphs (or tables), provide statistical evidence (p-values), present a research model

When reviewing a paper:

Are the stats correct? Do they back up the authors' claims?



Statistics

Review: when to use which stats

You don't have to be able to *conduct* statistical analyses, but you should know e.g. when to apply a t-test vs. an ANOVA



Other methods

A final synopsis



Surveys

When/why?

Univariate or multivariate research questions that are correlational in nature

How?

Like an experiment, but without manipulations

Drawbacks

No *ceteris paribus*; hard to get rid of confounding variables



Surveys

Review question:

Two studies demonstrate a relationship between X (e.g. Facebook use) and Y (e.g. academic success). One is a survey, the other is an experiment.

Discuss the benefits and drawbacks of each approach

Which study is more conclusive?

Which study is more ecologically valid?



Think-aloud

When/why?

Find usability problems with a system (that is under development)

How?

Develop a (paper) prototype, ask the participant to use it while thinking aloud, analyze the breakdowns

Drawbacks

Purely formative; can be “expensive”



Think-aloud

Review question:

You identify a usability issue through heuristic evaluation, but when you do a think-aloud test with 5 real users, the problem does not occur.

Why would this happen? Would you still fix the issue?



Contextual inquiry

When/why?

Understand a work practice (with the goal of developing a system to support it)

How?

Observe people doing the work, ask questions, create work models, use them as a basis for redesign

Drawbacks

Very time-intensive; step from modeling to redesign can be difficult



Contextual inquiry

Review question:

How would you do a contextual inquiry with football coaches (assuming they can't answer your questions during the game)?



Diary studies/ESM

When/why?

Study something (e.g. system use) that occurs throughout the day

How?

Ask participants to report notable events as diary entries (in ESM: prompted)

Drawbacks

Can be hard to set up; requires a lot of participant effort



Diary studies/ESM

Review question:

How would you use these methods to study technology use among people who use the CATbus?

Think about triggers, prompts, and questions to ask



Participatory design

When/why?

Eliciting new product ideas based on extensive user input

How?

A collaborative design activity; interpret the process and the output

Drawbacks

Requires participant commitment; preparation



Participatory design

Review question:

How do you use the designs generated during participatory design in your work?



Design research

When/why?

A qualitative method to evoke theory through design

How?

Reflect on the design process and/or use the design as a prop in an observational study

Drawbacks

Difficult to impart scientific rigor



Design research

Review question:

How would you use this method to study technology use among people who use the CATbus?

E.g. create a (number of) design(s) and reflect on what they stand for

E.g. put an evocative technology in the bus and observe user reactions



Grounded theory

When/why?

A qualitative method to evoke theory through observation and interviews

How?

Conduct semi-structured interviews; iteratively analyze the results to develop theory

Drawbacks

Difficult to guide the analysis without bringing in your own preconceptions



Grounded theory

Review question:

How do you bring related work into a grounded theory paper?



Course evaluation

Please fill it out!



Course evaluation

Research shows that:

Student evaluations of teaching (SET) do not meaningfully correlate with teaching effectiveness

SETs correlate with many other factors, e.g. class size and time, whether a classroom has been renovated, students' grade expectations, and instructors' perceived gender, race, age, and attractiveness

Comparing numerical averages eases an administrative burden, at the expense of marginalized groups, including those protected by federal anti-discrimination law



Course evaluation

Please fill out the course evaluation at:

clemson.edu/course_eval/?it=s