

# Preface

## Who This Book Is For

This book is written for engineers and students at technical universities who plan to conduct human subject research. The definition of human subject research is broad: It includes experiments with human participants, field studies, observational research, questionnaire research, interviews, and the analysis of datasets that contain private or identifiable information about human individuals.

## Why This Book Is Important

In recent years, engineering has become strongly connected to human-related disciplines such as biology and psychology. For this reason, engineers and engineering students are often expected to perform human subject research. Typical topics of human subject research in engineering include:

- anthropometry (e.g., making a three-dimensional scan of the human body);
- biometrics (e.g., research on fingerprints and iris scans);
- computer vision, including speech and facial recognition;
- ergonomics and biomechanics;
- exoskeletons and prosthetics;
- human–computer interaction (e.g., evaluating the usability of software);
- human–robot interaction;
- interaction with manipulators and teleoperation;
- product evaluation;
- psychophysics (i.e., the study of how humans perceive or respond to visual, auditory, or tactile stimuli);
- psychophysiology (i.e., inferring participants’ psychological state based on physiological measurements, such as heart rate or pupil diameter);
- sports research;

- transportation safety research, including research on driving, motorcycle riding, flying, cycling, train driving, and walking;
- virtual reality; and
- wearable devices and behavioural tracking (e.g., of work and travel patterns).

Thus, it can be said that knowledge on how to conduct human subject research is necessary for a variety of engineers.

Engineers are generally well trained in calculus and mechanics, but may lack appropriate knowledge for conducting research on humans. In order to perform high-quality human subject research in an ethical manner, several guidelines have to be followed and pitfalls have to be avoided. This book presents these guidelines and pitfalls. The aim of this book is to help engineers and engineering students to carry out human subject research in a responsible manner.

## Who This Book Is *Not* For

This book is *not* written for professionals who intend to do medical research. Medical research involves the following: (1) diagnosing or treating illness; (2) medical procedures, such as injections or medical imaging; (3) administering medication or requiring participants to stop taking their medication; (4) collecting body tissues or fluids (except saliva); or (5) recruiting patients. The stimulation of brain regions (such as with transcranial magnetic stimulation) also qualifies as medical research (Green et al. 1997).

Although this book does not cover experimental methods for medical research, medical researchers can still benefit from the content of this book. Furthermore, engineers who do not plan to carry out human subject research may benefit from the methodological material provided herein. This book treats issues of research design, experimental validity, bias, and statistics, which are topics that are applicable to almost all empirical research.

## Scripts

At the end of this book, we provide MATLAB scripts that reproduce the figures in each chapter.

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## References

- Green, R. M., Pascual-Leone, A., & Wasserman, E. M. (1997). Ethical guidelines for rTMS research. *IRB: Ethics & Human Research*, 19, 1–7. <https://doi.org/10.2307/3563539>

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A Practical Guide

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