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School of Computer Science

EVALUATION METHODS AND STATISTICS

Prof. Chris Baber

Chair of Pervasive and Ubiquitous Computing

Integrity in Research

"The first principle is that you must not fool yourself – and you are the easiest person to fool. So you have to be very careful about that. After you've fooled yourself, it's easy not to fool other scientists. You just have to be honest in a conventional way after that." [Richard Feynman]

- Declare your assumptions and expectations
- Explain your hypotheses (a priori)
- Report what you think might affect the experiment's outcome (positively and negatively)…so, say what could be improved
- Report and explain potential confounds or alternative explanations.

"…if you're doing an experiment, you should report everything that you think might make it invalid — not only what you think is right about it; other causes that could possibly explain your results; and things you thought of that you've eliminated by some other experiment, and how they worked — to make sure the other fellow can tell they have been eliminated." [Richard Feynman]

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The ethics of ‘conditioning’

- US Behaviorism, 1920s, Watson and Rayner
- Albert, a 9 month old orphan baby raised in a children’s hospital
- Shown a white rat, a white rabbit, a monkey, masks…and was not afraid of them but reached out to touch them
- Next when he reached for a white rat, a very loud noise was used to frighten him
- The study continued with the noise being associated with the presence of the rat…
- …and then until Albert associated anything white and fluffy with a loud noise and fear.
- Albert’s fear was never (as far as we know) desensitized.
- (see also the character Tyrone Slothrop in Thomas Pynchon’s novel ‘Gravity’s Rainbow’

Contemporary problems of Ethics…

- Facebook offers to pay you to conduct a study.
- The study will focus on the impact of emotions on social media sharing.
- The study will involve manipulating newsfeed for individual users. So, some users might see many positive news items and some might see many negative news items.
- Can you see (at least) FOUR issues here that might cause you to be concerned?

The study took place in 2012

http://www.pnas.org/content/111/38/13675.full

- Published in the Proceedings of the National Academy of Sciences
- Facebook argue that users had agreed to the Terms of Service (and, by implication, to participation in the study and to the conditions to which they had been assigned and the manipulations that these involved)

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http://www.koeppeldirect.com/drtvblog/facebooks-emotion-study-causes-outrage-raises-ethics-questions/

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Experimental Design and Ethics

- At the very least…
  - You should have good reason to conduct an experiment involving human participants
  - You should make every effort to ensure that the protocol is safe, secure, robust and reliable
  - You should ensure that dignity and well-being of participants is protected (both during the experiment and in reporting results)

Deception and Misinformation

- Dilemma…
  - If a participant knows (or can reasonably expect) what your experimental results will be…
  - …will they change how they perform the way they do the task?
  - If you design the study to prevent them doing this, are you deceiving (or lying) to them?

Some impacts of being a 'participant'

- Hawthorne Effect
  - Elton Mayo at Hawthorne works of the Western Electrical Company in Chicago
  - Presence of experimenters, more that environmental or work changes, can *sometimes* influence people's performance
  - Also, belief in the Hawthorne Effect (by experimenters) can influence it…
- Social Desirability Bias
  - Participants will report answers to questions that they believe to be socially acceptable (to society at large or to their peer group)
- Demand Characteristics
  - Participants will change their natural behaviour to suit their interpretation of what the experiment seeks to prove
- Effect of Expectancy
  - Participants could align their performance to a target defined by their peers, e.g., most people complete the task in x minutes
  - This can also influence experimenters belief about whether someone can complete a task

UK Data Protection Act (2018)

- Data collected following informed consent
  - Participants should not be identifiable from their data
  - Participants will know what data and why it is collected
  - Participants will know who will collect the data and what it will be used for
  - Participants will know where the data will be stored and who will have access to it
- 'Special Category Personal Data'
  - 'Sensitive data'(under 1998 Data Protection Act)
    - Racial or ethnic origin, political opinions, religious or philosophical beliefs, trade union membership;
    - Physical or mental health
    - Sex life or sexual orientation
    - Genetic or biometric data
    - Criminal convictions and offences

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Measures to take…

- Use ‘technical and organisational measures’ to minimise data, e.g., pseudoanonymisation
- Using (pseudo)anonymised data wherever possible
- Avoid processing or reporting of data in ways that will cause damage or distress to individuals
- Allow individuals to decide how their data can be used
  - *“any freely given, specific, informed and unambiguous indication of the data subject’s wishes by which he or she, by a statement or by a clear affirmative action, signifies agreement to the processing of personal data relating to him or her.”*

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Consent Form for project entitled:

Title of the proposed study

Fair Processing Statement

This information is being collected as part of a research project concerned with (objective of the research) by the School of Electronic, Electrical and Computer Engineering in the University of Birmingham as part of a (MSc/MEng/BEng) project.

The information which you supply and that which may be collected as part of the research project will be entered into a filing system or database and will only be accessed by authorised personnel involved in the project. The information will be retained by the University of Birmingham and will only be used for the purpose of research, and statistical and audit purposes. It may form part of a publication in a technical journal or other forum.

By supplying this information you are consenting to the University storing your information for the purposes stated above. The information will be processed by the University of Birmingham in accordance with the provisions of the Data Protection Act 1998. No identifiable personal data will be published.

Statements of understanding/consent

- I confirm that I have read and understand the participant information leaflet for this study. I have had the opportunity to ask questions if necessary and have had these answered satisfactorily.
- I understand that my participation is voluntary and that I am free to withdraw at any time up to (project submission date) without giving any reason. If I withdraw my data will be removed from the study and will be destroyed.
- I understand that my personal data will be processed for the purposes detailed above, in accordance with the Data Protection Act 2018.
- Based upon the above, I agree to take part in this study.

Name, signature and date

Name of participant..... Date..... Signature.....

Name of researcher/
individual obtaining consent..... Date..... Signature.....

A copy of the signed and dated consent form and the participant information leaflet should be given to the participant and retained by the researcher to be kept securely on file.

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Participant Information Sheet For Project Entitled:

Title of the proposed study

This is project forms part of a course of study for a (MSc) degree in the School of Computer Science in the University Of Birmingham.

The aims of the study are (State the aims of your project and why it is important)

You are invited to participate in this study on a voluntary basis and you may withdraw at any time. You have been selected because (reasons for selection, which may be random or because the participant has the required characteristics of age etc)

The study will require you to (state what you want the participants to do) and this will take approximately (duration). You (may/will) experience (boredom, dizziness, nausea or anything else they may experience or no positive or ill effects delete as applicable). If you do not understand, prior to participating, you may seek further clarification from the researcher.

Your responses will be recorded using (video, audio, questionnaire, nothing delete as applicable),

Reward/reimbursement/expenses

For participating in this study you will receive (compensation, nothing)

Confidentiality/anonymity and data security

Your data will be treated as (Confidential and you will be given a unique identifying code which will be used to identify your data)

Only the researcher (insert name) and their supervisor (insert name) or their nominees will have access to the data which will be used to (insert what will be done with the data). The data will be stored electronically on secure university of Birmingham servers and paper copies will be destroyed. The data will be kept until the end of the project and for at least 10 years following the date of publication by (insert supervisor name), if a publication of any sort results from the project.

Results of the study

The results of the project will be analysed and contribute to a (MSc) project report and may result in a publication which will appear in a technical journal or other forum. Participants can find out about the outcome of the project by contacting the researcher and their supervisor whose details are given below

Contact details

Researcher	Supervisor
Student Name and contact details.	Supervisor name and contact details.

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University Ethical Review Form

https://intranet.birmingham.ac.uk/finance/RSS/Research-Support-Group/Research-Ethics/Ethical-Review-Forms.aspx

- Summary of project
- Conduct of project
- Participants as subjects of research
- Recruitment
- Consent
- Participant feedback
- Participant withdrawal from the project
- Compensation for participation
- Confidentiality
- Storage, access and disposal of data
- Risks

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Nuremberg Code (1947)

- The voluntary consent of the human subject is absolutely essential.
- The experiment should be such as to yield fruitful results for the good of society...
- The experiment should be ... based on the results of animal experimentation and a knowledge of the natural history ... [based on theory].
- The experiment should be so conducted as to avoid all unnecessary physical and mental suffering and injury.
- No experiment should be conducted where there is an a priori reason to believe that death or disabling injury will occur; except, perhaps, in those experiments where the experimental physicians also serve as subjects.

Nuremberg Code (1947)…continued

- The degree of risk to be taken should never exceed that determined by the humanitarian importance.
- Proper preparations should be made and adequate facilities provided to protect the experimental subject
- The experiment should be conducted only by scientifically qualified persons
- During the course of the experiment the human subject should be at liberty to bring the experiment to an end...
- During the course of the experiment the scientist in charge must be prepared to terminate the experiment at any stage...

Declaration of Helsinki (2013, 7th revision)

- World Medical Association
- Combines 1947 Nuremberg Code with 1948 Declaration of Geneva
- Several revisions…some controversy…
  - First version June 1964
  - US Federal Drug Authority (FDA) only recognises 3rd (1989) revision
  - EU Clinical Trials Directive cites 4th (1996) revision
  - EU recognise 5th (2000) revision

Declaration of Helsinki (2013, 7th revision)

- Basic Principles
  - Respect for the individual
  - Respect for individual's right to self-determination
  - Respect for individual's right to make informed decisions
  - Investigator's duty of care

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Declaration of Helsinki (2013, 7th revision)

- Operating Principles
  - Research should be based on thorough knowledge of scientific background to the study
  - Research should involve careful assessment of risks and benefits of conducting the study
  - Research should have a reasonable benefit for population studied
  - Research should be conducted by suitably trained investigators
  - Research should using approved protocols, subject to independent ethical review and oversight by properly convened committee

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Revisiting Experimental Design

Hypothesis: The inability to avoid attending to a mobile phone is a form of 'addiction'	
Independent Variable: mobile phone alerts	
Task: participants will perform a simple task (e.g., solve a puzzle, complete a jigsaw) with a mobile phone on the table	
Control Condition: No Alerts	Experimental Condition: 10 Alerts (randomly spaced over trial)
Dependent Variables: (i.) self-reported score of 'addiction' [but can we measure this accurately or trust reports?] (ii.) time spent looking at mobile phone [how can we measure this? What are the possible confounding variables in this design?]	

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Types of Study Design

- Post-test
  - Control versus experimental group complete task: outcome is measured and compared
- Pretest-Post-test
  - Control versus experimental group complete task and outcome is measured and compared; experimental group treatment and both groups tested again
- Solomon Four Group
  - 2 control groups and 2 experimental groups; pretest-post-test and post-test only.
- Factorial Design
  - 2 or more independent variables manipulated.
- Crossover (repeated measures) Design
  - Participants randomly allocated to perform both control and experimental conditions complete task and outcome is measured and compared

Independent Samples ANOVA

- For independent samples ANOVA, your independent variable has Level that correspond to each condition
- You will also define your data in a table that indicates levels…

Participant	Reaction Time (DV)	Condition (IV)
1	350	control
2	425	experiment
3	508	control

- Assume that the data is in a file called ‘Test’, we assign levels in R using the command

>levels(test$Condition)

This is a nice source: http://www.sthda.com/english/wiki/one-way-anova-test-in-r