ICT Workshop on Empirical Research with Pedagogical Agents

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Our behavior is killing us...

Proportional contribution to premature death

Schroeder NEJM 200
Even When We Know Better ...
Behavior is complicated

- Current understanding of human behavior is based on static ‘snapshots’ of human behavior.
- But behavior is ongoing, dynamic feedback loops...
- Responding to ever-changing biological, social, personal, and environmental events/states across time and situation.

Change – often doable. Maintenance, not so much.

Spruijt-Metz et al under review
Target variable:

**Chocolate Consumption**

Desire to eat chocolate changes over time of day

- morning
- midday
- afternoon
- evening
Target variable depends on proximity to chocolate
Target variable is also influenced by stress levels.
And by the proximity of certain people

morning  midday  afternoon  evening
WE CAN KNOW! Unprecedented data: Temporally dense, Contextually rich

A. Abrupt change in level.
B. Delayed change in level.
C. Temporary change in level.
D. Decaying change in level.
E. Abrupt change in direction.
F. Delayed change in direction.
G. Temporary change in direction.
H. Accelerated change in direction.
I. "Evolutionary operations" effect.
J. Change in variability.

Glass, 1975
Mobile Health (mHealth) (Hardware, Software & Smarts)

• Continuous, simultaneous, **multimodal** capture of various elements of behavior, environment, health status,
• Compact, portable, and unobtrusive recorder systems that allow “naturalistic” assessment
• Computer processing that enables
  – Control of confounding variables outside the laboratory
  – Behavior recognition
  – Rapid diagnosis of medical conditions,
  – Provision of adaptive, personalized, just-in-time interventions,
• **All in the user’s natural mobile environment**
Mobile Technologies:
Data-Hungry and Ubiquitous

- Sensors sensing behavior
- GPS sensing place
- Sound/device recognition sensing conversation, other people, mood
- Integrates wireless data from wearable/deployable sensors
- Pictures, videos, and soon - HUD
- Record of phone, email, Internet use
- Patterns of change over time and place
- Real- or near-time data transfer/feedback

Source: Lane et al. 2011
Current/Recent Projects

Jaimie Davis, Austin Texas
Nicole Gatto
Gisele Ragusa, Education & Engineering
Chad Lane, ICT
Marientina Gotsis, Cinema
Shri Narayanan, Urbashi Mitra, Murali Annavaram, Gaurav Sukhatme,
Engineering
Marientina Gotsis, Cinema
Tom Valente, Preventive Med
MaryAlice Jordan-Marsh, Social Work
Maja Mataric, Engineering

International Workshop on Using New Technologies to Model
Health Behavior Change and Maintenance: Stephen Intille
Zemi – for Imagine HEALTH 3
Art

• The many aspects that can be tested are manifested so differently across disciplines, abilities, sensibilities – is there a measure for ‘artfulness’ – ‘goodness’ of a PA?
  • Look
  • Sound
  • Animation
  • NLP
  • Immersion
Role

• What is the role of the agent? Friend, peer, teacher, big brother, can it adapt over time?
• Is ‘best’ role dependent on learner characteristics? But aren’t some of these characteristics dynamic?
• Is ‘best’ role context dependent? If we go mobile with this (and we should) how will we deal with that?
The NOW of it – back end data

• What’s happening in real time? What is under the hood?
• PA’s react to actions of learner – sometimes with complex algorithms, sometimes less intricately. Sometimes theory based, sometimes not. What are we learning from that about timing, frequency, type of feedback for specific problem areas in specific contexts? How can EMA and PA learn from each other?
Optimal arcs

- What are the optimal arcs over time – the sequence of type & formulation of ‘nudge’ (input, hint, feedback, etc), changes in self efficacy, motivation, type of agent (age, gender, ethnicity, species, empathetic or polite or rude...) – how these loop back and impact over time in lagged sequence...
Figure 2. A healthy breakfast is a boosting event for the perceived competence (PC) of maintaining a healthy diet, which in turn boosts self-regulation (SR). Eating doughnuts in the afternoon causes PC to drop. The “memory” input represents a dynamic feedback loop that might independently boost PC and thus SR.
Let them take it home

- Mobile platforms that provide feedback to the teachers/instructors/participants in real time
- In context of life.