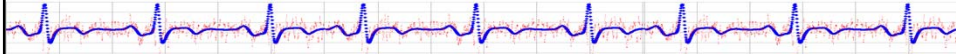


Empirical Research Methods in Information Science

IS 4800

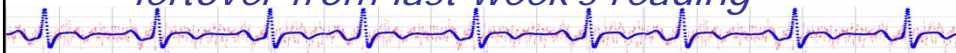


Lecture 4

1

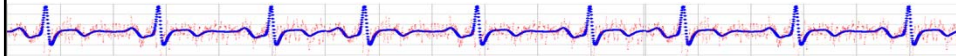
Science Gone Bad

leftover from last week's reading



- Intentionally
- Unintentionally

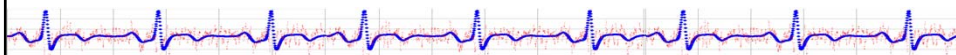
Fraud in research



What kinds of fraud happen?
Why does it happen?
How can you tell?
How is it dealt with?
What prevents it from happening more?

3

Fraud in Research



- Types of Research Fraud
 - Outright fabrication of data
 - Altering data to make them “look better”
 - Sabotage of others’ work
 - Claiming credit for work done by others
 - Attaching your name to a study you had little to do with

4

Gray areas

- Selecting only the best data for publication
- Using the “least publishable unit” rule
 - Deriving several publications out of a single study
- Dropping subjects (data points) without justification
- Fishing by design (sing many outcome measures)
- Post-hoc Fishing (methods, analyses)
- Running subjects until you get your result

- How to avoid?

5

Review: Ethical Principles in Human Subjects Research

- Respect for persons
- Beneficence
- Justice

Identified in Belmont Report and enshrined in all subsequent federal guidelines

7

NU Guidelines for Student Research Projects Involving Human Subjects



- If...
 - normal part of the student's coursework;
 - is supervised by a faculty member;
 - purpose is development of the student's research skills;
 - does not present more than minimal risk
 - does not include any persons under 18
 - does not include any vulnerable populations
 - does not involve any sensitive topics
 - will no result in publication
- Then, can proceed without IRB approval. But,
 - Must submit proposal to instructor first.
 - Must obtain verbal consent.
 - Must give instructor as point of contact if any questions.

8

Example Verbal Consent



"Hi, I'm conducting a survey to find out what people think about putting computers in the Curry center food court. I'd like to ask you some questions and it will just take 5 minutes. It's for a course I'm taking in Research Methods from Prof. Timothy Bickmore in the College of Computer and Information Science. Your participation is voluntary and you can stop anytime and ask that your data not be used. Can you help me out with this?"

9

Homework 12-3 Review

- Describe how knowledge acquired from conducting the study specified in the [sample research plan](#) meets (or does not meet) the criteria for “scientific explanations”.
- Describe the roles that background research play in the sample research plan, giving an example of each.
- Find at least three technical references that relate to the proposed study in different ways. For each, give the full citation, describe how you found it, and describe how it contributes to the research plan.

10

Scientific Explanations

- Empirical
- Rational
- Testable
- Parsimonious
- General
- Tentative
- Rigorously Evaluated

11

Homework 12-3 Review

- Describe how the sample research plan addresses the three ethical principles of (a) respect for persons; (b) beneficence; and (c) justice, discussed in class.
- What is the overall purpose of the “Data and Safety Monitoring Plan” described in Section E.8 of the sample research plan?
- What is the overall point of Section “D.3.4.1 Study Subjects”?

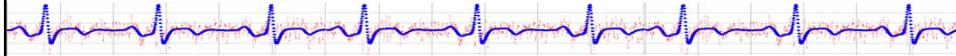
12

Overview of Research Methods

- quantitative
 - descriptive
 - correlational
 - experimental
 - demonstration
- qualitative
 - ethnography
 - case studies
- mixed

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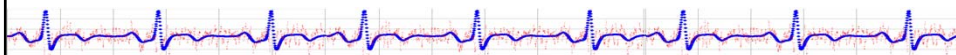
Quantitative vs. Qualitative Research Methods?



- Where did the methods come from?
- Kinds of data
- Kinds of analyses
- Kinds of explanations
- Exploratory vs. Confirmatory
- Generalizable theories/relationships vs. in-depth analysis of particular cases

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Quantitative research methods



- Based on physical science research paradigm
- Important ideas: hypothesis, prediction
- Data in the form of variables: dependent, independent
- Attempts to “prove” a causal relationship between the independent variable(s) and the dependent variable
- Data collected – represented as tables
 - Rows – observations
 - Columns - variables
- Data is analyzed using statistics
- Proof in the form of statistical significance levels

15

Types of quantitative studies

- Descriptive
- Correlational
- Randomized, Controlled Experiments
- Quasi-experiments (“naturally occurring” IV)

Examples:

H1: icons with text labels are better than icons without text labels?

H2: color displays lead to employees spending more hours each day working at their computers

H3: more hours spent on the Internet by teenagers leads to increased psychological and behavior problems

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Advantages/disadvantages of quantitative studies

- + Systematic rules and procedures already worked out, and can be followed
- + Traditional, accepted as “proof”
- Closed-ended questions may lead to ignoring important factors and relationships
- Quantitative methods cannot handle phenomena that are difficult to turn into variables

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Qualitative research methods

- Developed by social scientists
- Used for exploratory studies where important factors not yet identified
- Used for studies involving people's subjective experience
- Used for studies involving social interaction
 - Group identity and cohesion
 - Group decision making

Data collection: field observations, open-ended interviews, focus groups, examining artifacts (manuals, email logs, customer support logs).

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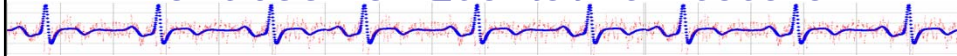
Advantages/disadvantages of qualitative methods

- + more innovative, creative, and exploratory
- + capable of addressing issues that do not lend themselves to being described by variables
- conclusions may be less credible

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Qualitative Research

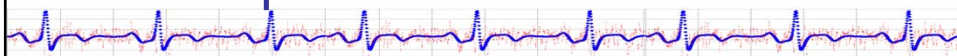
Handbook of Qualitative Research



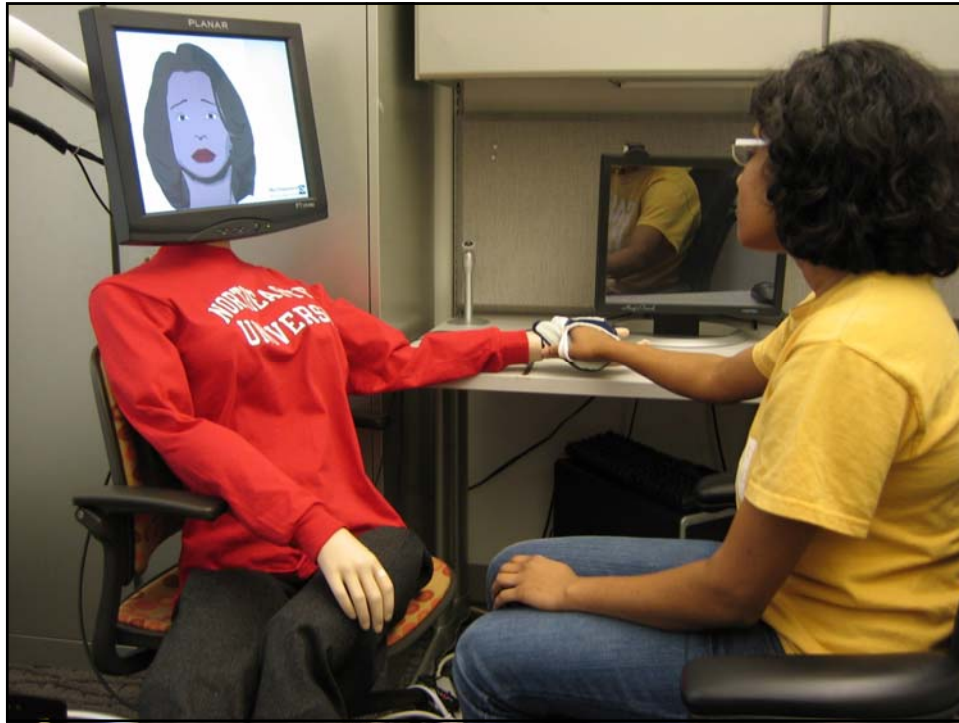
- A situated activity that locates the observer in the world.
- A set of interpretive, material practices that make the world visible... that transform the world into a set of representations.
- An interpretive, naturalistic approach.
- Study things in their natural settings, with interpretation in terms of the meanings people bring to the things they study.

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Example: Touchbot

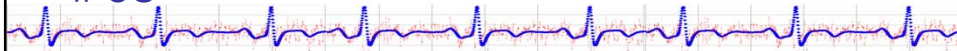


22



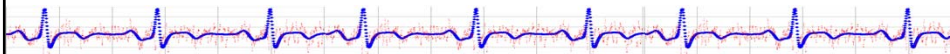
What were your overall impressions?

#08



- "I thought it was interesting. I've worked with a computer before, where you can tell it to do things... like my computer does that.. but the technology's not very good it doesn't hear you very well when it types things. So it seemed like, the recognition was really good. That it recognizes what you say. But the hand thing was weird.. I don't think it really felt natural, it wasn't like, it was squeezing you, it was more like a machine moving, and you're like 'oh, okay, it's moving'."
- "Like I was thinking that if it was really grasping you then the fingers should move too, coz it was only just coming from the palm, so only felt that movement and not the rest of the hand, so that's why it didn't feel real."

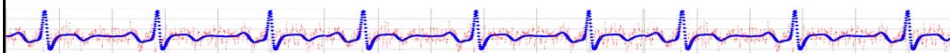
What were your overall impressions?



- #09
- "I really thought it was very helpful, very informative and the information was presented in a non-threatening way. It helped my attention, and I think, although I know about skin cancer, about the SPF factors, I learned more today."
- #10
- "I thought it was weird to have the body"

25

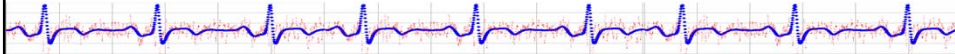
What were your overall impressions?



- #11
- "I found it interesting. And, I've never conversed with a computer character, and it wasn't as bizzare or strange or disturbing as I ever might have anticipated. The material was well presented, ..."
- "The handshake, I think, needs some work. Not the handshake, the hand squeezing. I just found that, if you're trying to convey reassurance that it seems, um, distracting and/or even unproductive, because, it doesn't, the times that it would occur, seemed off, somehow. I'd have to study that more, be a part of, I think you could do just the hand squeezing focus, aspect, of this, I think if you wanted to make it more effective. Because once with all this conversation, and answering and so forth, and all of a sudden this glove will start puffing off her, and it seems like some sort of puff-out kind of apparatus as opposed to squeezing of the hand."

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What were your overall impressions?

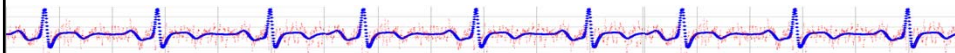


- #18
- "Enjoyable, very different, very comfortable"

- #19
- "I think it was kind of weird, once she was squeezing it, because you can't predict it, so that I kind of freaked me out I startled every time she was squeezing it..."
- "At first I tried to like figure out a pattern to figure out when she would squeeze it, but I couldn't. It was kind of normal.. I was like, I felt like I was reacting like I would to like a normal person, like I found myself nodding..."

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What were your overall impressions?



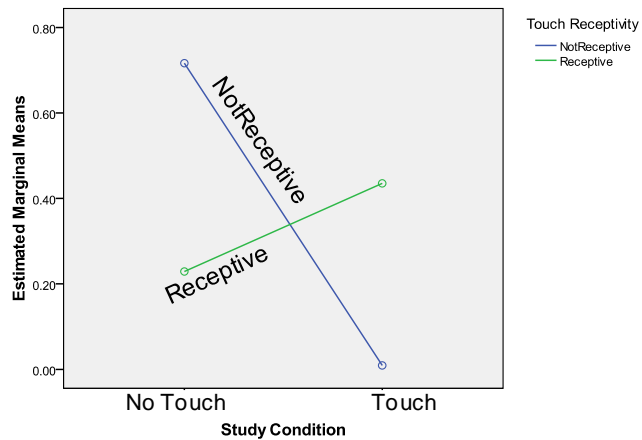
- #20
- "It was very awkward"

- #22
- "It was awkward interacting with laura, and it made it hard to concentrate on some of the things that she was saying"

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Empathic Touch

Estimated Marginal Means of Change in WAI Over Baseline

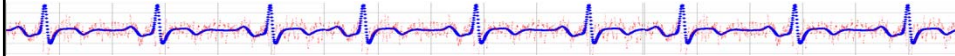


Analytic Induction *when to stop recruiting?*

1. Phenomenon tentatively defined
2. Hypothesis is developed
3. A single instance is considered to determine if hypothesis is confirmed
4. If hypothesis fails, then phenomenon or hypothesis is redefined
5. Additional cases are examined and, if the new hypothesis is repeatedly confirmed, some degree of certainty results
6. Each negative case requires that the hypothesis be reformulated until there are no exceptions

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Mixed Methods



Pragmatic philosophy – find out whatever you can using whatever methods are possible

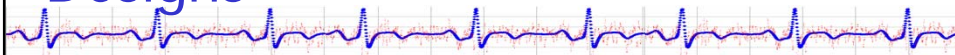
Involves both qualitative and quantitative elements
→ (at least 2 stages of research)

Advantages/Disadvantages

- + combines structure and flexibility
- requires more time and resources

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Examples of Mixed Method Designs

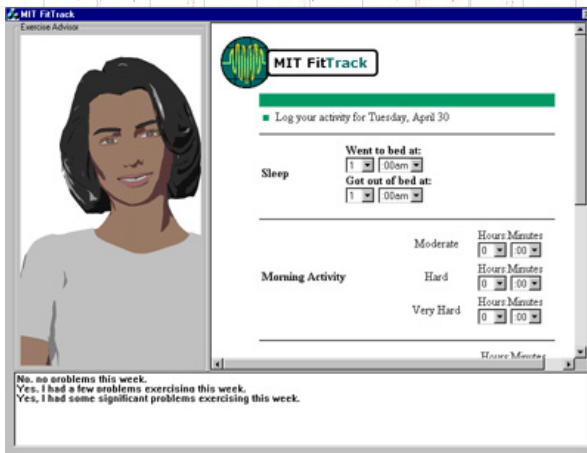


Pattern 1: “instrument” data followed by in-depth interview to get insight on the reasons for the observed relationships and capture any insights you overlooked in study design

Pattern 2: exploratory study followed by survey or experiment to generalize the results – representative of a long-term research program

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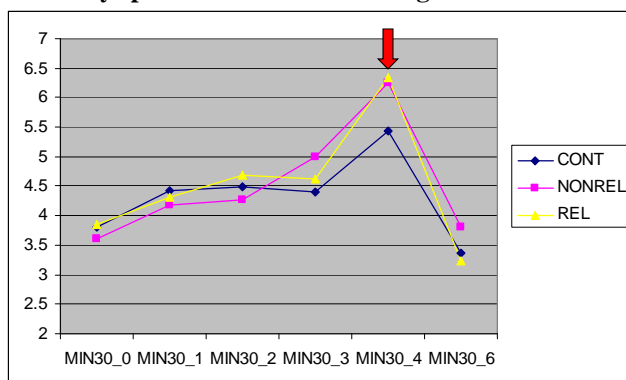
Intervention Efficacy Study: MIT FitTrack



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Behavioral Results

Days per week over 30 minute goal

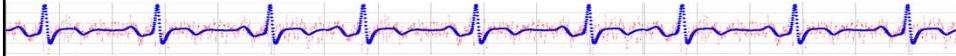


Only difference between groups is WK4, CONTROL < AGENT $p=.06$

Significant increase WK0-WK4 $p<.001$
Significant decrease WK4-WK6 $p<.001$

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Qualitative Analyses Laura as Motivator



■ Most felt responsible to her

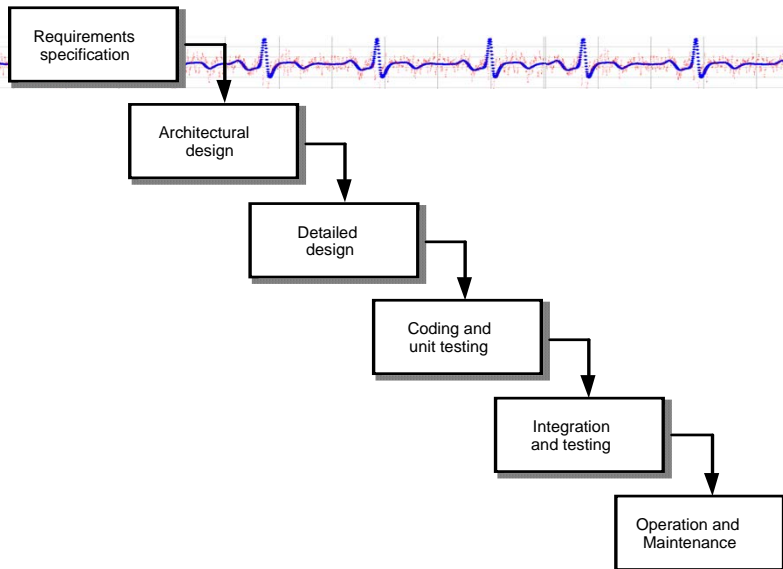
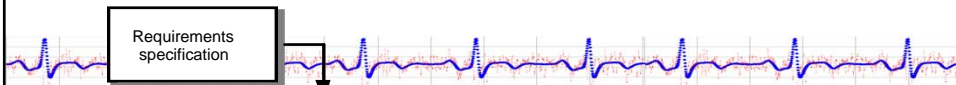
When I said I couldn't exercise I felt bad. When she said "are you sure you can't exercise?" it would make me think about it. (NON-RELATIONAL)

It sort of kept me motivated, because I always do more if I know I'm responsible to someone. (RELATIONAL)

It kept you on your toes because you didn't know if you were going to meet with the animated person. (RELATIONAL)

As silly as it sounds, I find that I found a little motivation to exercise knowing that Laura would ask if I did or not. Now that I don't have anyone checking, I find it harder to get motivated. (RELATIONAL)

When to do which studies?



Some Qualitative Research Methods

- Content analysis
- Case Study
- Ethnography

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Content Analysis Example

- You want to review all 14,000 emails sent to customer support over the last year to determine
 - How many of them have positive things to say about your company.
 - What they like best about your products.

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Case Study

- In-depth, longitudinal examination of a single instance or event
 - Not randomly selected; selected for expository or other purposes
- Usually performed retrospectively
- not necessarily qualitative, e.g., time-series analysis
- Types
 - Illustrative case studies describe a domain
 - Exploratory case studies are a way to gather initial information about a new field of inquiry
 - Critical instance case studies review a situation of unique interest (e.g., failure analysis)
- No formal methodology
- Goal: tell a coherent "story" with lessons learned

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Ethnography

The art and science of describing
a group or culture.

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Bronislaw Malinowski

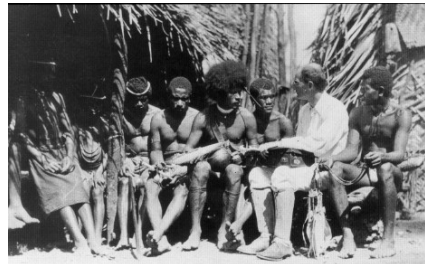
- 1914, Anthropology grad student, traveled to Papua, New Guinea
- He became stranded.
 - WWI, as a Pole from Austria-Hungary in a British controlled area, he was unable to leave.
- After a period in which he actively avoided contact with the native Trobrianders, who he considered to be "savages", Malinowski finally decided, out of loneliness, to participate in their society.
- After he did so, Malinowski learned the local language, formed close friendships with the people and is even rumoured to have fallen in love with one of the islanders.
- It was during this period that he conducted his fieldwork on Kula and produced his theories of Participant observation, which are now key to anthropological methodology



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Ethnography

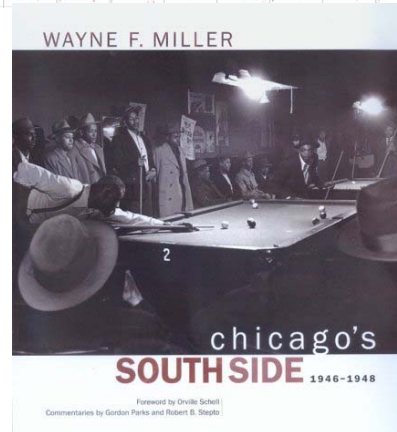
- Invented in 1915 by Bronislaw Malinowski
 - Start of cultural anthropology
 - Purpose: to become intimately familiar with a way of life by living it ("emic" perspective)
 - Method: use multiple sources of info
 - "Things are not what they seem."
 - People can't always tell you what they do.
 - To make authoritative claims about a culture you must have been there, done that.



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Ethnography

- 30's-60's focus on ordinary life
- "Chicago sociology"
- Studies of cat houses, insane asylums, jazz clubs, wine alleys, public toilets, race tracks, etc.



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Ethnography

- Formally – the analysis, interpretation and writeup of all information to form a holistic description.
- "Triangulation" – checking one source against another
- Be aware of your own biases & preconceptions



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Ethnography Fieldwork Methods

- Participant vs. Non-participant
- Overt vs. Covert
- Observation
 - 6 months – 1 year (not!)
- Interviews
 - Formally structured
 - Semistructured
 - Informal
 - Grand tour questions

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Ethnography (Observational Study) Exercise

You have been asked to develop a website to sell eyeglass frames.

As part of your background research, you decide to do an ethnographic study of work practices in an optometrist's office, focusing on interactions between the optometrist and a salesperson.

What questions would you ask?

(Start at 7 min)



4

Example Studies

- Methods?
- Data?
- Findings?



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Example Studies

- Methods?
- Data?
- Findings?



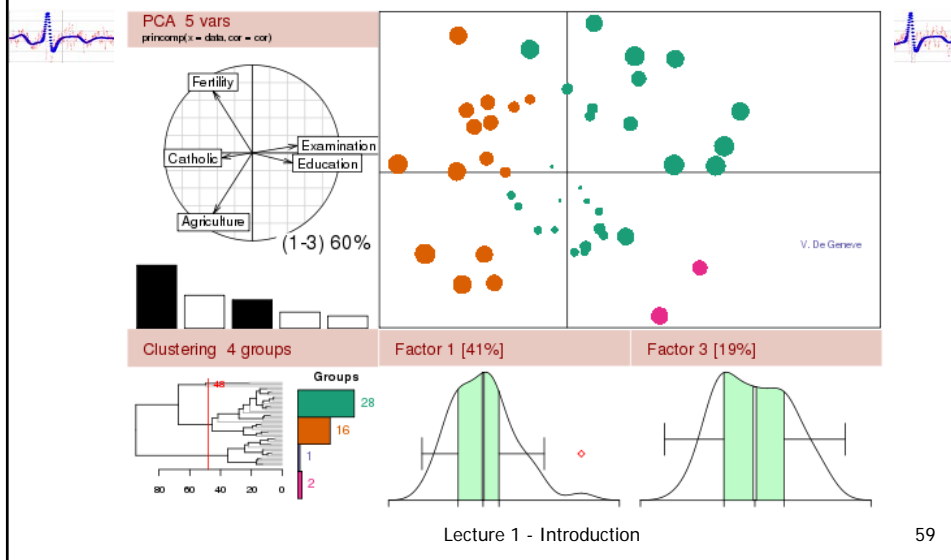
56

Ethnography Homework

- Goal: idea to make your favorite food hall more efficient and friendly
 - Pick a location and spend an hour people watching with a notebook and pencil.
 - Identify an activity you find interesting.
 - Watch several people do it.
 - Interview two or more about it.
 - Don't forget to obtain verbal consent!
- Write it up.
 - Be as detailed as possible.

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The R Project for Statistical Computing



R Introduction

- An integrated suite of software facilities for data manipulation, calculation and graphical display.
- Features:
 - data handling and storage facility,
 - suite of operators for calculations on arrays, in particular matrices,
 - a large, coherent, integrated collection of intermediate tools for data analysis,
 - graphical facilities for data analysis and display either directly at the computer or on hardcopy,
 - a programming language (called 'S')
 - Extensible, with many contributed *packages*
- An environment within which many statistical techniques have been implemented

Basics

- An expression language with a very simple syntax.
- Elementary commands are either expressions or assignments.
- Commands
 - Separated by ';' or newline.
 - Grouped with '{' '}'
- Comments : '#' to end of line
- Case sensitive.
- Names
 - All alphanumeric symbols are allowed, plus '.' and '_'
 - must start with '.' or a letter, and if it starts with '.' the second character must not be a digit.

Some Data Types

- Numbers
- Boolean (TRUE, FALSE)
- NA, NaN, Inf
- Strings
 - "foo", 'bar', "this is a \" quote"
- Vectors (all elements of same type, ordered)
- Matrices, Arrays, Factors, Lists
- Data Frames
- Objects
- Functions

Some Basic Numeric Operators

- +, -, *, /, ^
- log, exp, sin, cos, tan, sqrt
- max, min, length, sum, prod
- range -> vector of (min,max)
- mean – sample mean
- var – sample variance
- order – sort in increasing order

Some things to get started

- `c` – concatenate
 - `c(2,7,3,9,4)`
- `<-` assignment
 - `x <- 52`
 - `x <- c(2,7,3,9,4)`
 - `y <- c('A','B','C','D')`
- `barplot(x)`
- `barplot(x,names.arg=y)`

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R/R Studio - Demo

Your first mission

1. Find an R (and R Studio) you can use.
2. Create a barchart.
3. Paste it into Word.

Done! (you don't need to turn in)

Note: in one week you will need to be fluent enough in R to:

- Load data from excel
- Compute a variety of descriptive statistics
- Create a variety of visualizations
- Export all to Word

Homework

- Read B&A Ch 4
- Do Homework 4 (due in one week)
- R mission #1