

CS 5306
INFO 5306:
Crowdsourcing and
Human Computation

Lecture 9
9/19/17
Haym Hirsh

No class Thursday, September 21

Last Time

Infotopia, Chapter 1

The (Occasional) Power of Numbers

Last Time

Infotopia, Chapter 1

The (Occasional) Power of Numbers

Infotopia, Chapter 2

The Surprising Failures of Deliberating Groups

Infotopia, Chapter 2

The **Surprising** Failures of Deliberating Groups

Aristotle, Politics, Book 3 1281

There is this to be said for the Many. Each of them by himself may not be of a good quality; but when they all come together it is possible that they may surpass—collectively and as a body although not individually—the quality of the few best. Feasts to which many contribute may excel those provided at one man's expense. In the same way, when there are many who contribute to the process of deliberation each can bring his share of goodness and moral prudence; and when all meet together the people may thus become something in the nature of a single person who—as he has many feet, many hands, and many senses—may also have many qualities of character and intelligence. This is the reason why the Many are also better judges than the few of music and the writing of poets: some appreciate one part, some another, and all together appreciate all.

Aristotle, Politics, Book 3 1281

We may note that this combination of qualities, which gives the Many their merit, can also be traced in cases of *individual* merit. The thing which makes a good man differ from a unit in the crowd—as it is also the thing which is generally said to make a beautiful person differ from one who is not beautiful, or an artistic representation differ from ordinary reality—is that elements which are elsewhere scattered and separate are here combined in a unity. It is this unity which counts; for if you take the elements separately, you may say of an artistic representation that it is surpassed by the eye of this person or by some other feature of that.

Aristotle, Politics, Book 3 1281

It is not clear, however, that this combination of qualities, which we have made the ground of distinction between the many and the few best, is true of all popular bodies and all large masses of men. Perhaps it may be said, "By heaven, it is clear that there are some bodies of which it cannot possibly be true; for if you included them, you would, by the same token, be found to include a herd of beasts. That would be absurd; and yet what difference is there between these bodies and a herd of beasts?" All the same, and in spite of this objection, there is nothing to prevent the view we have stated from being true of *some* popular bodies.

John Rawls, *A Theory of Justice*, 1971

Nevertheless, we normally assume that an ideally conducted discussion among many persons is more likely to arrive at the correct conclusion (by a vote if necessary) than the deliberations of any one of the them by himself. Why should this be so? In everyday life the exchange of opinion with others checks our partiality and widens our perspective; we are made to see things from their standpoint and the limits of our vision are brought home to us. But in the ideal process the veil of ignorance means that the legislators are already impartial. The benefits from the discussion lie in the fact that even representative legislators are limited in knowledge and ability to reason. No one of them knows everything the others know, or can make all the same inferences that they can draw in concert. Discussion is a way of combining information and enlarging the range of arguments. At least in the course of time, the effects of common deliberation seem bound to improve matters.

John Rawls's
A THEORY
OF JUSTICE

the
MUSICAL!

a
new musical
by Eylon Aslan-Levy,
Ramin Sabi & Tommy Peto



An all-singing,
all-dancing romp
through 2,500
years of political
philosophy

Keble O'Reilly Theatre
entrance on Blackhall Road

3rd Week

Wed 30th Jan - 19.30

Thu 31st Jan - 19.30

~~Sat 1st Feb - 19.30~~

Sat 2nd Feb - 14.30

Sat 2nd Feb - 19.30

Tickets £8/7, from
www.atojtm.com

Pre-show lectures for ticket-
holders (18:30-19:15)

30th Jan - Cecile Fabre

'Justice... and the Human Body'

31st Jan - Stuart White

'Justice... and Disability'

1st Feb - Adam Swift

'Justice... and the Family'



@ATOJTMusical
www.facebook.com/ATheoryOfJusticeTheMusical

Carl Schmitt, *The Crisis of Parliamentary
Democracy*, 1985

Parliament is accordingly the place in which particles of reason that are strewn unequally among human beings gather themselves and bring public power under control.

Deliberation seems like a good thing

- Get information from the smartest person
- Aggregate distributed information
- Synergy and learning

Deliberation Often Isn't a Good Thing

- Deliberating groups are no better than statistical groups
- Deliberation gives false sense of security about decisions
- Groups members feel “majority pressure”
 - Informational influences
 - Social influences

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 - Social influences: I want to be liked
 - Can be framed economically – private benefits vs social benefits

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(John Van Maanen, "The Smile Factory: Work at Disneyland."
In P. Frost, *et al* (eds.) *Reframing Organizational Culture*, 1991)

task (correct, error, inserted error, and corrected error) to allow typists to distinguish sources of errors and correct responses and, therefore, provide a stronger test of illusions of authorship. We asked 24 skilled typists (WPM = 70.7 ± 16.4) to type 600 words, each of which was followed by a four-alternative explicit report screen. Typists typed 91.8% of the words correctly. Mean interkeystroke intervals, plotted in Fig. 3A, show post-error slowing for incorrect responses ($F_{1,138} = 117.7, p < 0.01$) and corrected errors ($F_{1,138} = 120.0, p < 0.01$), but not for inserted errors ($F < 1.0$), indicating that inner-loop detection distinguishes between actual errors and correct responses.

Explicit detection probabilities, plotted in Fig. 3B, show good discrimination between correct and error responses. For correct responses, typists said "correct" more than "error" [$t(23) = 97.29, p < 0.01$]; for error responses, typists said "error" more than "correct" [$t(23) = 8.22, p < 0.01$]. Typists distinguished actual errors from inserted errors well, avoiding an illusion of authorship. They said "error" more than "inserted" for actual errors [$t(23) = 7.06, p < 0.01$] and "inserted" more than "error" for inserted errors [$t(23) = 14.75, p < 0.01$]. However, typists showed a strong illusion of authorship with corrected errors. They were just as likely to call them correct responses as corrected errors [$t(23) = 1.38$].

The post-error slowing and post-trial report data show a dissociation between inner- and outer-loop error detection. We assessed the dissociation further by comparing post-error slowing on trials in which typists did and did not experience illusions of authorship (21). The pattern of post-error slowing was the same for both sets of trials (fig. S6), suggesting that the pattern in Fig. 3A is representative of all trials.

The three experiments found strong dissociations between explicit error reports and post-error slowing. These dissociations are consistent with the hierarchical error-detection mechanism that we proposed, with an outer loop that mediates explicit reports and an inner loop that mediates post-error slowing. This nested-loop description of error detection is consistent with hierarchical models of cognitive control in typewriting (9, 10, 15–17) and with models of hierarchical control in other complex tasks (2, 8, 22). Speaking, playing music, and navigating through space may all involve inner loops that take care of the details of performance (e.g., uttering phonemes, playing notes, and walking) and outer loops that ensure that intentions are fulfilled (e.g., messages communicated, songs performed, and destinations reached). Hierarchical control may be prevalent in highly skilled performers who have had enough practice to develop an autonomous inner loop. Previous studies of error detection in simple tasks may describe inner-loop processing. The novel contribution of our research is to dissociate the outer loop from the inner loop.

The three experiments demonstrate cognitive illusions of authorship in skilled typewriting (11–14). Typists readily take credit for correct output on the screen, interpreting corrected errors as their own correct responses. They take the blame for inserted errors, as in the first and second experiments, but they also blame the computer, as in the third experiment. These illusions are consistent with the hierarchical model of error detection, with the outer loop assigning credit and blame and the inner loop doing the work of typing (10, 17). Thus, illusions of authorship may be a hallmark of hierarchical control systems (2, 11, 22, 23).

References and Notes

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- We thank J. D. Schall for comments on the manuscript. This research was supported by grants BCS 0646588 and BCS 0957074 from the NSF.

Supporting Online Material

www.sciencemag.org/cgi/content/full/330/6004/683/DC1

Materials and Methods

SOM Text

Figs. S1 to S6

References

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Evidence for a Collective Intelligence Factor in the Performance of Human Groups

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Psychologists have repeatedly shown that a single statistical factor—often called “general intelligence”—emerges from the correlations among people’s performance on a wide variety of cognitive tasks. But no one has systematically examined whether a similar kind of “collective intelligence” exists for groups of people. In two studies with 699 people, working in groups of two to five, we find converging evidence of a general collective intelligence factor that explains a group’s performance on a wide variety of tasks. This “c factor” is not strongly correlated with the average or maximum individual intelligence of group members but is correlated with the average social sensitivity of group members, the equality in distribution of conversational turn-taking, and the proportion of females in the group.

As research, management, and many other kinds of tasks are increasingly accomplished by groups—working both face-to-face and virtually (1–3)—it is becoming ever more important to understand the determinants of group performance. Over the past century,

psychologists made considerable progress in defining and systematically measuring intelligence in individuals (4). We have used the statistical approach they developed for individual intelligence to systematically measure the intelligence of groups. Even though social psycholo-

gists and others have studied for decades how well groups perform specific tasks (5, 6), they have not attempted to measure group intelligence in the same way individual intelligence is measured—by assessing how well a single group can perform a wide range of different tasks and using that information to predict how that same group will perform other tasks in the future. The goal of the research reported here was to test the hypothesis that groups, like individuals, do have characteristic levels of intelligence, which can be measured and used to predict the groups’ performance on a wide variety of tasks.

Although controversy has surrounded it, the concept of measurable human intelligence is based on a fact that is still as remarkable as it was to Spearman when he first documented it in 1904

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Evidence for a Collective Intelligence Factor

- Intelligence: “People who do well on one mental task tend to do well on most others, despite large variations in the tests’ contents and methods of administration.”
- There is similarly a single dominant factor in group performance:
Collective Intelligence factor
 - “the general ability of the group to perform a wide variety of tasks”
 - A group that performs well on a set of tasks are more likely to perform well on other tasks

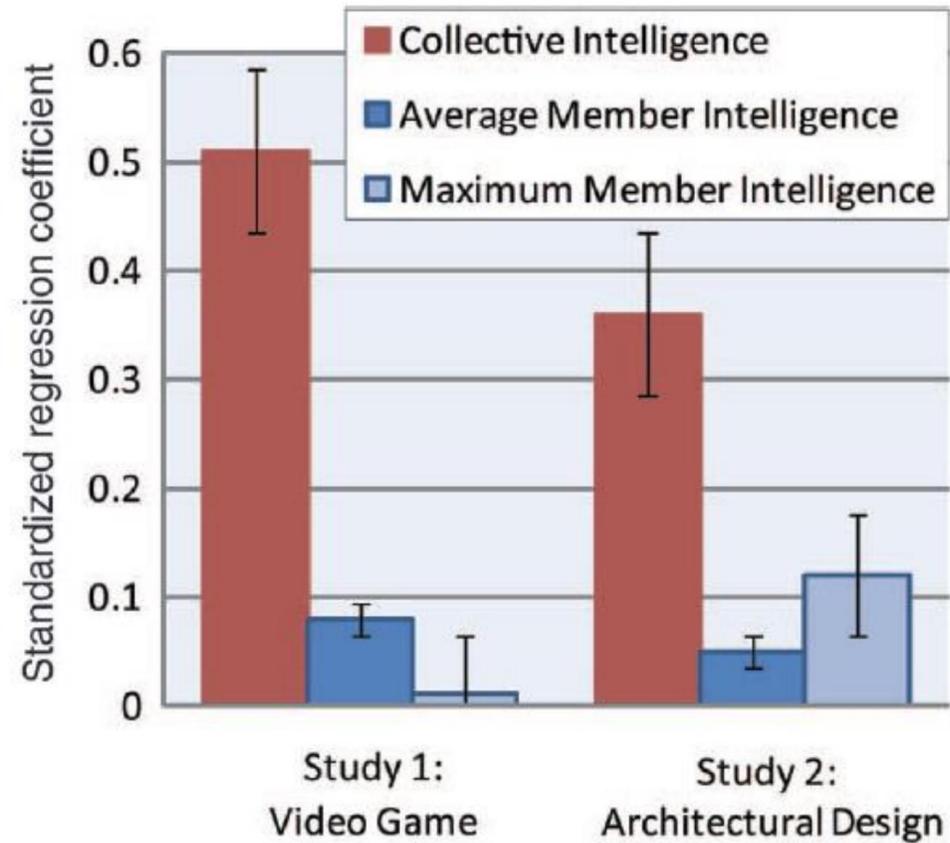
Evidence for a Collective Intelligence Factor

- Not strongly connected to average or maximum member intelligence, nor to group cohesion, motivation, or satisfaction

Evidence for a Collective Intelligence Factor

- Not strongly connected to average or maximum member intelligence, nor to group cohesion, motivation, or satisfaction
 - Group satisfaction: Agreement with statements such as “I have been very satisfied working on this team”.
 - Motivation: Agreement with statements such as “I would feel bad and unhappy if our team has performed poorly”.
 - Social cohesiveness: Agreement with statements such as “Members of this group would enjoy being at a party together”.
 - Psychological Safety: Agreement with statements such as “It is difficult to ask other members of this team for help”.

Evidence for a Collective Intelligence Factor



Evidence for a Collective Intelligence Factor

- Correlated with
 - Average social sensitivity of group members
 - More turn taking

Evidence for a Collective Intelligence Factor

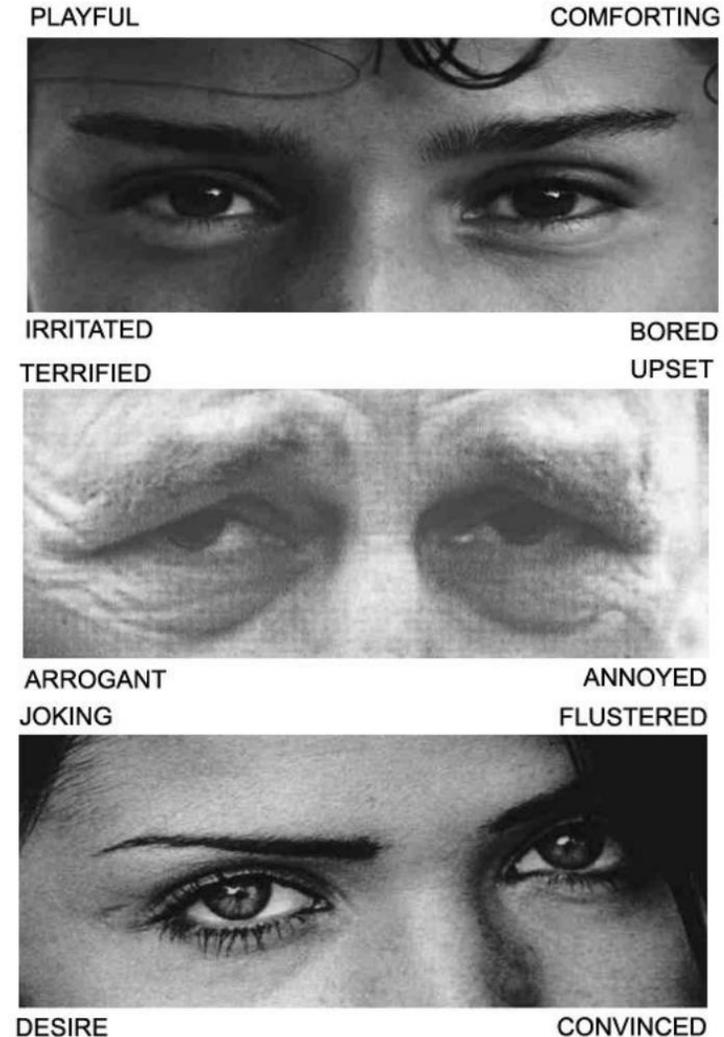
- Correlated with
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 - More turn taking
 - Proportion of females

Evidence for a Collective Intelligence Factor

- Correlated with
 - Average social sensitivity of group members
 - More turn taking
 - Proportion of females - Known to exhibit better social sensitivity and turn taking

Evidence for a Collective Intelligence Factor

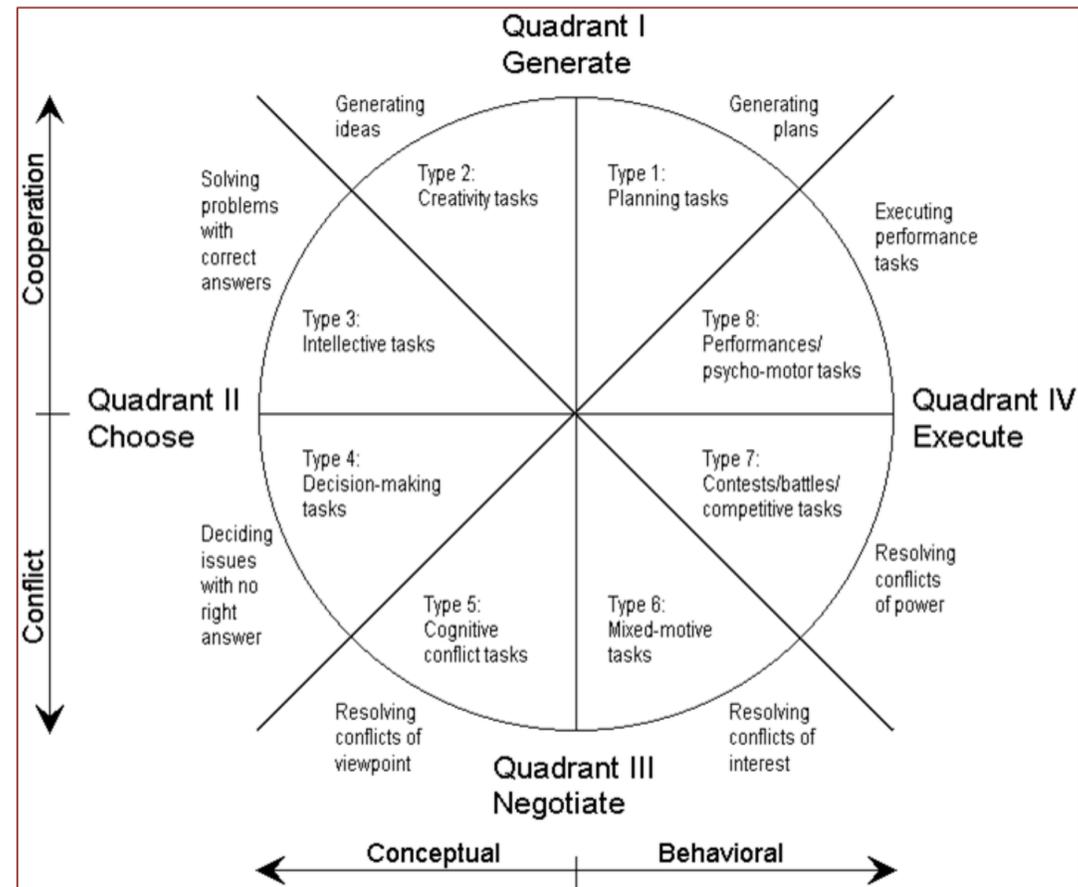
- Social Sensitivity:
Reading the Mind in the Eyes



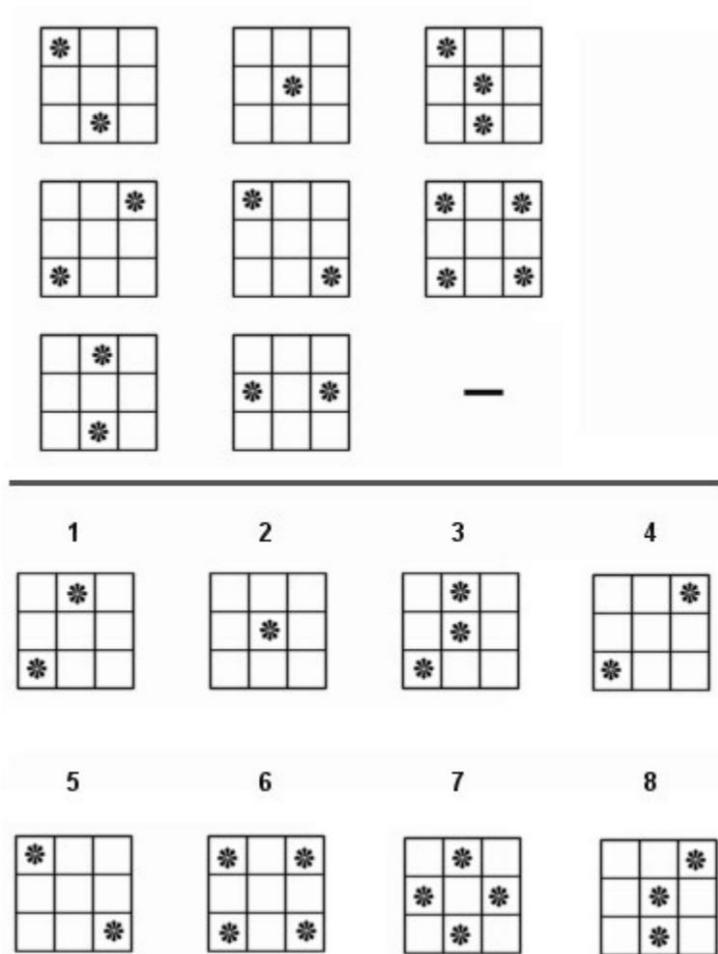
Evidence for a Collective Intelligence Factor



McGrath Task Circumplex



Raven's Advanced Progressive Matrices



NEO Personality Inventory (The “Big Five” Personality Traits)

- Neuroticism
- Extraversion
- Openness to experience
- Agreeableness
- Conscientiousness

Wonderlic Personnel Test

Which of the following is the earliest date?

- A) Jan. 16, 1898 B) Feb. 21, 1889 C) Feb. 2, 1898 D) Jan. 7, 1898 E) Jan. 30, 1889

LOW is to HIGH as EASY is to ?

- J) SUCCESSFUL K) PURE L) TALL M) INTERESTING N) DIFFICULT

A featured product from an Internet retailer generated 27, 99, 80, 115 and 213 orders over a 5-hour period. Which graph below best represents this trend?



A



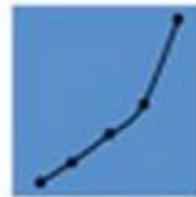
B



C



D



E

What is the next number in the series? 29 41 53 65 77 ?

- J) 75 K) 88 L) 89 M) 98 N) 99

One word below appears in color. What is the OPPOSITE of that word?

She gave a **complex** answer to the question and we all agreed with her.

- A) long B) better C) simple D) wrong E) kind

- Neuroticism
 - Anxiety
 - Hostility
 - Depression
 - Self-Consciousness
 - Impulsiveness
 - Vulnerability to Stress
- Extraversion
 - Warmth
 - Gregariousness
 - Assertiveness
 - Activity
 - Excitement Seeking
 - Positive Emotion •

- Openness to experience
 - Fantasy
 - Aesthetics
 - Feelings
 - Actions
 - Ideas
 - Values

Readings for Next Time

- *Infotopia*, Chapter 3
- “Embracing Error to Enable Rapid Crowdsourcing”, Ranjay Krishna, Kenji Hata, Stephanie Chen, Joshua Kravitz, David A. Shamma, Li Fei-Fei, Michael Bernstein, CHI 2016
- “Interactive Consensus Agreement Games For Labeling Images”, Upchurch, P., Sedra, D., Mullen, A., Hirsh, H. and Bala, K., Proceedings Hcomp 2016.