Wireless Health 2014 Panel

“Innovation Needed: Limits of Sensing, actuation and system integration technology

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what happens when life throws you a "googly"?
StudentLife study

48 students over 10 week Spring 2013 term
• 10 female, 38 male CS students
• 30 undergraduates, 18 graduates
• 8 seniors, 14 juniors, 6 sophomores, 2 freshmen, 3 Ph.D students, 1 second-year Masters student, and 13 first-year Masters students
• 23 Caucasians, 23 Asians and 2 African-Americans.
behavior inference
activity

- sitting
- standing
- walking
- running
around conversation

voiced

face to face conservation duration and frequency
Activity Feature
  stationary duration

Sound Feature
  silence duration

Light Feature
  darkness duration

Phone Usage Features
  Phone-lock, charging, phone-off duration

Sleep duration

Linear regression model

\[ S_l = \sum_{i=1}^{6} \alpha_i \cdot F_i, \alpha_i \geq 0 \]

\[ \min_{\alpha_i} \sum_{j=1}^{4}(S_{l_j} - \sum_{i=1}^{6} \alpha_i \cdot F_{i_j})^2 \]
Touch how you feel right now.

Stress

Right now, I am...

- A little stressed
- Definitely stressed
- Stressed out
- Feeling good
- Feeling great
pre-post questionnaires

- depression scale
- perceived stress scale
- loneliness scale
mental health
depression

- Sleep duration *
- Conversation frequency (day) **
- Conversation frequency (evening) *
- Number of co-locations *

*p ≤ 0.05, **p ≤ 0.01
spring GPA

- Conversation duration (day)
- Conversation frequency (day)
- Indoor mobility during (day)
- Indoor mobility during (night)

R value

\[ p \leq 0.05 \]
behavioral trends
conversation

The graph shows the trend of deadlines, conversation duration, and conversation frequency. The x-axis represents the day, and the y-axis represents the number of deadlines. The mid-term is indicated by the shaded area. The graph highlights how these factors change over time.
activity duration

mid-term

deadlines

activity duration

day
stress and affect trends (EMA)
gym visits

Mid-term

Day

Number of deadlines

deadlines

Gym visits

0

0.3

0.6

0.9

1.2

1.5

1.8

2.1

2.4
class attendance

The graph shows the trend of class attendance and deadlines over the course of the semester. The x-axis represents the days of the semester, with specific days marked on the grid. The y-axis represents the number of deadlines.

A shaded area labeled "mid-term" highlights the period around the mid-term examination. During this time, the attendance rate begins to decline, possibly due to the increased workload and the pressure of the mid-term exams.

The line graph indicates a general trend of decreasing attendance as the semester progresses, with a significant drop after the mid-term period.
few limitations!
24/7 sensing on smartphones is here!
- replace the gold standard surveys in 10 years with passive sensing
- get ride of EMAs (stress, affect, deadlines, etc)
- reduce stress, loneliness, depression, student burnout and drop out rates
- intervention
StudentLife is the first study that uses passive and automatic sensing data from the phones of a class of 48 Dartmouth students across an academic term to assess their mental health (e.g., depression, loneliness, stress), academic performance (grades across all the classes and cumulative GPA) and behavioral trends (e.g., how stress, sleep, visits to the gym, etc. change in response to college life).
what happens when life throws you a “googly"?