Reality Mining
For Health

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Honest Signals: A new framework for analysis of human interactions

- Not affect or cognition
- Unconscious signaling and response; a social sense
- Requires many seconds of observation (~ 30 seconds)
- People can use it to accurately predict behavior

`People have been studying this for a long time, but Alex is raising it up to another level.`
Nature, 1/09
Honest Signals Coordinate Human Behavior

<table>
<thead>
<tr>
<th>INTEREST</th>
<th>ATTENTION</th>
<th>EMPATHY</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>autonomic</td>
<td>thalamic attention</td>
<td>mirror neurons</td>
<td>cerebellar motor</td>
</tr>
<tr>
<td>ACTIVITY</td>
<td>INFLUENCE</td>
<td>MIMICRY</td>
<td>CONSISTENCY</td>
</tr>
</tbody>
</table>

Honest signals CAUSE response in others
Honest Signals for Behavioral Neuro-Economics
reading brain state from behavior

Instead of this:

You can use this:

So: we can `x-ray' entire organizations

2300 experiment hours for 800 people
1000 full workdays phone data for 84 people
80 years continuous phone data for 170 people

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Honest Signals shape your life

Sales, salary negotiation: up to 30% increase

Hiring and dating: signals that work

Pitching your vision: success and charisma

2300 hours of experiments with 800 people

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Coupled HMMs Of Signal-Response

Person A
Person B

Influence Model with Hidden States
Several days later…

Shows up

“Yes/Show”

Coach

Subject

Accepts and schedules

Enroller

Subject

Declines “No”

Does not show up

“Yes/NoShow”

Coach

?
Outcomes

Predicted vs. Actual
Outcomes

Results

- Overall Accuracy at classifying Yes/Shows and Yes/NoShows was 78%
- When predicted a Yes/Show, it was correct 73% of the time
- When predicted a Yes/NoShow, it was correct 84% of the time
Networks of Interactions

\[ P(S_t^i \mid S_{t-1}^1, \ldots, S_{t-1}^N) = \sum_j \alpha_{ij} P(S_t^i \mid S_{t-1}^j) \]
f2f Exposure

- key in infection
- changes opinions too!

Madan, Lazer, Pentland

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Signals In The Wild
Tribes

(Jebara et al, Sense Networks)
Cohesive Communities Drive Learning
Information Ghettos Are Poor and Sick

Healthy communities have both exploration and cohesion

Breakthrough Idea of the Year
Harvard Business Review