IoT, social media, and personal sensing: Moving from 'cold' computational models to 'warm' computational models of dynamic, highly contextualized & socially networked individual behavior

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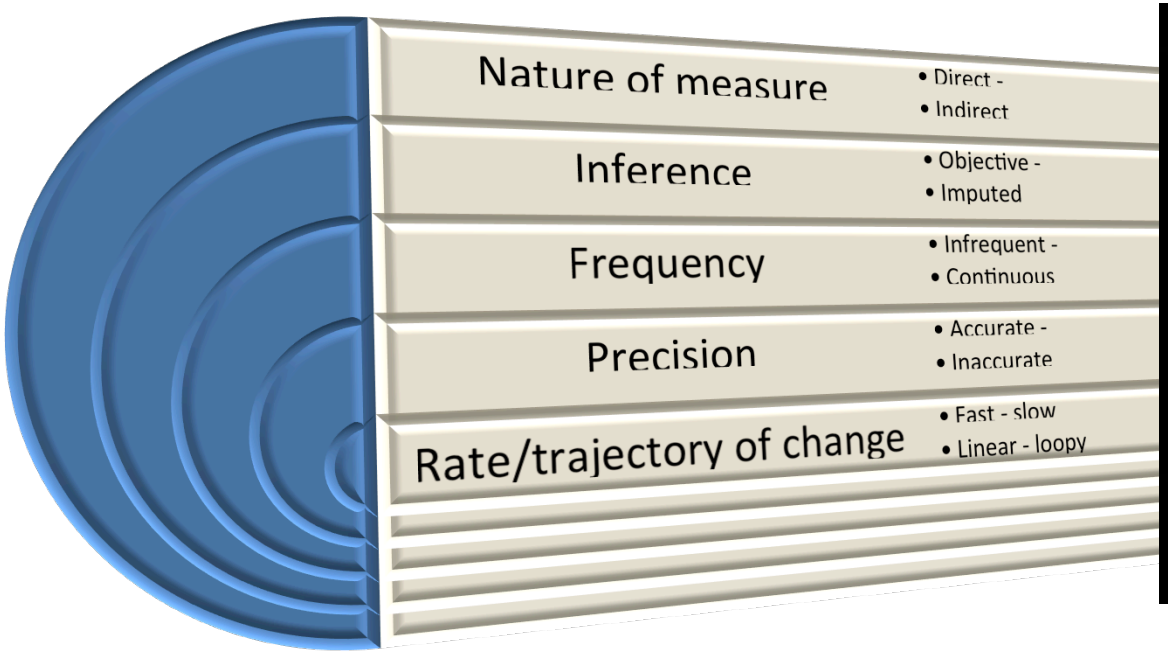
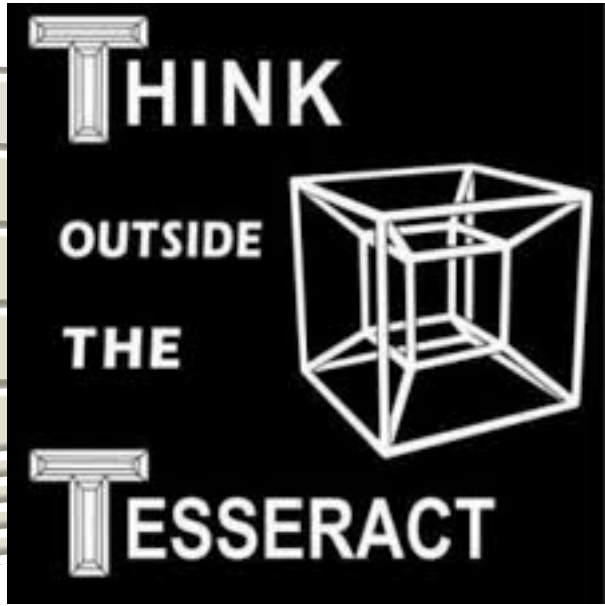
ASK
THE
RIGHT
QUESTIONS


WHAT
DO I
NEED TO
KNOW?

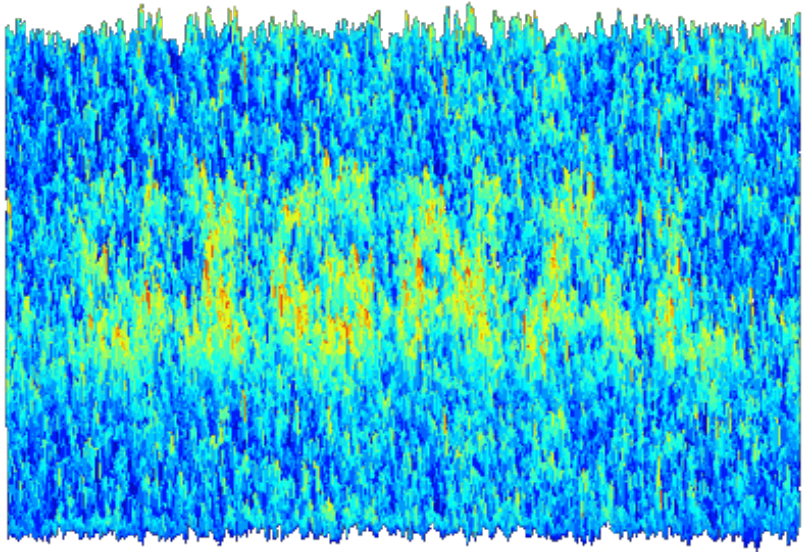
Continua in digital data: A multilevel multidimensional problem





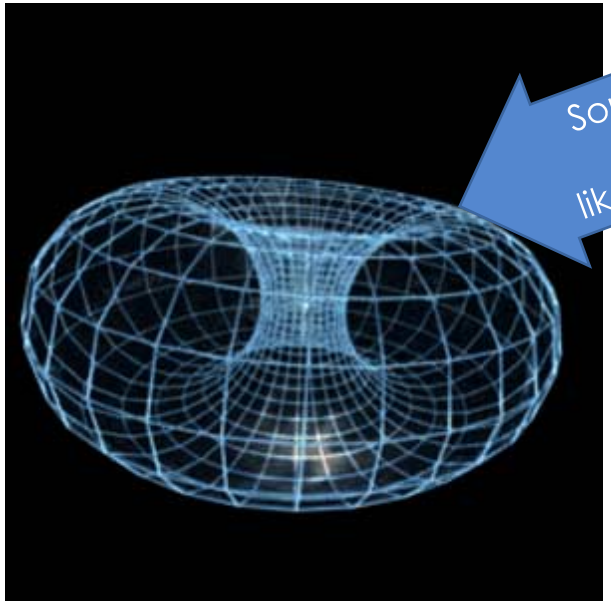
What new questions can transdisciplinary teams ask this data?

- Where are the useful signals in the current noise?
  - Semantically interesting patterns of personal & social behavior
  - A new search for meaningful mechanisms
- New variables/indices that can be discovered through a mash-up of measures
  - Adjustable across dimensions → the probability of a particular state personalizes adaptively as time-sensitive new data comes in.



"Cold" models seeded with general knowledge

Social/community index: Any data on friends, family, neighbors, Social aspects of the community, neighborhood, school etc.



Somewhat accurate 'good start' Multidimensional state/space likelihood of phenomena of interest

Cognitive & Emotional index: Composite of relevant data from "similar" groups, e.g. Jewish Princess of a Certain Age

Physiologic index or syndrome: Composite of continuous/ frequent (sensed) + infrequent (in-lab) measures of relevant data from "similar" groups

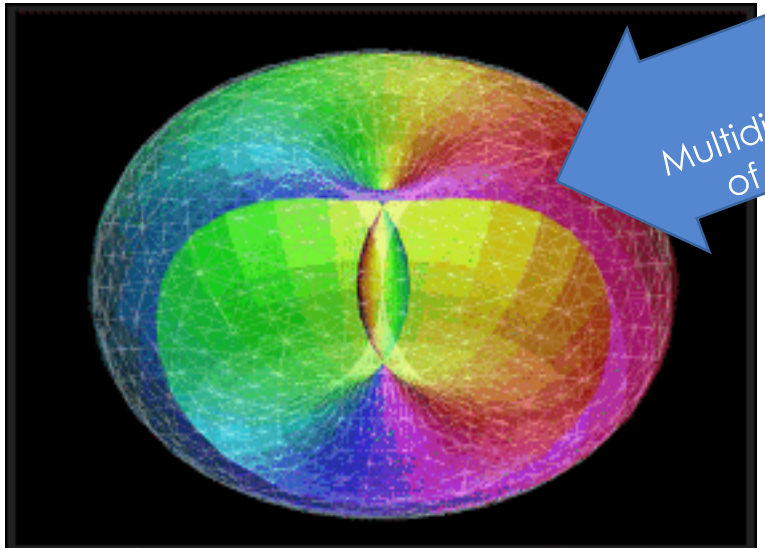
Contextualized behavioral index: Specific behavioral & common contextual data from specific group – e.g. taken from people of similar age, gender, ethnicity and neighborhood

"Warm" the model with individual data: It learns

Social/community index: Composite of continuous sensing (interactions e.g. via sound traces), proximity to others, data from the other three categories for proximal people

Much more accurate, highly personalized Multidimensional state/space likelihood of specific behavior/phenomena

Cognitive & Emotional index: Composite of ubiquitous streaming/frequent + periodic self-report



Physiologic index or syndrome: Composite of continuous/ frequent (sensed) + infrequent (in-lab) measures

Contextualized behavioral index: Composite of behavior → continuous sensed, episodic (sensed & self-report), + built environment → context static (e.g. database), sensed (e.g. air quality), streaming (e.g. GPS), 'neighborhood/community index

From “Cold” models to “Hot” models

- Start with ”cold” models → seeded with knowledge at group level
- Models are ”warmed” adaptively with individual’s data until highly predictive of individual behavior
- Knowledge is fed back into the ”cold” models which are now seeded with dynamic individual data and warming up at the individual as well as the community level
- “Hot” models are accurate, adaptive,
  - Adaptively model dynamic individual behavior in context
  - Adaptively model dynamic, socially networked communities in context

Thank you! Any questions? Please stay connected!

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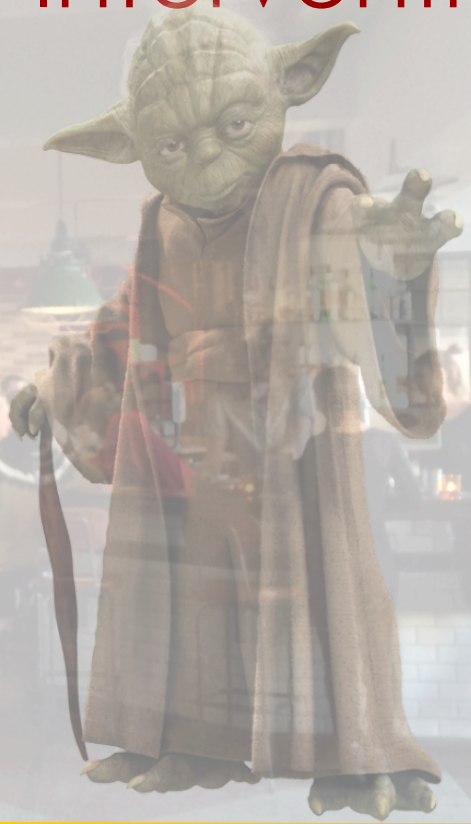
Just In Time Adaptive Interventions

- Responsive to moment-by-moment context

Context



Just In Time Adaptive Interventions

- Adaptive, Personalized
- Delivered via mobile devices
- Anytime, Anywhere,
- When the person is in need/ vulnerable & receptive (Spruijt-Metz et al 2015, Nahum-Shani, Hekler & Spruijt-Metz, 2015, Heron & Smyth, 2010)
- More effective than standard interventions or simple reminders (Smyth 2016)

IoT: mHealth[4]: