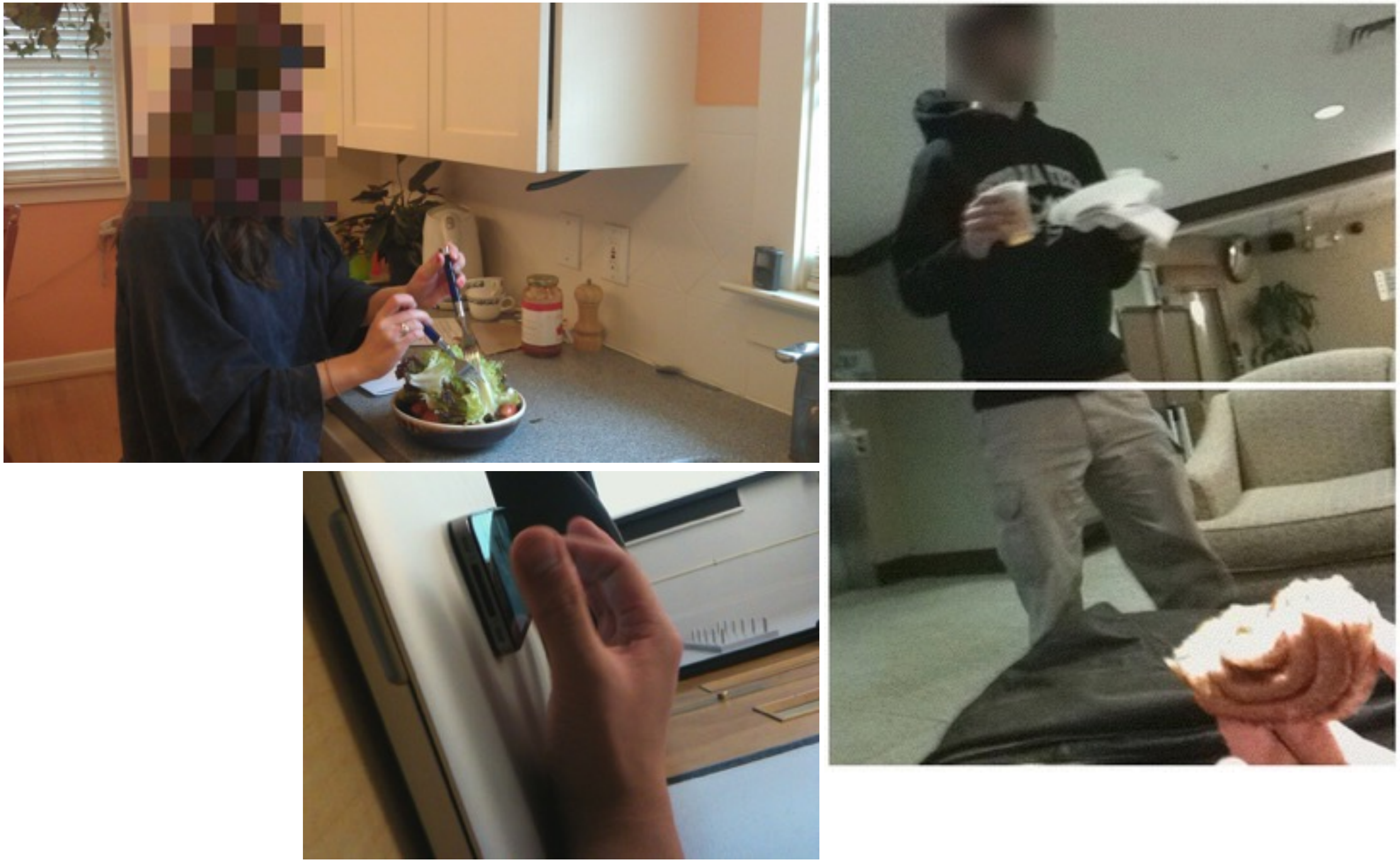


Data Collection: Human Subjects

EE382V Activity Sensing and Recognition

UT Austin • Dept. Electrical and Computer Engineering • Fall 2016

Today

ABCs of Human Subject Research: 40 minutes

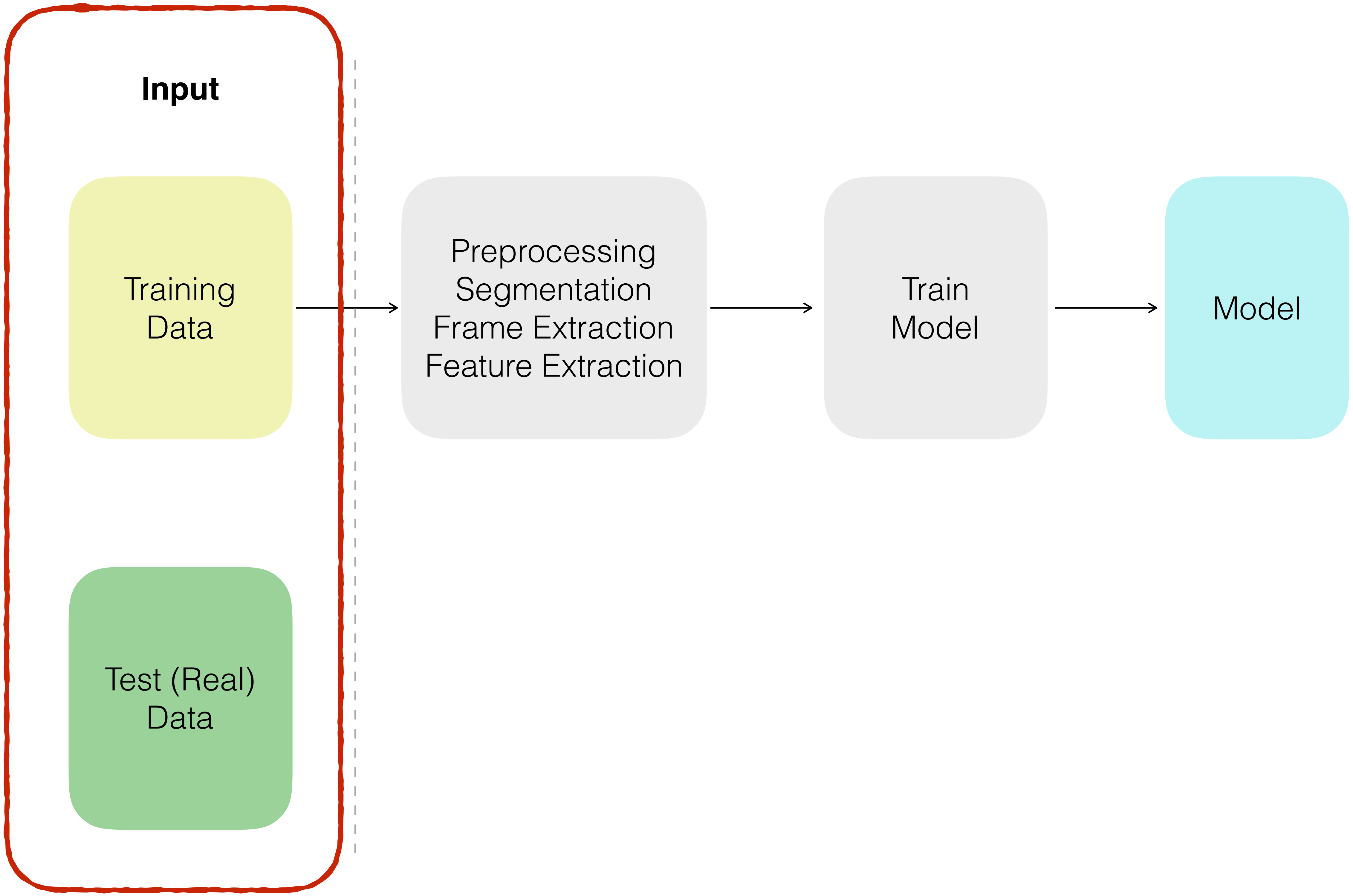
- Why Do It
- History
- Training and Protocol
- Classes of Studies

Papers (Panel of Experts): 30 minutes

Why Collect Human Subjects Data

Foundation of Activity Recognition Research

Activity Recognition Pipeline



Tuskegee Syphilis Study (1932-1972)

Track natural progression of untreated syphilis

Tuskegee Syphilis Study (1932-1972)

Participants were deceived

- Not life-threatening disease
- Free meals and healthcare

Participants went untreated

- Penicillin was proven as cure in 1947
- Wives and children contracted disease

President Clinton: “most infamous biomedical experiment in U.S. history”

Milgram Experiment (1961)

Stanley Milgram at Yale

Educated at Harvard University

Obedience Experiments

Teacher (Participant), Learner (Actor)

Involved administering electric shocks to learner

Teacher asked to keep delivering shocks despite requests of learner to stop

Highly disturbing psychologically

Unacceptable Harm and Risk in Human Studies

Prison inmates as test subjects

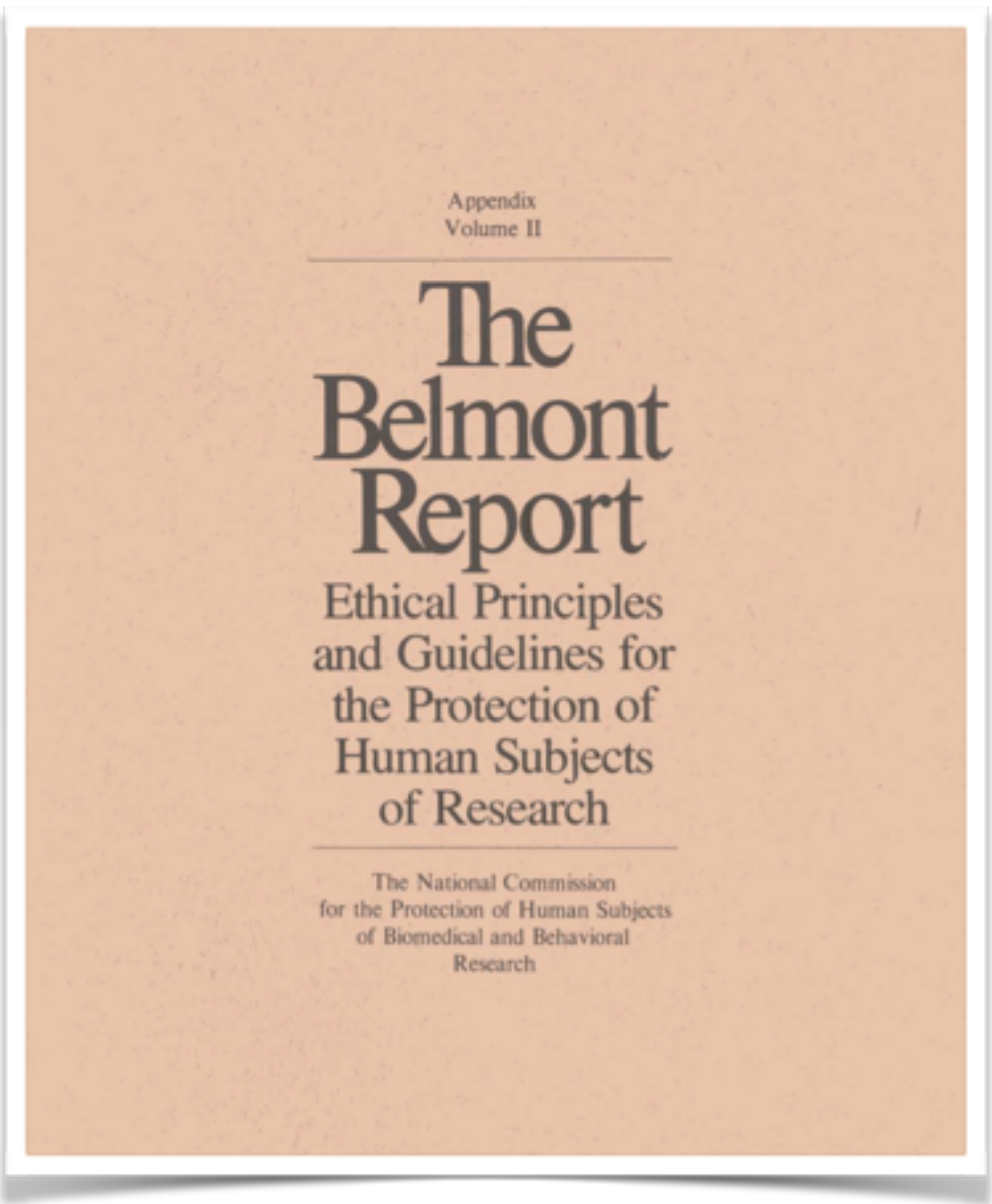
Unacceptable Harm and Risk in Human Studies

Radioactive materials in pregnant women

Unacceptable Harm and Risk in Human Studies

Mustard gas tested on American military (1943)

Belmont Report



National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research

Summarizes ethical principles and guidelines for research involving human subjects

September 30th 1978

- Respect for persons
- Do no harm (max benefits, min risks)
- Justice (reasonable procedures)

TEXAS

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- IRBaccess
- RMS

Human Subjects

Welcome
Welcome to Human Subjects Research and IRB.

About Human Subjects Research
Learn more about the IRB and the administration of research ethics at The University of Texas at Austin.

What is Human Subjects Research?
Learn more about what constitutes human subjects research.

IRB Policies and Procedures Manual
Find current policies, procedures, standards and regulations about human subjects research.

IRB Contacts
Find the contact for IRB Program Coordinators

IRB Meeting Dates and Deadlines
Information on currently scheduled IRB Meetings and submission deadlines.

IRB Forms
Find required templates and other useful forms for submitting to the IRB.

IRB Training
Training requirements for conducting human subjects research.

IRBaccess User Guide
Instructions for using IRBaccess

IRB Application Process Guide
Instructions for the IRB application process.

Departmental Review Committee (DRC) Contacts
Information on the current

Student Research
Human subjects research information for University students.

Special Topics
Find information on a number of areas involving human subjects research.

Information For Research Participants
Understand your rights as a research participant and the obligations of researchers.

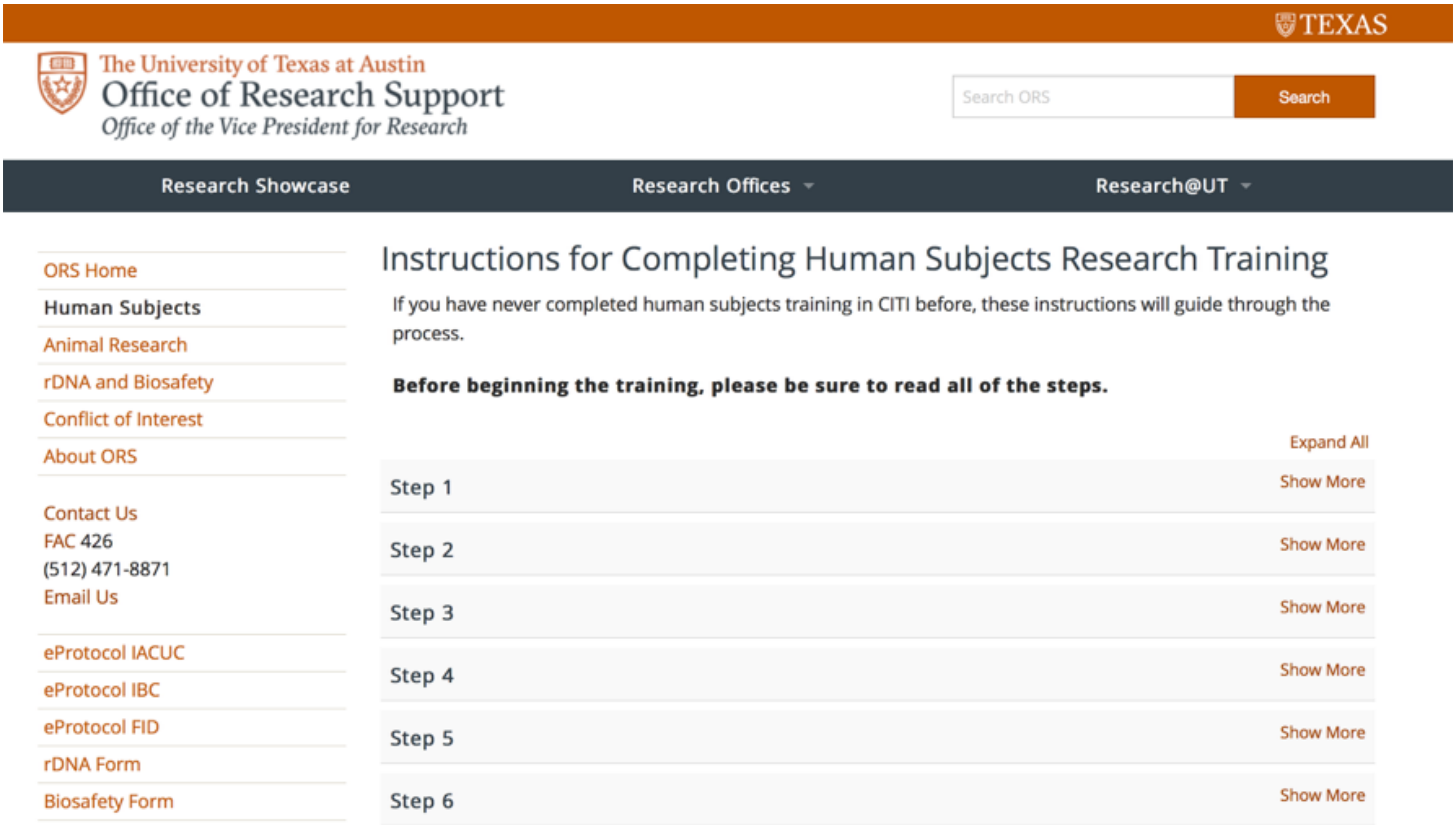
IRB Member List
Information on the current roster of IRB members.

IRB Member Resources
Find reviewer checklists and guides for current IRB members.

IRB News
Find the latest IRB news and updates.

https://research.utexas.edu/ors/human-subjects/

How to Collect Human Subjects Data



Human Subject Research Training

CONSENT DOCUMENT FOR ENROLLING ADULT PARTICIPANTS IN A RESEARCH STUDY

Longitudinal Tracking and Inference of Everyday Activities with Multimodal Sensing

Investigators: *Gregory Abowd, Irfan Essa, Edison Thomaz, Rushil Khurana*
Georgia Institute of Technology

You are being asked to be a volunteer in a research study.

Purpose:

In our research we are exploring the use of multimodal sensing approaches to recognize people's everyday activities, such as sleeping, exercising, socializing, and eating. The ultimate goal is to build systems that can recognize what people are doing in real-time and act on that knowledge, either by providing relevant information or nudging people for behavior change purposes (e.g. help them eat healthier meals).

The study consists of providing participants with wearable sensor(s) (e.g. activity trackers, physiological sensors, wearable cameras) and asking them to perform their normal activities while wearing these devices over multiple days. Participants will be asked to login to a web site on a regular basis (e.g., every evening) and annotate their sensor data for the day, indicating their activities. We will collect the annotated sensor data and use it to build systems that can classify activities based on sensor signals.

We will delete all the raw data, including images and sensor data after a period of two weeks from data collection.

Exclusion/Inclusion Criteria:

- You must be willing to wear the sensor(s) and/or device(s) throughout the duration of the study as much as possible.
- You must agree to care for and recharge the sensor(s) and/or device(s) throughout the duration of the study.
- You must agree that we will collect sensor data reflecting your everyday activities.
- You must agree to annotate the sensor data collected, indicating your everyday activities.
- You must be willing to receive short text messages or notifications on your phone asking for confirmation about activities you are performing.

Two Classes of Studies

Lab Studies

- Controlled settings
- Easy to obtain ground truth
- Better Internal Validity

Field Studies

- Non-controlled settings
- Hard to obtain ground truth
- Better External Validity

Papers

Papers

Getting Closer: An Empirical Investigation of the Proximity of User to Their Smart Phones

Anind K. Dey, Katarzyna Wac*, Denzil Ferreira, Kevin Tassini, Jin-Hyuk Hong & Julian Rojas

Human-Computer Interaction Institute
Carnegie Mellon University

*Institute of Services Science
University of Geneva

ABSTRACT

Much research in ubiquitous computing assumes that a user's phone will be always on and at-hand, for collecting user context and for communicating with a user. Previous work with the previous generation of mobile phones has shown that such an assumption is false. Here, we investigate whether this assumption about users' proximity to their mobile phones holds for a new generation of mobile phones, smart phones. We conduct a data collection field study of 28 smart phone owners over a period of 4 weeks. We show that in fact this assumption is still false, with the within arm's reach proximity being true close to 50% of the time, similar to the earlier work. However, we also show that smart phone proximity within the same room (arm+room) as the user is true almost 90% of the time. We discuss the reasons for these phone proximities and the implications of this on the development of mobile phone applications, particularly those that collect user and environmental context, and delivering notification to users. We also show that we can accurately predict the proximity at the arm level and arm+room level with 75 and 83% accuracy, respectively, with features simple to collect and model on a mobile phone. Further we show that for several individuals who are almost always within the arm+room level, we can predict this level with over 90% accuracy.

Author Keywords

Proximity, mobile devices, mobility, smart phone.

ACM Classification Keywords

H.m. Information systems: Miscellaneous.

General Terms

Experimentation, Human Factors

INTRODUCTION

It is without question that we are living in a world where emerging mobile personal devices and high-capacity wireless networks are enabling new and innovative applications that compliment many different aspects of daily life. Over the past decade, mobile computing has become ever more present in our society, particularly as smart phones become more prevalent. By December 2010, 31% of U.S. mobile phone users had smart phones [14] and this figure is expected to cross 50% by the end of 2011 [7]. This trend holds worldwide, with almost 300 million smart phones being sold in 2010 [5] and another 500 million predicted for 2012 [4].

In keeping with this trend, there has been an underlying assumption in much of the work in ubiquitous computing that a phone is always with its owner. This assumption, if true, means that ubiquitous computing systems can use the phone as a medium for collecting data from users and communicating information to users, at any time. Further, this means that the mobile phone is an accurate proxy to collect contextual information on users' location and activity. This assumption was investigated in 2006 [20] when mobile devices were not as robust and feature-filled as they are today. At that time Patel *et al.* found that when participants had their phones on (81% of the time), they kept their phone within arm's reach 58% of that time, which was less than the participants perceived themselves as doing, and the phone was within the same room as participants an extra 20% of the time.

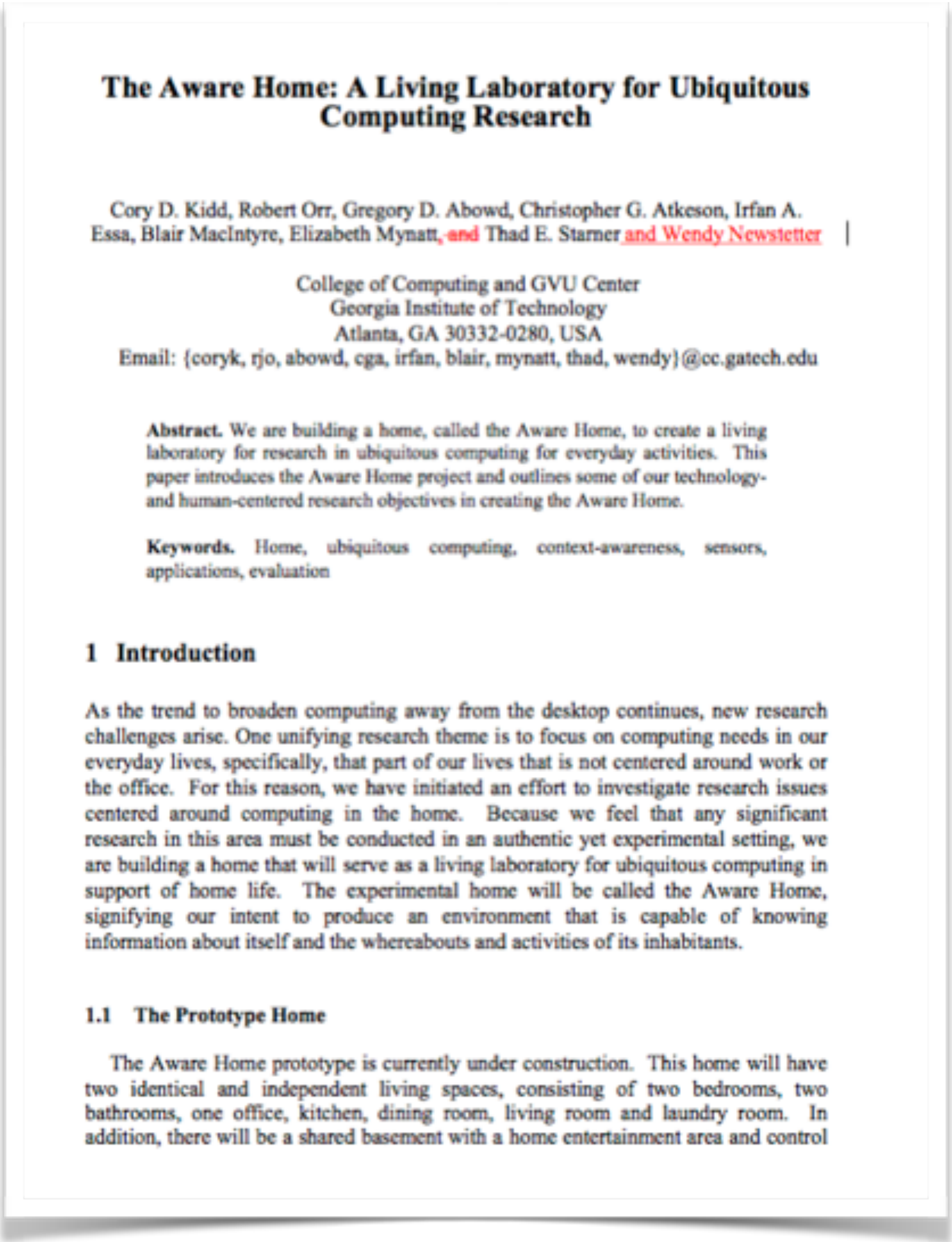
Since this study, five years ago, we have seen the introduction and mass adoption of Apple's iPhone and the Android platform that have redefined the mobile computing experience, and the operating systems and capabilities of mobile devices that are available to the average user. We now live in an era of so-called "smart" phones. These mobile devices have progressed far beyond a means of making and receiving phone calls, and for many, have become an almost indispensable tool to access information, complete tasks, be entertained and communicate in a wide variety of ways (*e.g.*, Skype, instant messenger, email). As a whole, it seems reasonable then to presume that people rely on their mobile phones far more than they used to and are thus likely to keep it more accessible as well. Based on the widespread availability of smart phones, it is important to re-investigate the assumption (and Patel *et al.*'s findings) about users' proximity to their phones, to determine if the smart phone is as ubiquitous a device as we believe.

Using a series of surveys and interviews, as well as by employing an application on Android mobile devices, we have gathered both quantitative and qualitative data from 28 participants over 4 weeks of real-world behaviors with their own smart phones. For this study we looked at participants'

UbiComp '11, Sep 17–Sep 21, 2011, Beijing, China.

Data Collection Environment

Papers



The Aware Home: A Living Laboratory for Ubiquitous Computing Research

Cory D. Kidd, Robert Orr, Gregory D. Abowd, Christopher G. Atkeson, Irfan A. Essa, Blair MacIntyre, Elizabeth Mynatt~~, and~~ Thad E. Starner and Wendy Newstetter

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Abstract. We are building a home, called the Aware Home, to create a living laboratory for research in ubiquitous computing for everyday activities. This paper introduces the Aware Home project and outlines some of our technology- and human-centered research objectives in creating the Aware Home.

Keywords. Home, ubiquitous computing, context-awareness, sensors, applications, evaluation

1 Introduction

As the trend to broaden computing away from the desktop continues, new research challenges arise. One unifying research theme is to focus on computing needs in our everyday lives, specifically, that part of our lives that is not centered around work or the office. For this reason, we have initiated an effort to investigate research issues centered around computing in the home. Because we feel that any significant research in this area must be conducted in an authentic yet experimental setting, we are building a home that will serve as a living laboratory for ubiquitous computing in support of home life. The experimental home will be called the Aware Home, signifying our intent to produce an environment that is capable of knowing information about itself and the whereabouts and activities of its inhabitants.

1.1 The Prototype Home

The Aware Home prototype is currently under construction. This home will have two identical and independent living spaces, consisting of two bedrooms, two bathrooms, one office, kitchen, dining room, living room and laundry room. In addition, there will be a shared basement with a home entertainment area and control

Living Laboratory

A new type of user study

Aware Home - Atlanta, GA

Papers

Sensus: A Cross-Platform, General-Purpose System for Mobile Crowdsensing in Human-Subject Studies

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Department of Systems and Information Engineering, University of Virginia
Charlottesville, Virginia, USA

ABSTRACT
The burden of entry into mobile crowdsensing (MCS) is prohibitively high for human-subject researchers who lack a technical orientation. As a result, the benefits of MCS remain beyond the reach of research communities (e.g., psychologists) whose expertise in the study of human behavior might advance applications and understanding of MCS systems. This paper presents Sensus, a new MCS system for human-subject studies that bridges the gap between human-subject researchers and MCS methods. Sensus alleviates technical burdens with on-device, GUI-based design of sensing plans, simple and efficient distribution of sensing plans to study participants, and uniform participant experience across iOS and Android devices. Sensing plans support many hardware and software sensors, automatic deployment of sensor-triggered surveys, and double-blind assignment of participants within randomized controlled trials. Sensus offers these features to study designers without requiring knowledge of markup and programming languages. We demonstrate the feasibility of using Sensus within two human-subject studies, one in psychology and one in engineering. Feedback from non-technical users indicates that Sensus is an effective and low-burden system for MCS-based data collection and analysis.

Author Keywords
Crowdsensing; Participatory Sensing; Programmable Platform; Human Factors

ACM Classification Keywords
C.2.4 Distributed Systems: Distributed Applications

INTRODUCTION
Human-centric, participatory sensing [3] and mobile crowdsensing (MCS) [18] have facilitated participant recruitment and data collection for a range of human-subject studies. Instead of establishing data collection agreements in person with each participant and recording behaviors manually, MCS researchers aim to recruit participants online and track behavioral and cognitive data automatically and remotely through apps running on mobile devices in the field.

Eagle and Pentland *et al.* [11, 13, 12] were among the first to use MCS to study human subjects. The authors developed the Reality mobile app to sense social interactions and mobility, and they recruited participants to install and run Reality on their mobile devices. By analyzing the collected data, the authors were able to investigate relationships between the structure of friendship networks and mobility patterns. Pentland's group extended this work to personality [7] and social ties [9], and others have used a similar approach to study mental and physical health relationships [29], connections between mental health and academic performance [39, 38], and human mobility and depression [4]. These and other studies indicate that MCS is a feasible paradigm for recruitment and data collection in human-subject research [10, 31].

The MCS paradigm has many potential benefits; however, heterogeneity of the mobile infrastructure and lack of general-purpose MCS tools present significant barriers to entry for human-subject researchers who lack a technical orientation. Existing MCS systems are predominantly designed for a single purpose, target only one of the major mobile platforms (Android or iOS), and require knowledge of markup and programming languages. This paper presents Sensus, a cross-platform, general-purpose system for MCS-based human-subject studies. Sensus lowers the barrier to entry into MCS-based research and increases the likelihood that MCS will be applied in a diverse set of fields. The remainder of this paper motivates Sensus, reviews related systems and research, presents technical details of Sensus, and presents two Sensus-based studies that demonstrate the flexibility and effectiveness of Sensus.

OPEN ISSUES FOR MCS IN HUMAN-SUBJECT STUDIES
Consider the following normative scenario, which motivates the use of MCS in human-subject research and highlights several open issues that we address in this paper.

Normative Scenario *A group of psychologists aims to better understand the relationship between students' social anxiety levels and telephone-based communication with family members and friends. The researchers have designed a survey to measure anxiety, and they would like to tag survey responses with location identifiers to help eliminate potential confounds*

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Collecting Data

Upcoming Classes

Data Collection: Sensors and Sensing

Specialized vs. Commodity Devices, Sensors available in devices, Sensors Pros and Cons, Sensor APIs, On-Body vs. Environmental

Data Collection: Lab

Collect some data using phones/activity tracking devices

Any questions?