9.63 Laboratory in Cognitive Science

Fall 2005
Course 1- Introduction
Aude Oliva

3 Projects, 3 Experiments

- **Project 1:** One experiment, single-factor design (1 factor, 2 conditions + controls, t-test)
- **Project 2:** One experiment, factorial design (2 factors, ANOVA)
- **Project 3:** A research question, with 1 or 2 experiments
- All research projects done in group (2 to 5 students)

Written Assignments

- 5 CogLab Summaries (1 page each)
- Two small papers (~ 1000 words each, for Project 1 and Project 2) **
- One long paper (final paper, 12-15 pp) **
  ** Option to rewrite/correct your paper

CogLab Summary

- A 1 to 2 pages word document including:
- A graph of your results (when possible)
- A summary in 7 sections (200-300 words)
  1- A title
  2- Introduction (1-2 sentences)
  3- Hypothesis (1-3 sentences)
  4- Experimental method (2-4 sentences)
  5- Result: A description of "your" result (2-4 sentences)
  6- Interpretation (2-4 sentences)
  7- Conclusion (2 sentences)
- Answers to 1-2 questions

“Email” CogLab Assignments

- A total of 5 html/excel files with your data from 5 coglab experiments
- Due Friday midnight (written summary due the next Wednesday)
Talk “assignments”

- Participation in class
- Present 1 coglab experiment
- Present 3 talks (one for each project)

CogLab Talk

- Present 1 coglab experiment:
  - We send you the excel file with the data from all the participants
  - You run a statistic (using excel or matlab)
  - You plot the group graph
  - You think a little about the results
  - You talk in class about the group results (5 min, draw on the board or prepare slides)
  - We all discuss the results and the interpretation

Mid-Term Exam

- 15 % of the total grade
- Based on the slides and the coglab
- Do not worry

Grading Scale

- Experiment 1 (single factor): 15 % (10 % for the small paper, 5% talk presentation in group)
- Experiment 2 (factorial design): 15 % (10 % for the small paper, 5% talk presentation - 10 min - in group)
- Experiment 3 (a more elaborated experiment): 30 % (10 % for the talk, 20% for the 12-15 pp paper)
- Assignments (coglab experiments: 5/7): 15 % (5 summaries of coglab experiments)
- Mid-Term Exam (in class): 15%
- CogLab presentation in class: 5%
- Participation in class: 5%

More meetings with us

- Contact directly the instructor by email
  - Subject line: 9.63 – keywords, topic
  - 9.63 – can we meet?
  - 9.63 – references help
  - 9.63 – course 3: question
  - 9.63 – got a great idea!!

- Once we are in the new BCS building, there will be additional lab hours and access to computers

Sept 12: Getting started: Variables, Controls and Signal Detection Theory

- And lots of details to get started..
Sept, 14: Single factor design and statistical analysis (t-test)

- A single factor design will be used in Project 1 (for oct. 3)
- T-test analysis presented by Ruth Rosenholtz

Sept. 21 & 26 Factorial Design, External Validity & ANOVA

- A factorial design will be used in Project 2 (for oct. 31)

Sept. 28: How to write a paper? How to give a talk?

- And how to react to the questions, the critics ....

Oct 3: Project 1 presentation

- Talk given by each group (10-15 min + 5 min questions) describing all the phases of the project
- You are speaking to us, so relax.

Oct 5: Matlab Tutorial (with computers)

- We should be in the new BCS building 😊
- We should have 5 new dell computers
- Matlab tutorials and exercises in:
  - statistics
  - experimental design

Oct. 12: Greatest Experiments in Cognitive Science

- Vision
- Memory
- Learning
- Problem solving
- Development
- Neuroscience
- Cool methods
Oct. 17: Experimental paradigms in Cognitive Science
- Description and demos of a variety of paradigms
- Use of CogLab and Matlab

Oct. 19: Cognitive Neuroscience Methods
- Lecture by Ben
- fMRI
- ERPs
- TMS
- Single cell recording

Oct. 24: Single Participant Study and Quasi-Experiments
- Also research methods in neuropsychology (with patients)

Oct. 26: Correlational studies and Non experimental research
- Lecture by Charles

Oct. 31: Project 2 Presentation
- You will have to talk again (and we will all listen)

Nov. 2: Description of Project 3
- Discussion in class of projects 3 as well as the different stages of each research topic (literature review, theoretical question, experimental hypothesis, prediction, methods, statistical analysis, results, interpretation, conclusion)
Nov. 7: Experiments in Other Sciences

- How to compare human results to computational modeling?
- Developmental research

Nov 9: Special Topic: Understanding the Visual World

- Talk and Brainstorming: How does the brain recognize objects and complex scenes?

Nov 14: Research Ethics

- Image removed due to copyright reasons.

Nov 16: General Review

- Reviews of all classes and CogLab experiments

Nov 21: Mid-Term Exam

- Based on the slides and the coglab
- Do not worry

Nov 23 (day off 😊)

- You do not have to come to class (leave for Thanksgiving)
- For those of you here, we will speak about your project 3 and results.
Nov. 28: Flawed studies

- What's wrong?

Experimental facts

- “You can observe a lot by just watching” Berra
- “Perfection is the greatest enemy of a good beginning”
- “The greatest the island of knowledge, the longer the shoreline of the unknown”.
- “I have no data yet. It is a capital mistake the theorize before one has data. Insensibly one begins to twist facts to suit theories, instead of theories to suit facts.”
- “When you rush, you make mistakes”

Eye-Witness Testimony

sequential or simultaneously presentation?

False Memory (Loftus)

- Subjects shown video (slides) of an accident between two cars
- Some subjects asked: How fast were the cars going when they smashed into each other?
- Others asked: How fast were the cars going when they hit each other?

False Memory (Loftus)

<table>
<thead>
<tr>
<th>Word Used in Question</th>
<th>Average Speed Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>smashed</td>
<td>41 m.p.h.</td>
</tr>
<tr>
<td>collided</td>
<td>39 m.p.h.</td>
</tr>
<tr>
<td>bumped</td>
<td>38 m.p.h.</td>
</tr>
<tr>
<td>hit</td>
<td>34 m.p.h.</td>
</tr>
<tr>
<td>contacted</td>
<td>32 m.p.h.</td>
</tr>
</tbody>
</table>

Mr. Angry and Dr. Smile (Schyns-Oliva)

Image removed due to copyright reasons.
Visual Memory

- Looking at movie trailers: what did you really see?
- What do you remember?
- Mary Potter RSVP Experiments

Effect of context on face/emotion recognition

The truth about Research

"As he was testing hypothesis number one by experimental method a flood of other hypotheses would come to mind, and as he was testing these, some more came to mind, and as he was testing these, still more came to mind until it became painfully evident that as he continued testing hypotheses and eliminating them or confirming them their number did not decrease. It actually increased as he went along". R.M. Pirsig (1975)

Visual Search & Attention

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Short-term memory

Image removed due to copyright reasons.

CogLab: Signal Detection

Data by Friday, Sept, 9, night? 😊

A research domain where SDT has been successfully applied is in the study of memory. Typically in memory experiments, participants are shown a list of words (image, sequence, etc) and later asked to make a “yes” or “no” statement as to whether they remember seeing an item before. Alternatively, participants make “old” or “new” responses. The results of the experiment can be portrayed in what is called a decision matrix.

<table>
<thead>
<tr>
<th></th>
<th>Old</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>Say “Old”</td>
<td>Hit</td>
<td>False Alarm</td>
</tr>
<tr>
<td>Say “New”</td>
<td>Miss</td>
<td>Correct Rejection</td>
</tr>
</tbody>
</table>