Researching Human Behaviour using Smartphones and Wearables: A Hands-On Introduction

Acquisition of evidence regarding human behaviors and exposure to environments forms a central focus of health and social research, and an important foundation for effective policy in these areas. The use of smartphones and affiliated devices to study health behavior via cross-linked sensor data and on-device self-reporting and crowdsourcing offers compelling advantages to complement traditional techniques. Data collected on such devices wearables can be particularly powerful in supporting understanding of behaviors in areas where accurate self-reporting is difficult, including nutritional intake, physical activity and sedentary behaviour, contact patterns, and exposure to physical and social environments. Through structured surveys and crowdsourcing mechanisms, such devices can further provide potent means of gaining insight into knowledge, attitudes, beliefs, and perceptions in health and social domains. Finally, while little explored, some of the most powerful uses of such data lie in terms of understanding the particular causal pathways impacted by interventions.

Following last year's well-received tutorial, we will present a high-level introduction to human behaviour data collection from mobile devices using the widely used Ethica Data system. Tutorial participants will be guided through the use of this state-of-the-art mobile data collection system spanning the iOS (iPhones), Android and web platforms, its web-based study, sensor and survey definition tools, adherence monitoring system, reporting system, and flexible Apache Kibana-based visualization toolkit.

Coverage will include -- but will not be limited to -- the following:

- Defining and real-time modification of the study design, including specification of participant involvement duration and study length, and enrollment staging, and specific sensor streams to collect.
- Definition of surveys with triggering conditions based on time, stochastic occurrence, or sensor data.
- Graphical, web-based drag-and-drop interface for defining survey questions, including multimedia questions (photo, audio, video) and conditional patterns/skip questions.
- Using extensions to collect time-use and nutrition data, enable in-app chatting between participants, and administer cognitive tests.
- Participant enrollment within a defined study, and live updates of surveys and study definition.
- Monitoring adherence: Monitoring data received from participants, and completeness of participant response to survey questions; per-participant completeness of sensor-specific data; pushing content to particular participants.
- Reporting interfaces, including participant heatmaps, enumerated survey responses (also showing audio-video question responses), GPS-based response maps, bluetooth-beacon-based network depiction, and data downloads.
- Use of Apache Kibana and VEGA-based visualization for flexible online visualization.
- Export of study data, and database interfaces.
- Wearables: Use of bluetooth beacons to record and trigger surveys based on proximity between participants, or of participants with resources, locations or other actors.

Audience: Health, social and computational scientists. No programming background is required.
Organizers:
Mohammad Hashemian, founder and president of Ethica, holds a B.Sc. in Software Engineering and M.Sc. in Computer Science with a focus on Epidemiology and Public Health. He has been involved in the design and rollout of 46 research projects using Ethica since 2016. Prior to founding Ethica, he was Platform Developer on Google Android TV.
Nathaniel Osgood, serves as Professor in the Dept. of Computer Science and Associate Faculty in the Dept. of Community Health & Epidemiology at U. Saskatchewan. He holds a B.Sc., M.Sc. and Ph.D. in Computer Science from MIT. His research focuses on advancing and cross-linking system science, data science, computational science and applied mathematics tools to improve decision making in health and health care policy.