

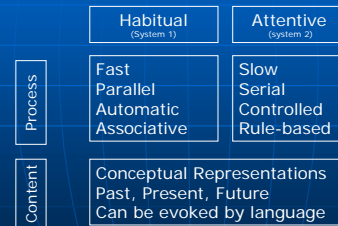
Reality Mining For Honest Signals

Or, what we can
learn from the bees



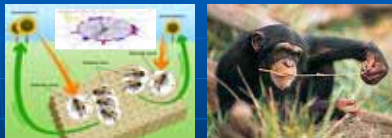
Two Minds

Nobel Prize winners Kahneman and
Simon: Humans have two minds



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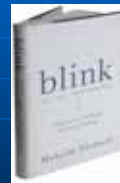
Honest Signals Evolve To Coordinate Social Species



learning is by mimicry, social pressure,
and (in humans) stories

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Honest Signals: A new framework for analysis of human interactions



- Requires many seconds of observation (~ 30 seconds)
- People can use it to accurately predict behavior
- Unconscious signaling and response; a social sense
- 'Gain control' for tone of voice, body language

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Contrast with Linguistics Framework

Signals

- Averaged over dozens of seconds
- Ancient, coarse
- Generally not under conscious control
- Concerned with group dynamics, connections
- Ecological, network analysis framework

Language

- Sub-second to a few seconds
- Modern, detailed
- Generally under conscious control
- Concerned with mental representations
- Syntactic, semantic analysis framework

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Contrast with Affect Framework

Signals

- Averaged over dozens of seconds
- Coarse
- Generally not aware of signal, response
- Concerned with group dynamics, connections
- Ecological, network analysis framework

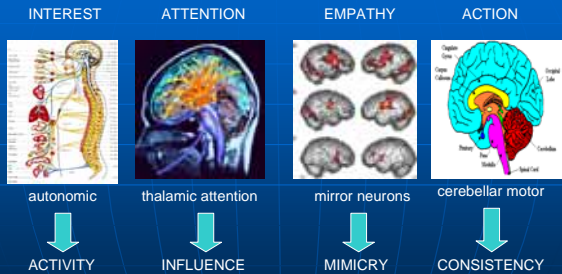
Affect

- Sub-second to a few seconds
- Detailed
- Generally aware of emotion, reaction
- Concerned with internal motivational state
- Ecological, individual analysis framework

...but there is overlap with 'basic emotion' framework, e.g.,
does arousal = activity?

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Honest Signals evolved to coordinate competition

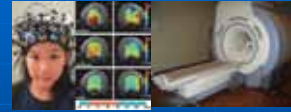


Honest signals CAUSE response in others

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Honest Signals for Behavioral Neuro-Economics reading brain state from behavior

Instead of this:



You can use this:



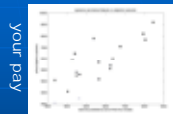
So: we can 'x-ray' entire organizations

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



your signals

Hiring and dating:
signals that work



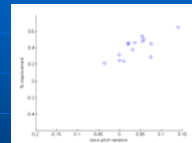
Pitching your vision:
success and charisma



2300 hours of experiments with 800 people

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Telephone Monitoring of Depression



$r = 0.81$ with HDI



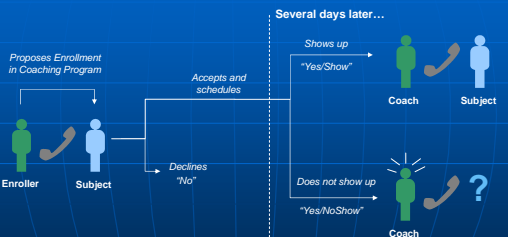
Screening by
honest signals
may be good as
gold standard !



No. 1 cause of lost days of work
Up to 90% undiagnosed !!!

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Trust



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Outcomes

Predicted vs. Actual
Outcomes

Predicted	Actual		
	No	Yes/NoShow	Yes/Show
Yes/Show	██████████	██████████	██████████
Yes/NoShow	██████████	██████████	██████████
No	██████████	██████████	██████████

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



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People influence others actions



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Honest Signals and Response

Honest signals provoke signaling response that depends on social context

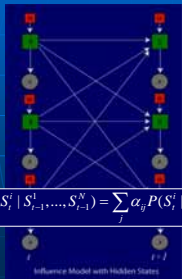
Example 1: in salary negotiation boss responds differently than employee

Example 2: in Survival experiment, approximately half of response variance is contingent on other people's signals

All subjects have same transition dependencies

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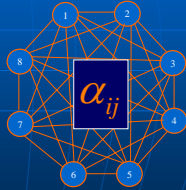
signaling model of group behavior



$$P(S_t^i | S_{t-1}^1, \dots, S_{t-1}^n) = \sum_j \alpha_{ij} P(S_t^j | S_{t-1}^i)$$

Influence Model with Hidden States

$\{\alpha_{ij}\}$
 $P(S_t^j | S_{t-1}^i)$



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Social Roles & Honest Signals

	Activity	Influence	Mimicry	Consistency
Listening	-	+	+	-
Exploring	+	+	+	-
Teaming	-	+	+	+
Leading	+	+	-	+

Light color: signal may be absent or suppressed

Honest Signals & Traditional Analysis

Honest Signals	Exploring (active, variable)	Teaming (influence, consist, mimicry)	Active listening (mimicry, variable)	Leading (active, influence, consistent)
Bales' Social role	Protagonist	Supporter	Neutral	Attacker
Bales' Task role	Givers	Orienteers	Followers	

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Role Recognition using Honest Signals

	Audio	Video	Both
Bales' Social Roles	0.77	0.72	0.78
Bales' Task Roles	0.71	0.68	0.71

Honest Signals Are Multimodal
...and the computer is as good as trained observers!

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Meeting Mediator

Adds Back Honest Signals



Promotes more balanced engagement

Removes star effect of dominant person (good for brainstorming)

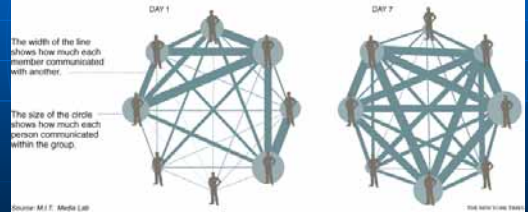
Promotes trust (and fitness) in public goods game

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From Bad to Great

A Map of Collaboration

Eight people working on a brainstorming task had their communication tracked for seven days by collective intelligence techniques. At the end of each day, they were shown the pattern of that day's interaction. By the end of the week, their interaction had increased greatly, and the group dynamic was much more successful.



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