MAPPS [Mobility Analysis for Pandemic Prevention Strategies]

Introduction to MAPPING@Brown and Breakout Sessions

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BROWN UNIVERSITY

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MAPPING@Brown

- Overarching, proof-of-concept activity
- 5-year goal:
  - To map the entire social network at Brown (!)
- 18-month goals:
  - Device development
  - Deep community engagement
  - Pilot in Brown School of Public Health in AY 2022/23

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MAPPING@Brown: Main Goals

- Measure the social network at Brown University
- Use the social network data to populate flexible and realistic mathematical models of disease transmission
  - Intervention assessment: Explore transmission dynamics under different scenarios of social mixing and mobility
- Simulation exercise
  - Introduce a virtual pathogen with specific epidemiological characteristics into the network and observe spread through the network
  - Identify point of intervention/changes in social mixing that would be effective at elimination or containment of the virtual pathogen

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MAPPING@Brown: How

- Long and deep community engagement
- Identifying potential barriers to participation
- Addressing concerns about confidentiality and data use
- Develop technology
- Think deeply about ethical issues
- Exploring differential privacy and ways of protecting user data

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MAPPING@Brown: Some questions we are pondering

- Can we find a reasonable workable balance where data is available for scientific purposes but carefully protected?
- What to do with personal identifying information?
- What demographic data do we need to collect and how do we balance that?
- How do we talk/think/discuss/address the variety of concerns users will likely have?

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MAPPING@Brown: Some questions we are pondering

- Can users see their own data?
- Should the app only track in a limited geographical boundary?
- Should users be able to turn on/off certain features?
- Do we want to incentivize the app?
- Will the app drain battery life?
- How frequently should we take measurements?
- Do we want to use passive data collected by Brown (wifi logins, card swipes, etc) and if so, how?

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Timeline: MAPPING@Brown

Phase 1 — Small pilot within the SPH using Bluetooth to measure social interaction

Phase 2 — Rollout across Brown adding GPS for measuring geographic footprints

Phase 3 — Future development incorporating biometrics and more…

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Preliminary thoughts on DATA for MAPPING@Brown

Module information	Data 'wish list'
Device	• Persistent anonymized device ID traceable over the course of the study
Wi-Fi	• Datetime-stamped records of connection to specific access point (AP) • Duration of connection to specific AP • Signal strength • Datetime-stamped records of disconnection from a specific AP

Bluetooth	• Datetime-stamped records of detection of other participants' devices (linkable via anonymized device IDs)
	• Signal strength for each of these contacts
	• Duration of proximity
	• *E*pidemic simulation:
	  • Store infection status for each device and pathogen
	  • Datetime-stamped records of each transmission

GPS	• App only collects/processes Wi-Fi and Bluetooth data when inside SPH geo-fence

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Some aspects of measuring social interaction

- With whom: demographic information
- Duration
- Distance
- Activity
- Environment
- Other behaviours: Masking? Vacccinated?
- Surveys imbedded in app?

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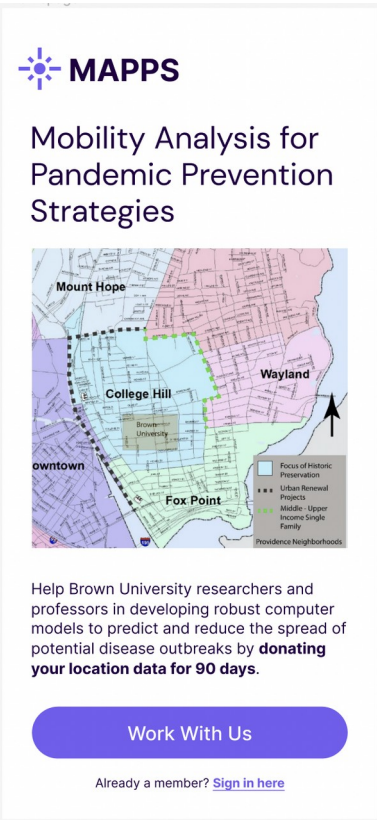
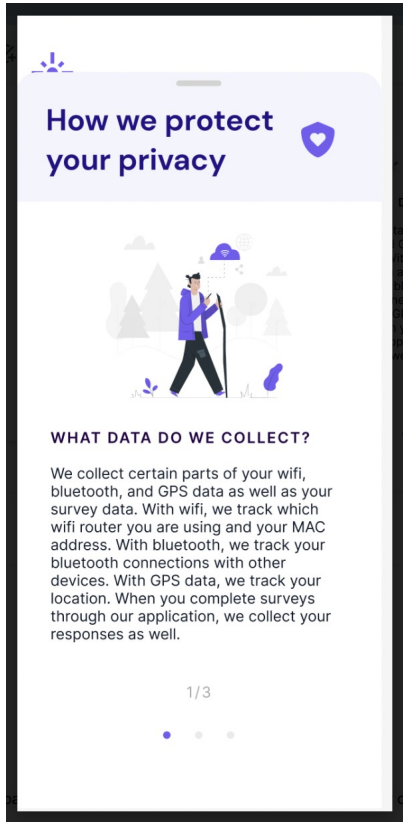
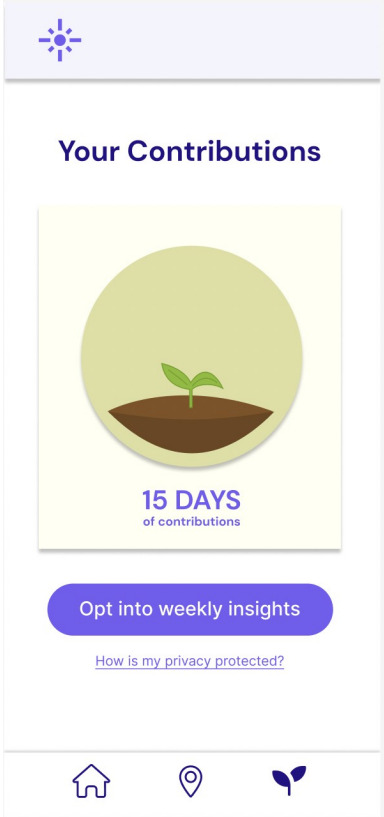
APP Development: Some early app prototypes







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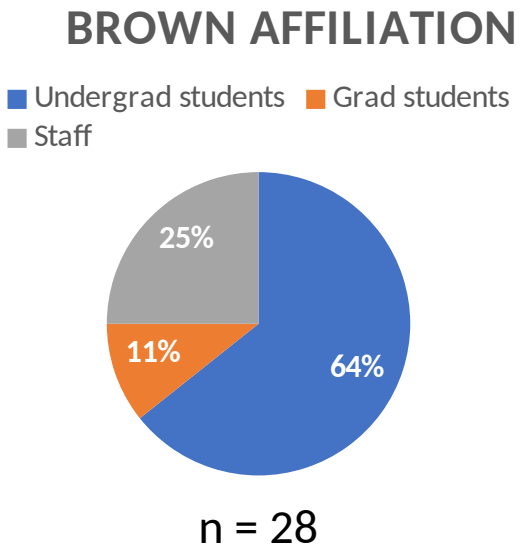
Focus groups with potential users

- Attitudes about MAPPING@Brown
  - Undergraduates: **Support for research**, indifference to tracking, personal and community **data insights**, financial or **material compensation**, peer participation
  - Graduates: Support for research, personal and community data insights, financial or material compensation
  - Staff: Support for research, personal data insights, material compensation
- Interaction with phone modules
  - Majority regularly **deactivate Wi-Fi** on campus (slow)
  - 86% always have Bluetooth activated
  - Half of students and all staff allow location tracking ‘only while using app’



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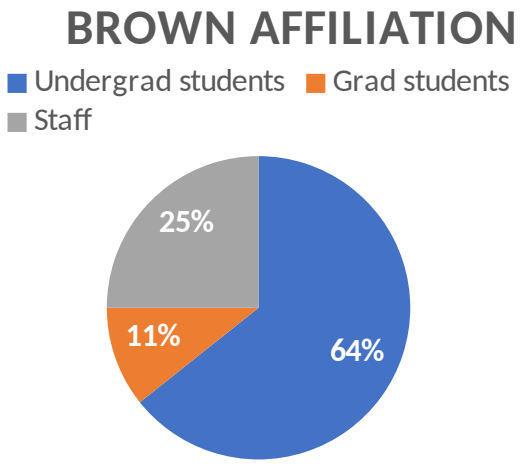
Focus groups with potential users

- Concerns with proposed study design
  - Top issue – **data access and ownership**
  - Students' primary concern was future use of data
  - Staff more likely to be concerned with re-identification
  - Transparency about potential **battery life** impact
- App UI prototype feedback
  - Felt at ease with simple and intuitive design
  - Students liked seeing their **data contribution** grow - Customizable? Linked to incentives?
  - Interested in reminders to reactivate tracking modules
  - Most appreciated that registration focused on **ethics, privacy, and consent**; wanted options for consuming this info



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Data

Device

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Modeling and Prediction

Ethics, privacy, confidentiality

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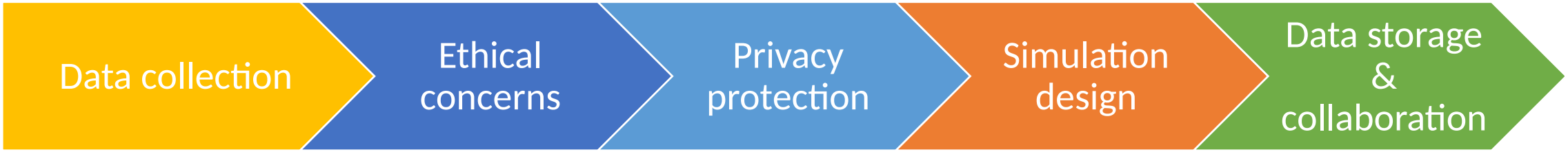
MAPPING@Brown Breakouts



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Breakout 1

What data will we collect during MAPPING@Brown in order to map mobility and social mixing patterns within the Brown community? How and how often might these data be collected?

Data collection

Desired outcomes:

1. A list of the specific data needs for the MAPPING@Brown exercise to capture mobility, mixing and other relevant data during Phase 1 (small, stripped-down pilot in the SPH), Phase 2 (roll-out across Brown), and Phase 3 (broader applications 5-10 years in the future).
2. Categorize measurements as either primary (highly important, priority data that is critical for analysis) or secondary (less important data that we may consider) during each phase.
3. Identify how and how often each type of data would be best measured during each phase.

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