

# Reason for Investing in Testbeds

- Technology:
  - We currently spend too much time/money reinventing the wheel
  - Allows for broader reach
    - Different geography, SES, populations, health conditions, etc...
- Data:
  - Allows us to increase power of studies, doing analysis of multiple data sets

# Technical Infrastructure

- How to **share testbeds** across researchers
- How to deal with **dynamic nature of technology interventions**:
  - Our interventions often evolve
  - Some are designed to adapt over time to a person
- How to create testbeds that **connect across level**
  - home, mobile and clinic ... and community and family.
- If have testbed crosses institutions, how do we **share data**?
  - Share data, or allow researchers to ask specific questions of the data?
- Possible approaches
  - a **group of people** willing to be in studies (each researcher provides technology for their study)
    - Partner with innovation clinics (recruitment goes through there)
  - a **physical infrastructure** (smart home testbed)

# Data Sharing

- **“Ground truth”** or “provisional truth with confidence”
  - Capture data and be able to label it to use it for inferences, training and validation
  - Infrastructure around collecting, storing and accessing it
- Challenges of **data sharing** so others can use it
  - Metadata and standardization
  - Data provenance
    - For some RQs, “location” is enough; for others, type of location (GPS v.s. wifi triangulation) matters.
  - Need to understand the cyber-social structure for sharing data and developing processes for standardization and sharing
- Identifying **common data elements** across research projects
- Data is collected through active interventions, so the **intervention impacts the data.**

# Actionable Directions

- Include testbeds and data sharing language in any “cohort” type of **NIH call**
  - E.g. what came out of human/automated loop breakout group
- Identify **grand challenges** that bring in these different components
  - E.g.: fitness level as a vital sign

# Reason for investing in infrastructure

- Technology: too much time/money reinventing the wheel
- Data: increasing power of study, doing analysis of multiple data sets
  - Student Life @ Dartmouth
    - 8 universities trying to replicate... very difficult to do. Is your location data the same as mine? Sensors are not all equivalent... even if they supposedly measure the same things
      - Data providence is incredibly important. It may be fine for some questions, but not others.
    - Spatial data, temporal data, network data, event analytics (timestamp with a tag)
      - Relational data models aren't easily expanded to these other types of data. Must have deep agreement among communities.

# Data

- “Ground truth” or “provisional truth with confidence”
  - Capture data and be able to label it to use it for inferences, training and validation
  - Infrastructure around collecting, storing and accessing it
- Challenges of data sharing so others can use it
  - Metadata and standardization
  - Need to understand the cyber-social structure for sharing data
    - Board for this social process on a regular basis (like medical guidelines for physicians)
  - Open mhealth standard represent some basic data elements. Need process for adding more complicated ones. Need communities that come together to build these standards.
    - SNOWMED is process for how medical terms get added. Industry needs to be involved on the tech side. Ontologies – linked to standard medical terminologies
  - Dynamic data dictionaries that evolve over time, then go back and map back into existing ontologies (and extend as needed)
  - Have to make sure we don’t let these constrain what we look at
- Common data elements across research projects
  - NIH may dictate what data is collected and shared for certain programs
- Data is collected through active interventions, so the intervention impacts the data.
  - To make progress, can focus portions of community on specific problem (e.g. symptom management), would we have a better way to move forward.