



Collective Intelligence: How diversity makes everyone smarter

UM6P



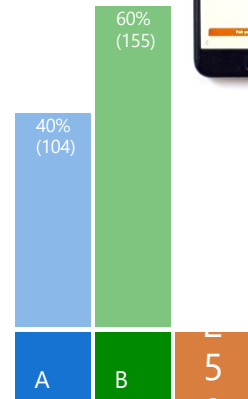
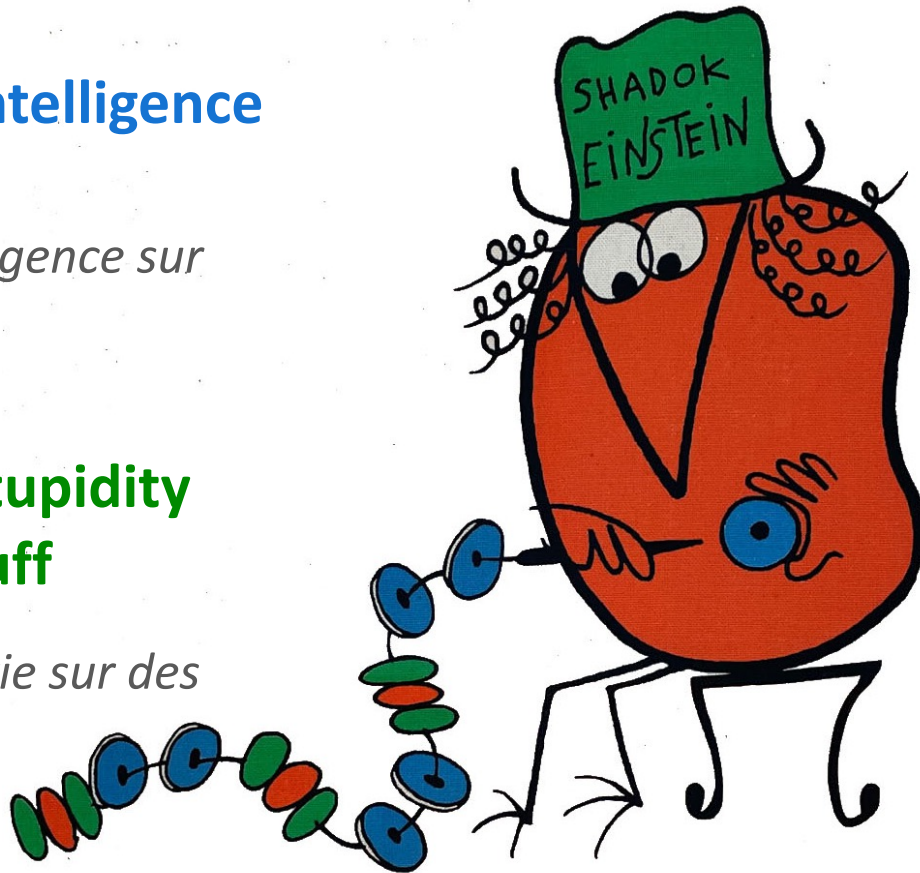
Which is better?

A. Mobilize your intelligence on stupid stuff

Mobiliser son intelligence sur des conneries

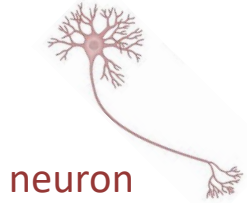
B. Mobilize your stupidity on intelligent stuff

Mobiliser sa connerie sur des choses intelligentes

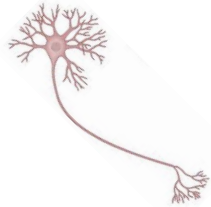




Strength in numbers



$\times 250,000 =$  $\times 1,000,000 \rightarrow$



$\times 80,000,000,000 =$  $\times 1 \rightarrow$



Organisation matters

1905: Measuring Intelligence



Alfred Binet



Theodore Simon

2010 : Measuring **Collective** Intelligence



Tom Malone



Anita Woolley

Human groups have their own IQ

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

Janita Williams Woolley,^{1*} Christopher F. Chabris,^{2,3} Alex Pentland,^{3,4} Naomi S. Cohen,^{3,5} Thomas W. Malone^{3,5}

Psychologists have long known that a single statistical factor 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 all 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

¹Carnegie Mellon University, Tepper School of Business, Pittsburgh, PA 15213, USA. ²Union College, Schenectady, NY 12308, USA. ³Massachusetts Institute of Technology (MIT) Center for Collective Intelligence, Cambridge, MA 02142, USA. ⁴MIT Media Lab, Cambridge, MA 02139, USA. ⁵MIT Sloan School of Management, Cambridge, MA 02142, USA.

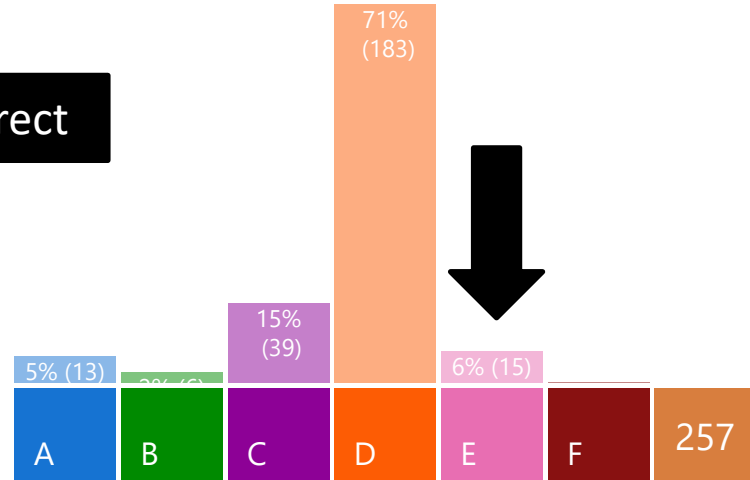
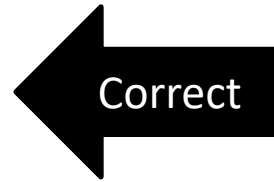
*To whom correspondence should be addressed. E-mail: awoolley@cmu.edu



What elevates **most** a group's IQ?

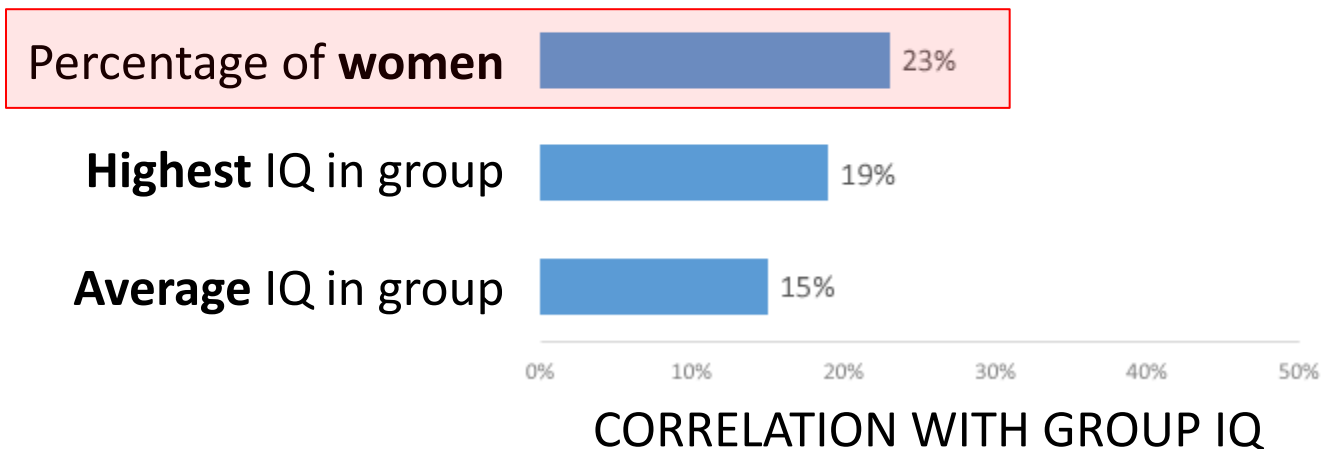


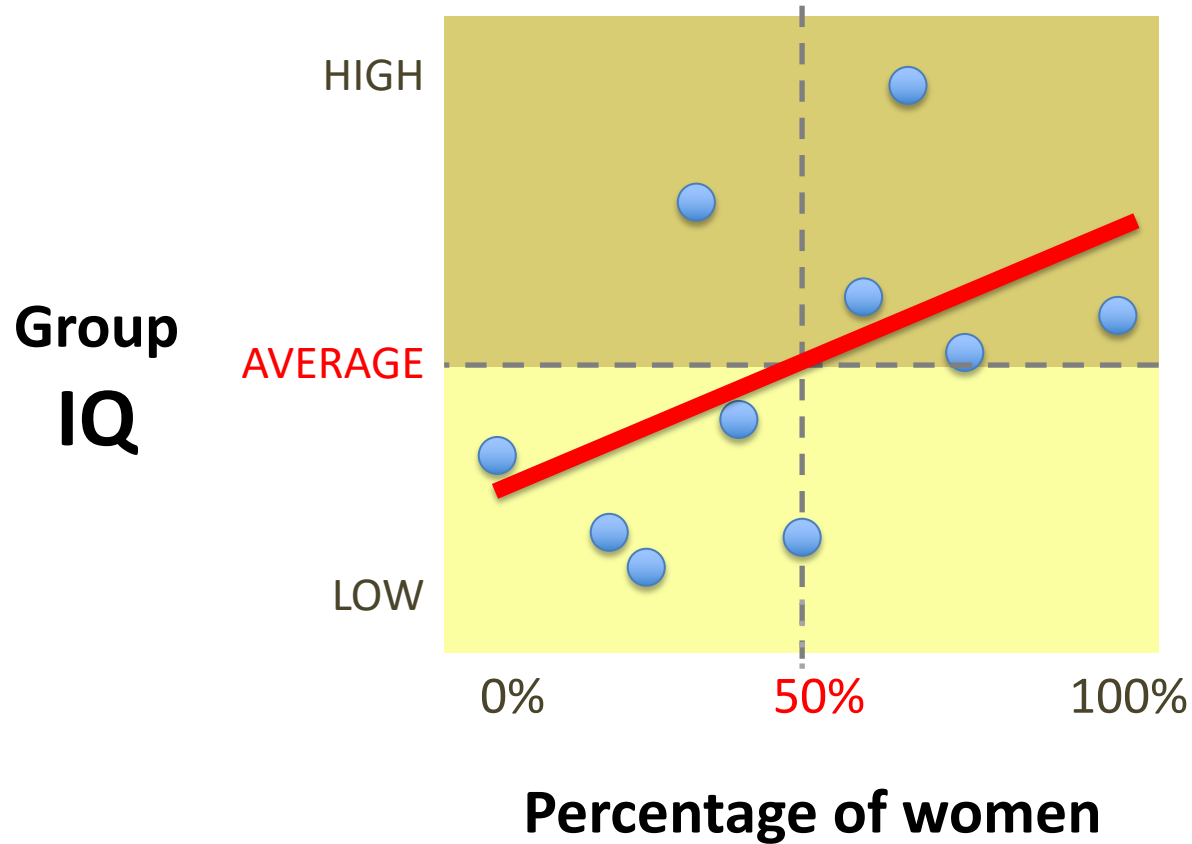
- A. Average IQ in the group
- B. Highest IQ in the group
- C. Group motivation
- D. Group **Cohesion**
- E. Percentage of **women**
- F. Percentage of **men**



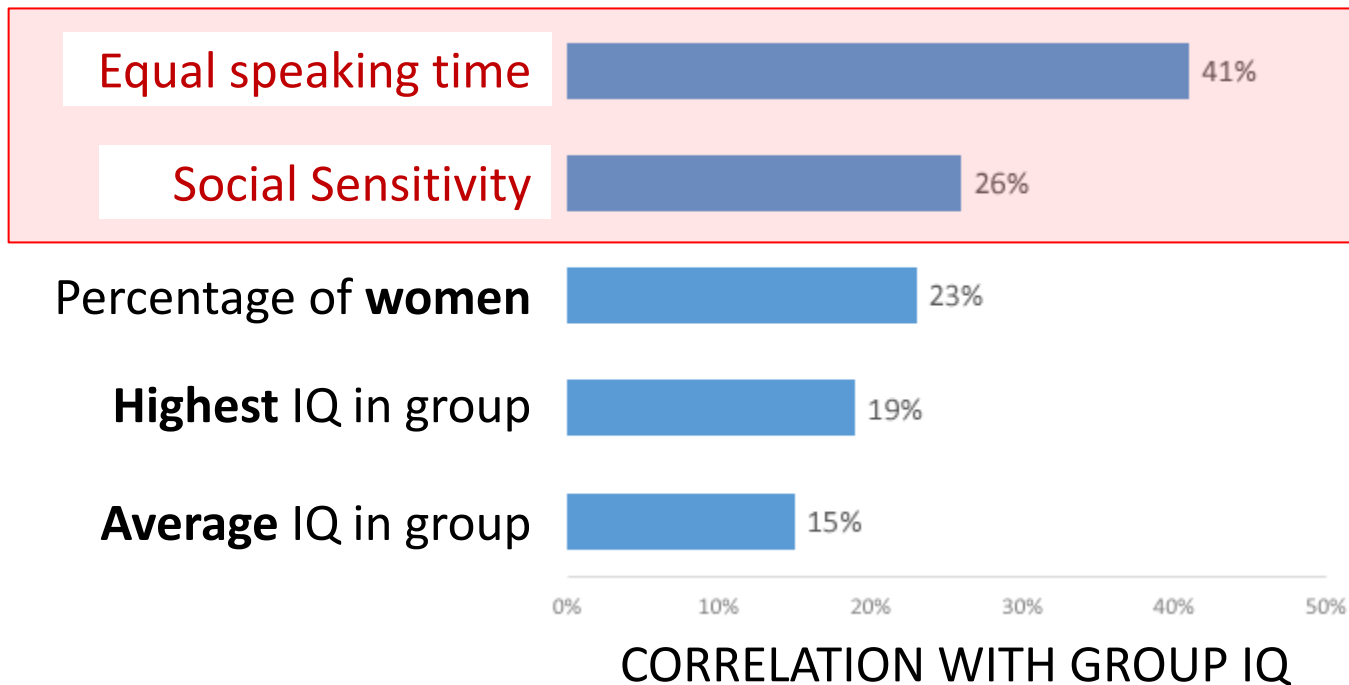
What elevates **most** a group's IQ?

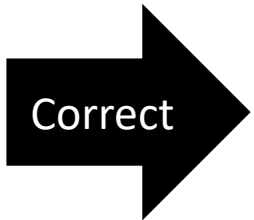
~~group cohesion~~
~~motivation~~
~~satisfaction~~ } NO correlation with group IQ



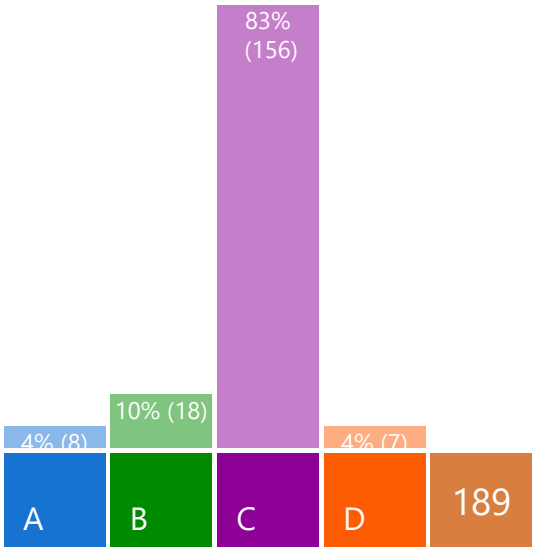


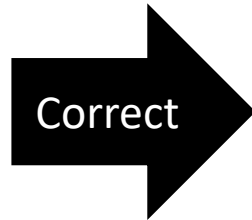
What elevates **most** a group's IQ?



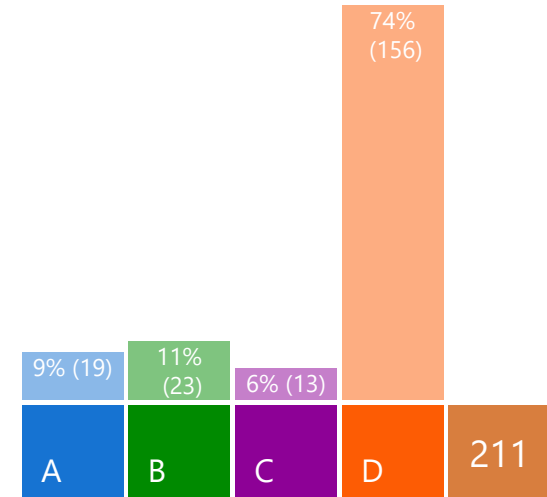


- A. Aghast (stupéfaite)
- B. Baffled (déconcertée)
- C. Distrustful (méfiante)
- D. Terrified (terrifiée)





- A. Fantasizing (rêveur)
- B. Guilty (coupable)
- C. Embarrassed (gêné)
- D. Concerned (préoccupé)





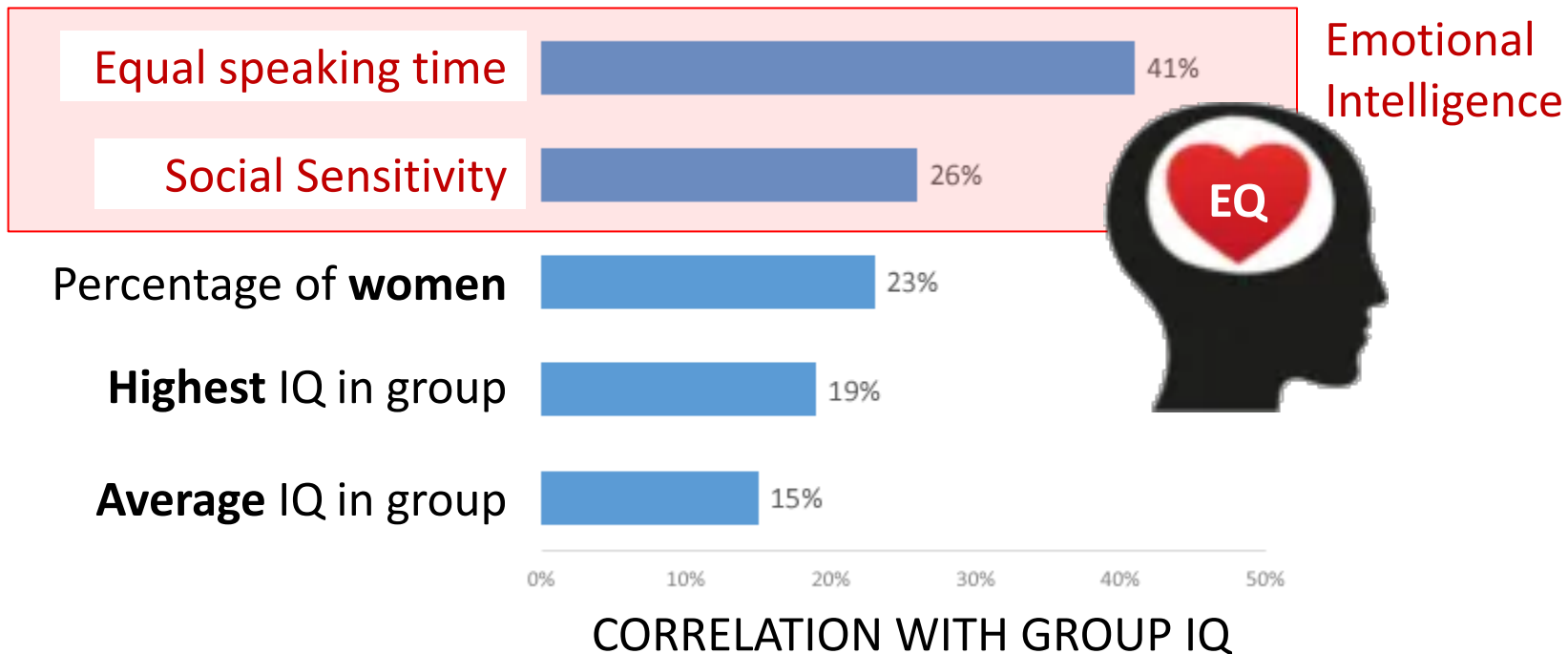
Women score
higher than men on
“social sensitivity”
(on average)

Number of
correct
answers

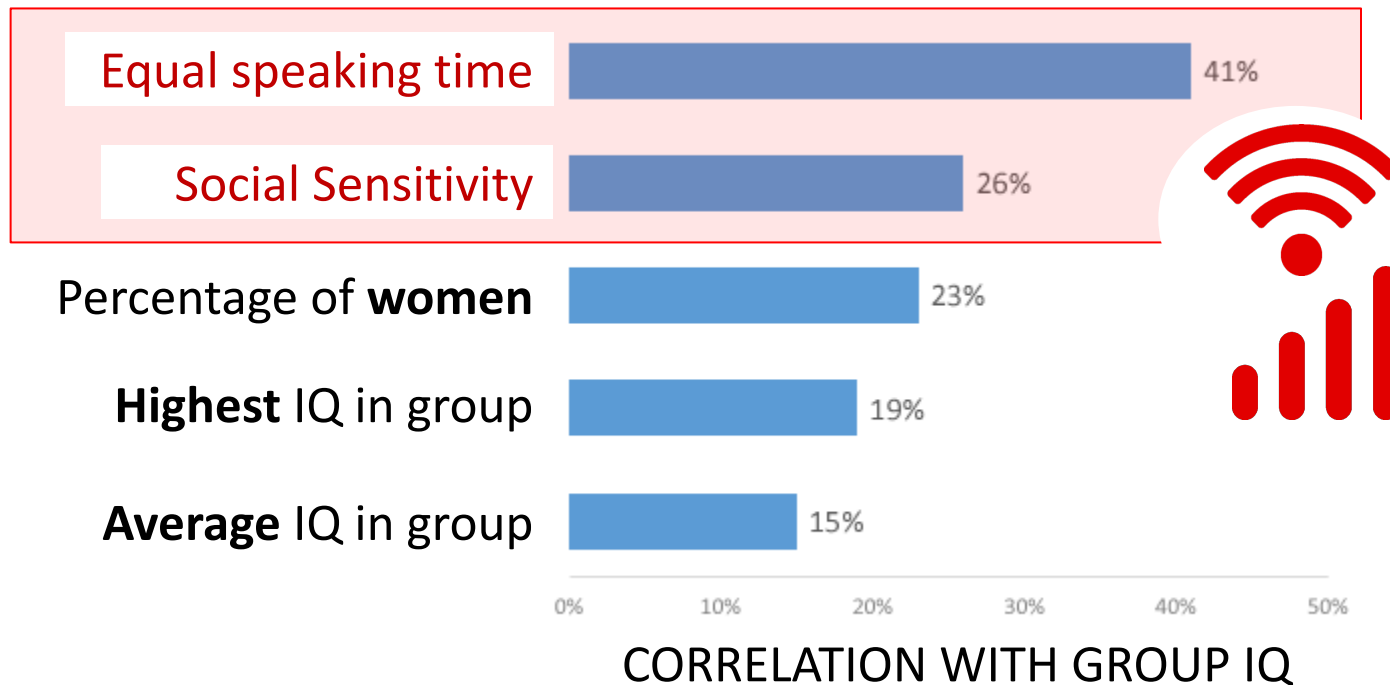


Baron-Cohen, S., et al. (2015). The “Reading the Mind in the Eyes” test: Complete absence of typical sex difference in 400 men and women with autism. *PLoS ONE*, 10 : 8.

Group IQ depends most on **individual EQ**

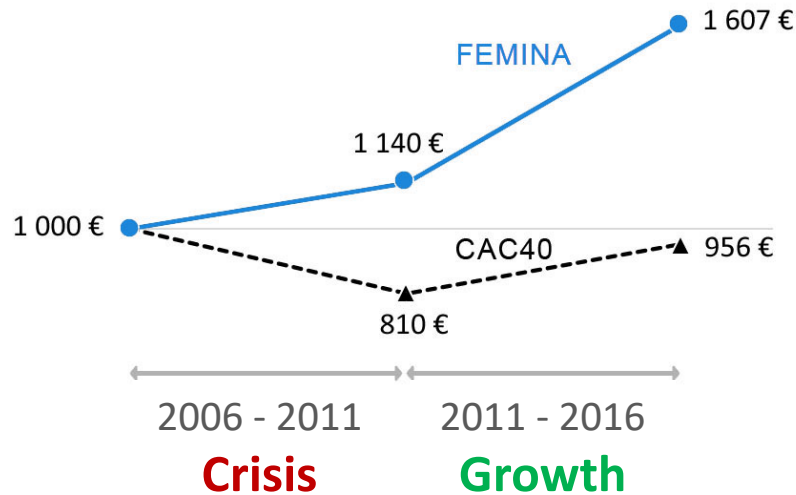


Group IQ depends most on **bandwidth** quality



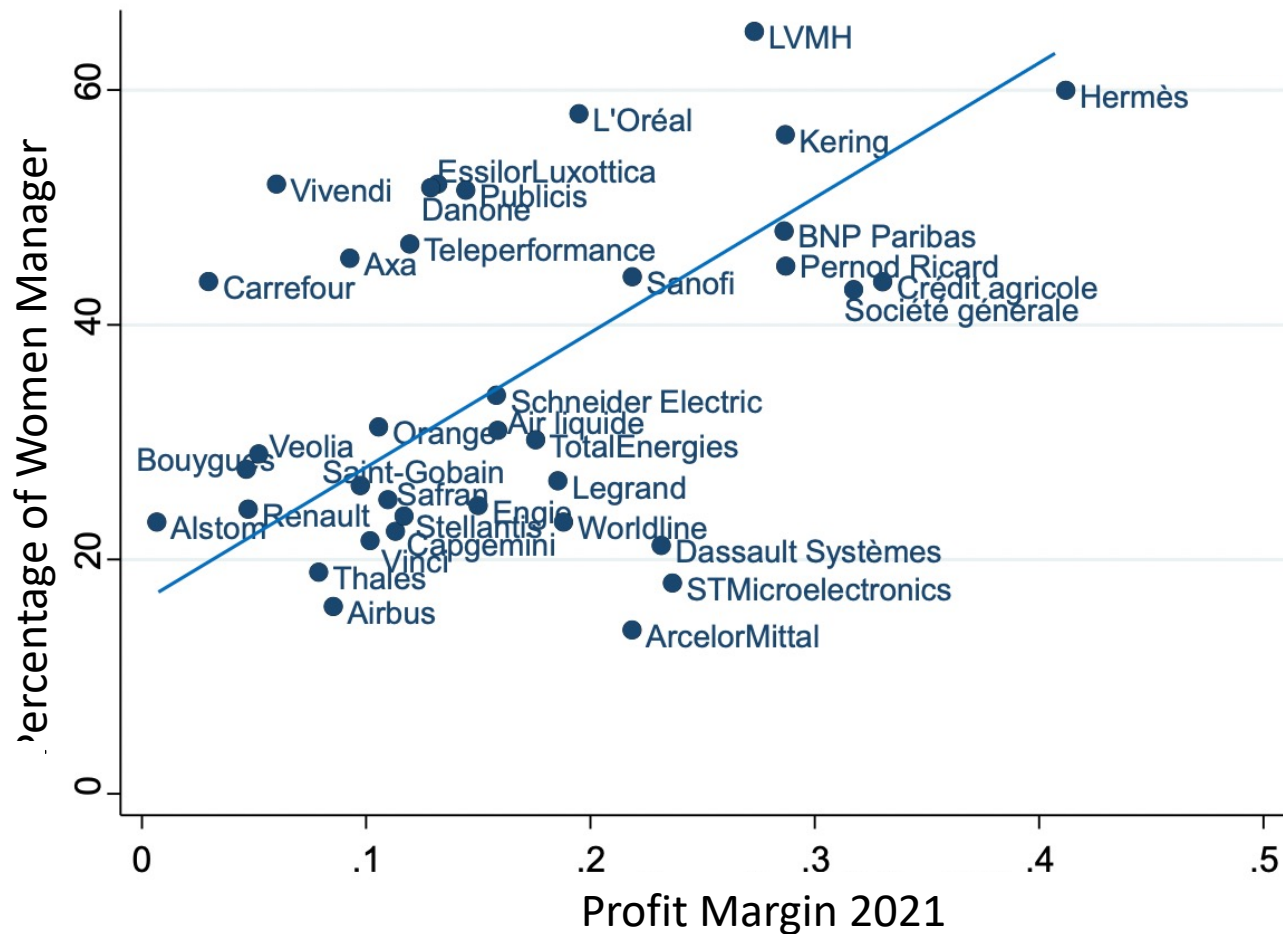
FEMINA index: 15 companies in CAC 40 with at least 35% women managers

Stock Market Performance 2006-2016



L'Oréal
Hermès
Casino
Natixis
Publicis
Sodexo
Vivendi
Danone
BNP Paribas
Société Générale
LVMH
Kering
Sanofi
Accor
Axa





The « female participation effect » is universal

205 technology companies



40 largest companies



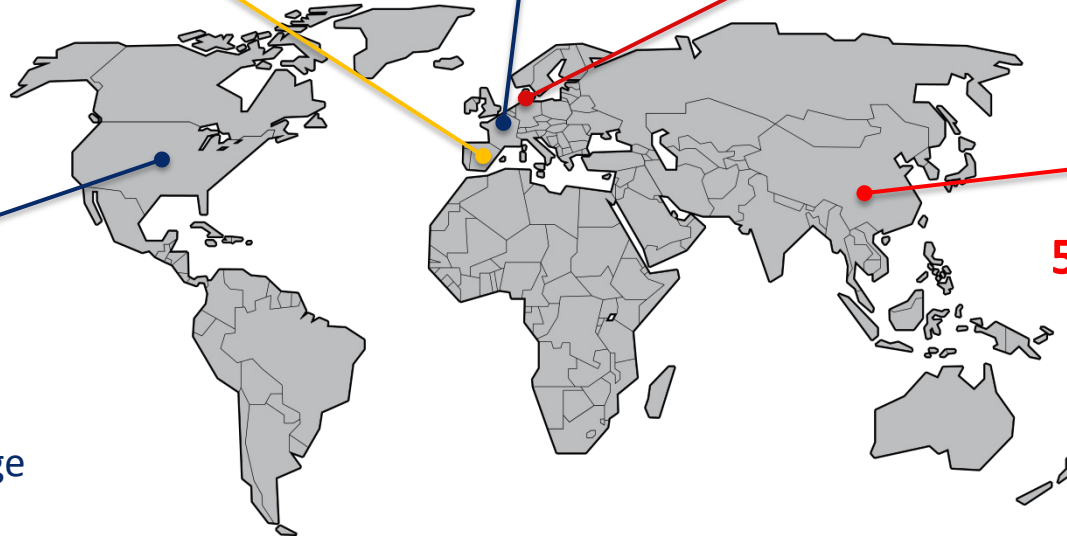
2500 largest companies



S&P 1500
small - med - large



567 private listed companies



The bigger the CEO's ego, the worse the company's performance



When I make decisions without consulting people, the probability that those decisions will be **wrong** is higher.



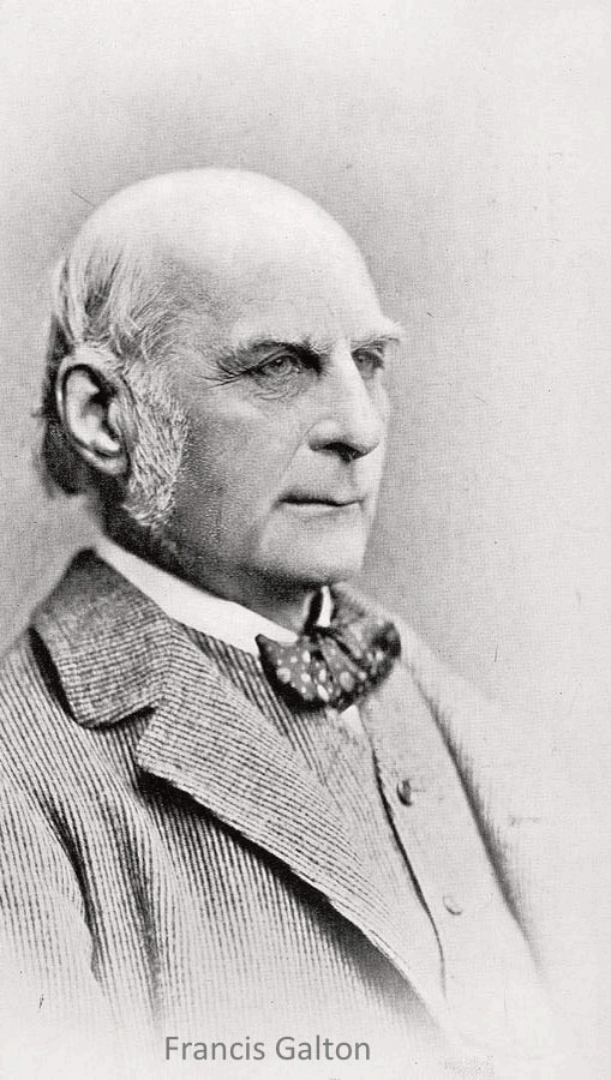
Elon Musk

November 2022



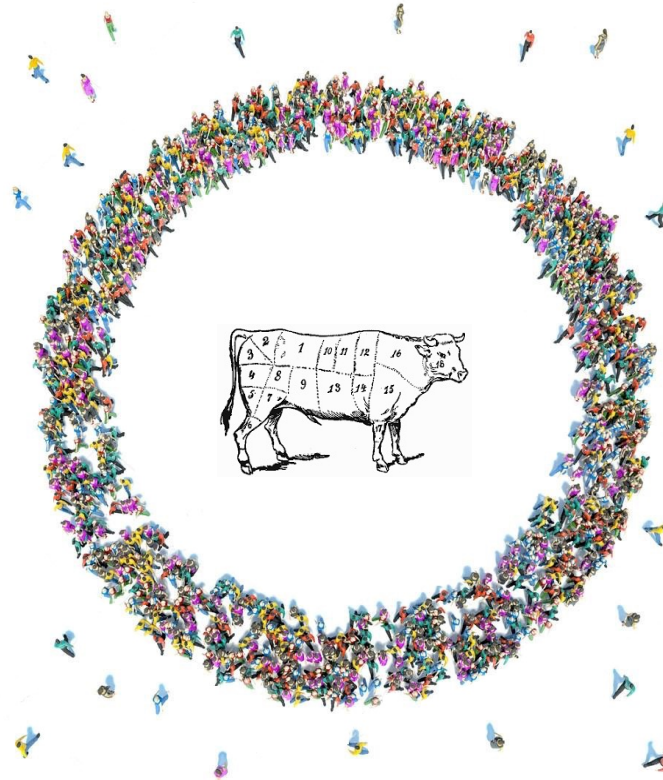


Wisdom of crowds



Francis Galton

The wisdom of crowds (1906)



787
estimates

Median estimate
548 kg

Real weight
?

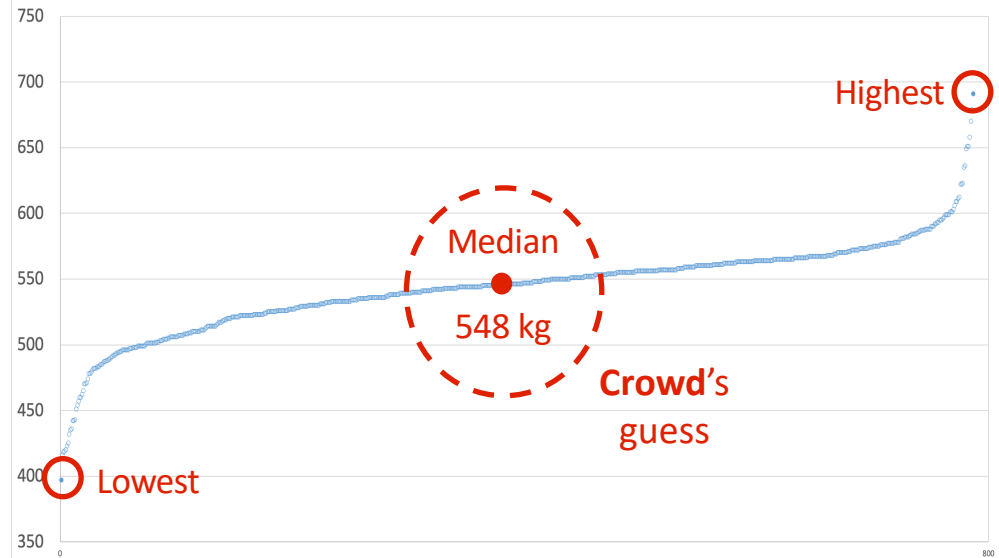
The wisdom of crowds (1906)



Francis Galton

787 estimates

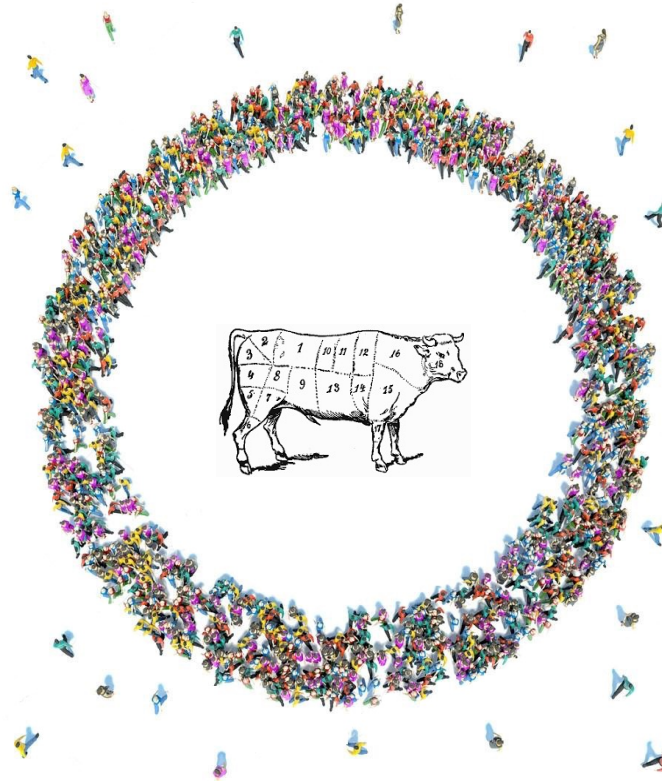
Estimated
weight
(kg)



The wisdom of crowds (1906)



Francis Galton



787
estimates

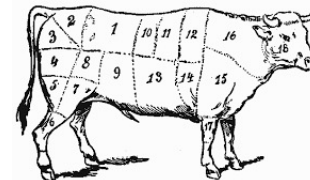
Median estimate

548 kg

Real weight

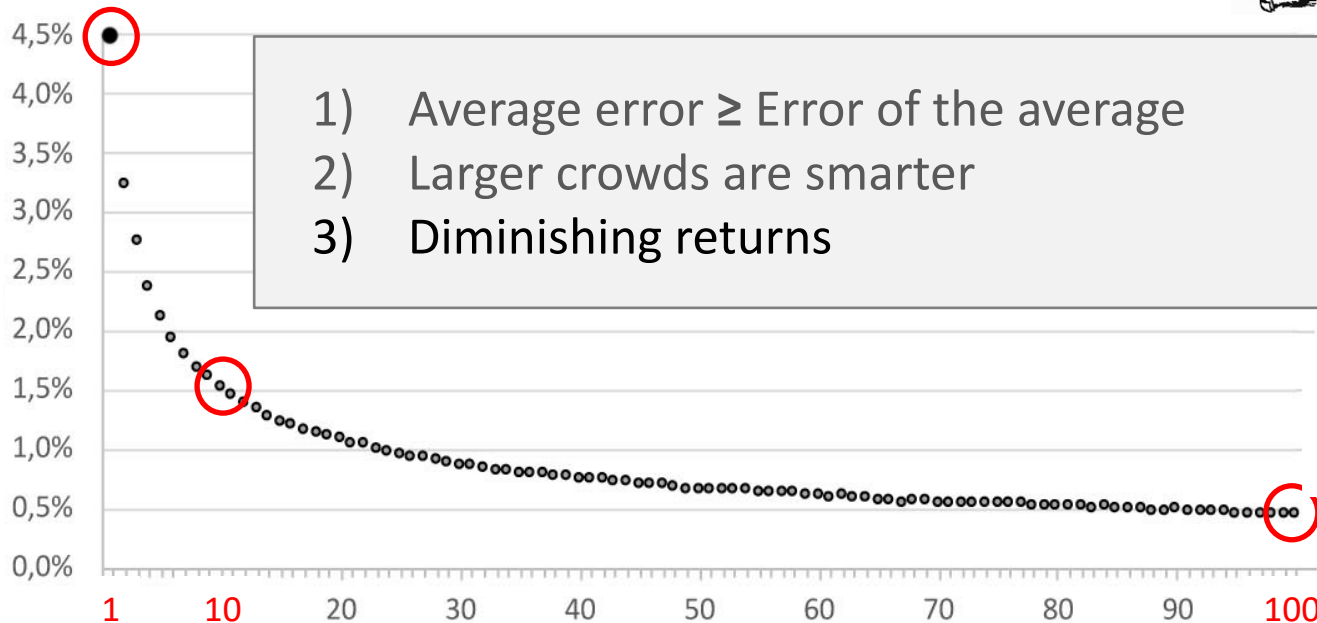
543 kg

3 principles of crowd wisdom



Average
error

ERROR



Error of
average



NUMBER OF COMBINED ESTIMATES

How many people are in this crowd?



A. 50 - 100

B. 100 - 150

C. 150 - 200

D. 200 - 250

E. 250 - 300

F. 300 - 350

G. 350 - 400

H. 400 - 450

I. 450 - 500



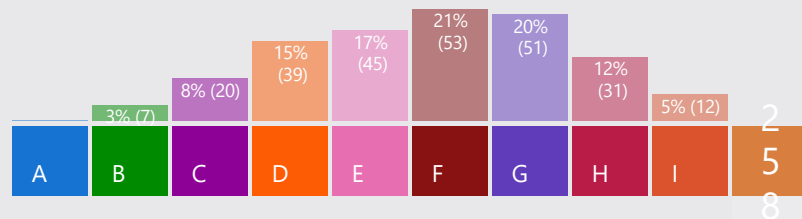
Correct = 277

Average individual error

77

Error of the average

36



Diversity Theorem

Scott
Page

The diagram illustrates the Diversity Theorem equation. It features three main components: a large orange arrow pointing down labeled 'GROUP ERROR', a large orange arrow pointing down labeled 'AVERAGE INDIVIDUAL ERROR', and a large green arrow pointing up labeled 'DIVERSITY OF OPINIONS'. The equation is written below these arrows, with blue brackets connecting the labels to their respective terms in the formula. The formula is:
$$(Group - Truth)^2 = \frac{1}{N} * \sum_{i=1}^N (individual_i - Truth)^2 - \frac{1}{N} * \sum_{i=1}^N (individual_i - Group)^2$$

GROUP ERROR = **AVERAGE INDIVIDUAL ERROR** - **DIVERSITY OF OPINIONS**

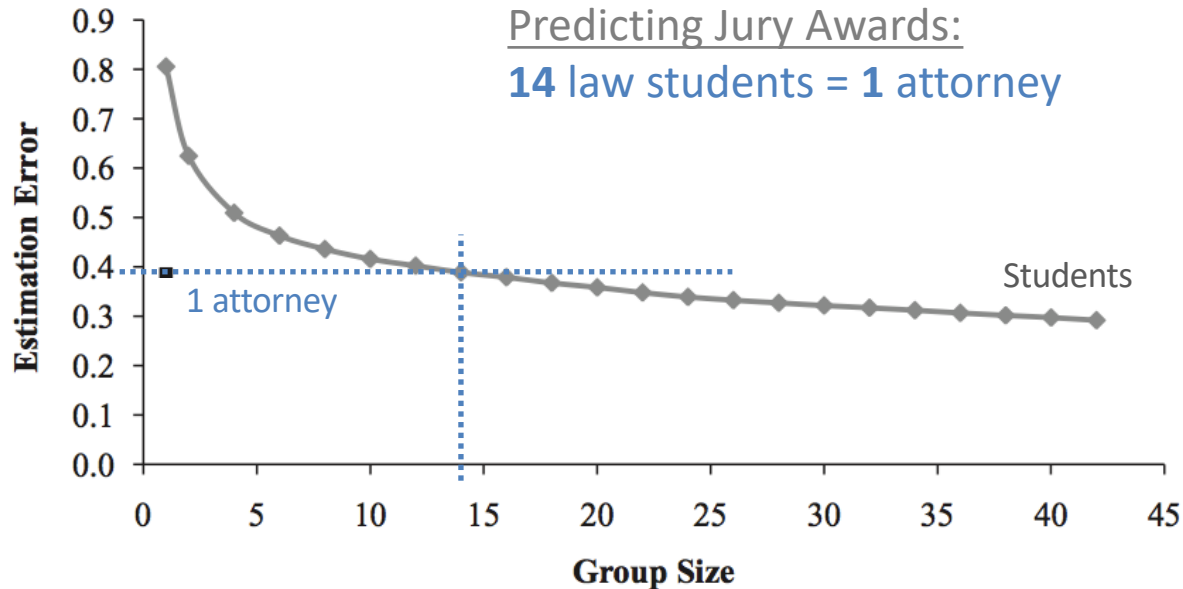
$$(Group - Truth)^2 = \frac{1}{N} * \sum_{i=1}^N (individual_i - Truth)^2 - \frac{1}{N} * \sum_{i=1}^N (individual_i - Group)^2$$

- Everyone contributes **knowledge** + **errors**
- Knowledge is **cumulative**
- Errors **cancel** each other

Scott
Page

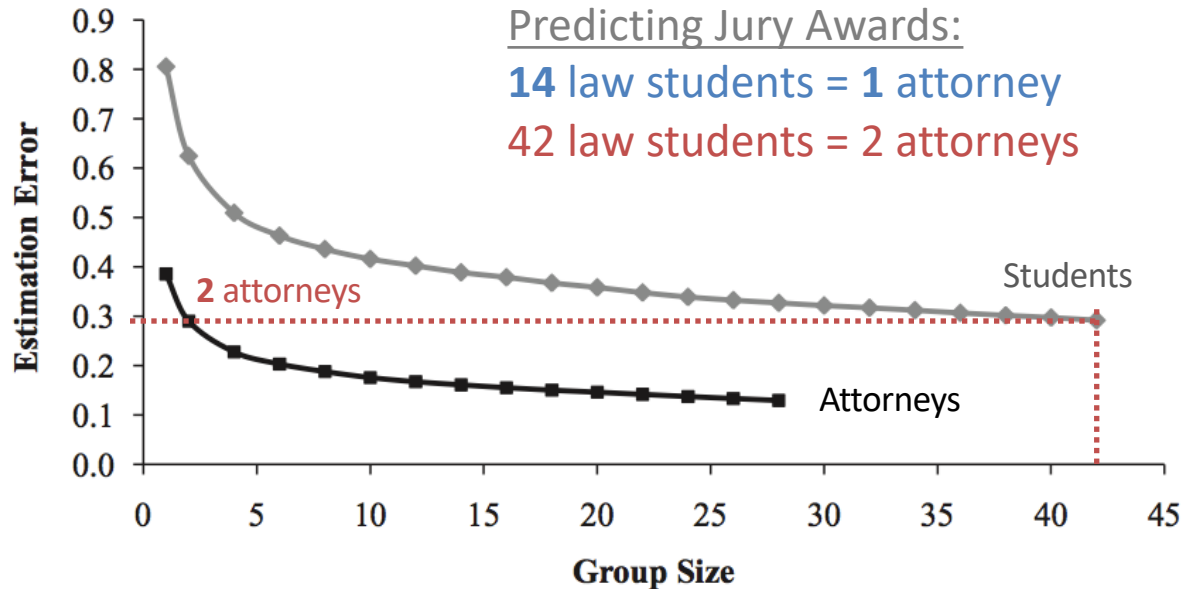
The diagram illustrates the relationship between Group Error, Average Individual Error, and Diversity of Opinions. It features three large shapes: a downward-pointing orange arrow on the left, a central downward-pointing orange arrow, and an upward-pointing green arrow on the right. The text 'GROUP ERROR' is inside the left arrow, 'AVERAGE INDIVIDUAL ERROR' is inside the central arrow, and 'DIVERSITY OF OPINIONS' is inside the right arrow. Below these shapes, a mathematical equation is presented, with blue brackets connecting the terms to the corresponding shapes. The equation is:
$$(Group - Truth)^2 = \frac{1}{N} * \sum_{i=1}^N (individual_i - Truth)^2 - \frac{1}{N} * \sum_{i=1}^N (individual_i - Group)^2$$

« Diversity trumps ability »



Jacobson, J., Dobbs-Marsh, J., Liberman, V., and Minson, J. (2011) Predicting Civil Jury Verdicts: How Attorneys Use (and Misuse) a Second Opinion. *Journal of Empirical Legal Studies*, 8(S1), 99--119

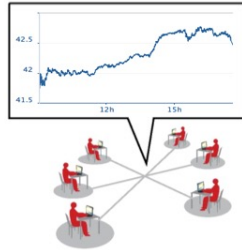
Diversity and expertise are interchangeable and complementary



Ethnic diversity makes a group smarter

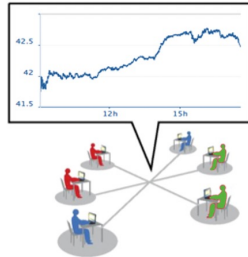


Ethnic diversity makes a group smarter



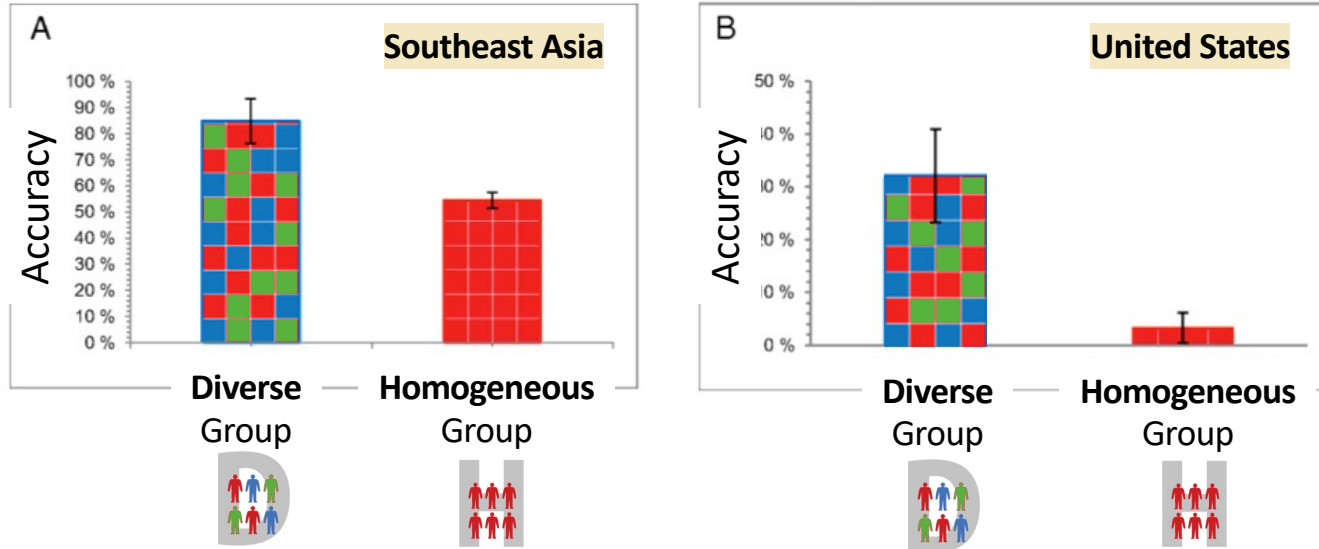
X

Southeast ASIA
Chinese, Malay, Indian



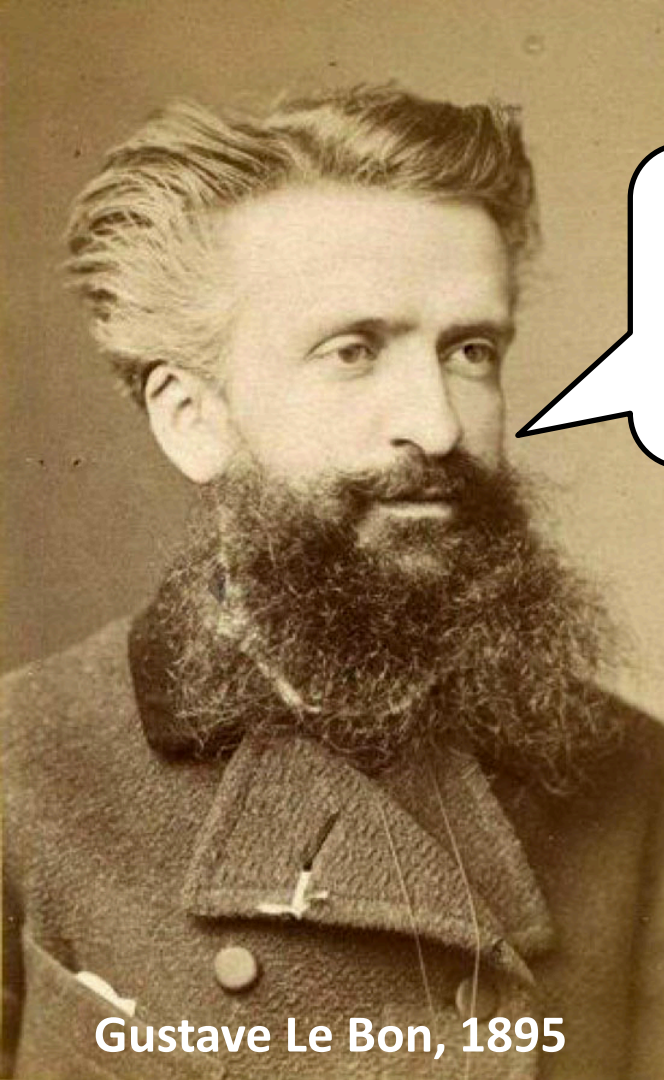
United States
White, Latino,
African-American

Ethnic diversity makes a group smarter



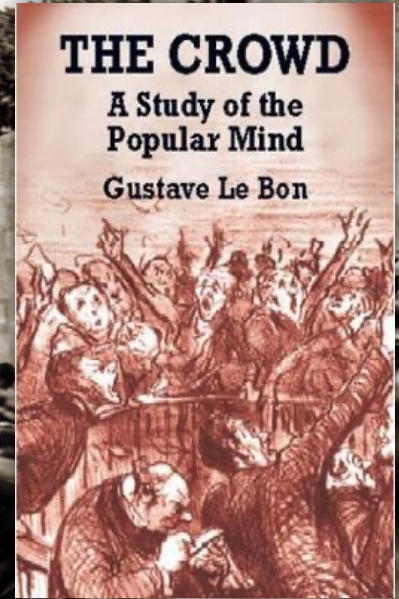
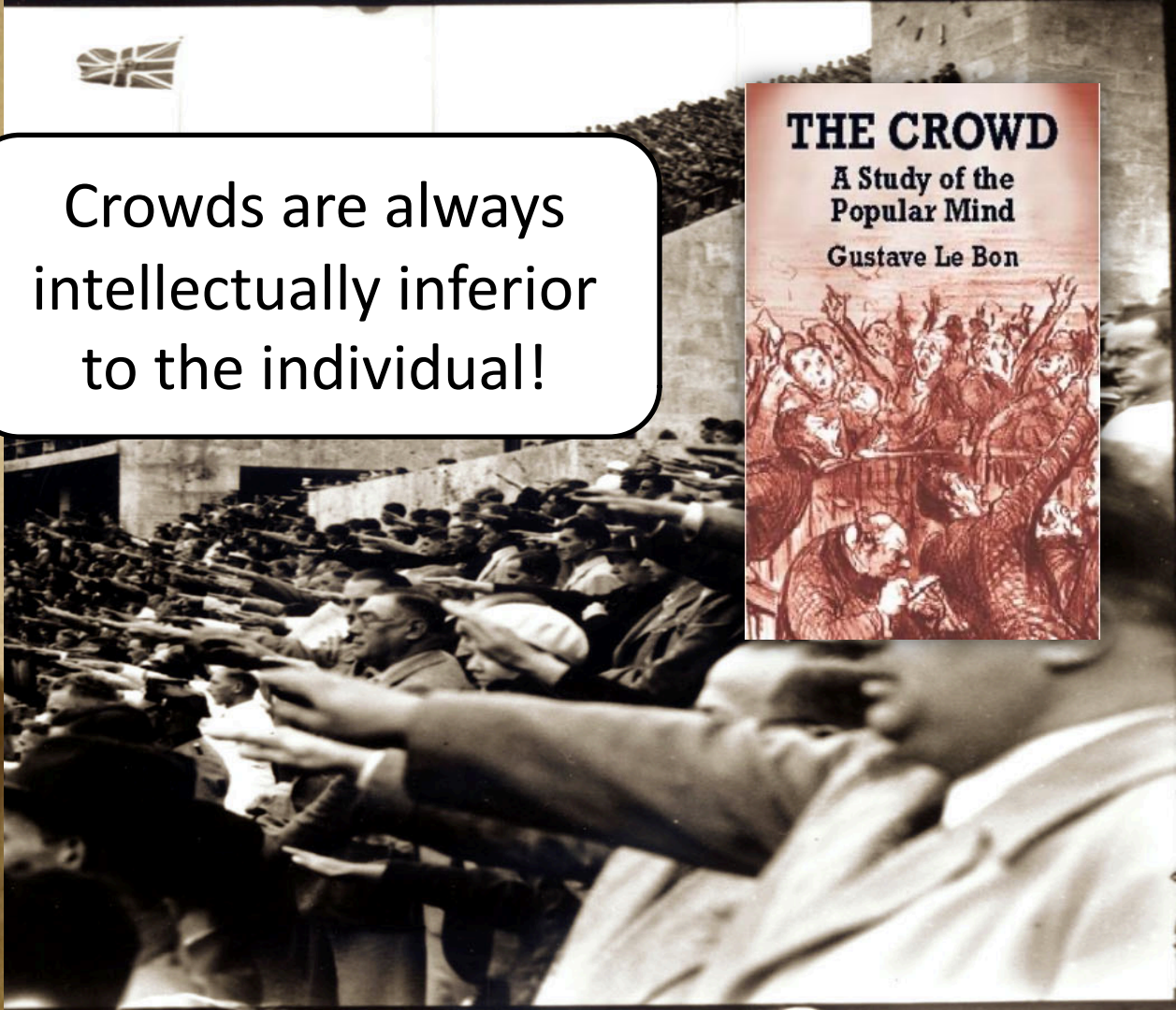
Ethnic diversity makes a group smarter
by combating **conformity**





Gustave Le Bon, 1895

Crowds are always
intellectually inferior
to the individual!



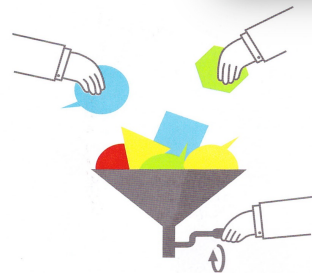
How to create ~~groupthink~~ intelligence



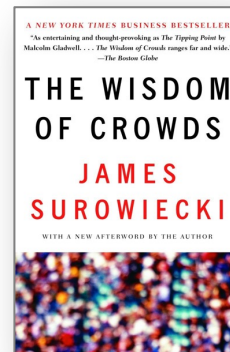
DIVERSITY
OF OPINIONS



INDEPENDANCE
OF THOUGHT



OBJECTIVE
AGGREGATION

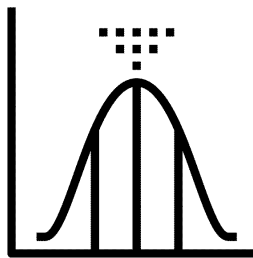




OBJECTIVE AGGREGATION



VOTE



AVERAGE



BET



DISEASE PREDICTION



JOHNS HOPKINS
BLOOMBERG SCHOOL
of PUBLIC HEALTH

Center for
Health Security

hypermind

How many countries
will report at least 1000
cases of Covid-19
before April 2020 ?

- Less than 16 ?
- 16 to 30 ?
- 31 to 45 ?
- More than 45 ?

15 months ; 61 questions ; 19 viruses

Ebola, Flu, Dengue, ... Covid !



562 participants

70% medical professionals



**DISEASE
PREDICTION**



JOHNS HOPKINS
BLOOMBERG SCHOOL
of PUBLIC HEALTH

Center for
Health Security

powered by
hypermind

FORECASTING QUESTIONS

FORUM

POLICY DASHBOARD

MY STATS

LEADERBOARDS

MORE

Help: [Exploring Resources](#)

How many WHO member states will report more than 1000 confirmed cases of COVID-19 on or before April 2, 2020?

MY FORECAST

Save

Reset

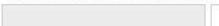
?

MY LOG

CROWD FORECAST

QUESTION DETAILS

15 WHO member states or fewer



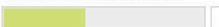
0 %

16-30 WHO member states



7 %

31-45 WHO member states



41 %

46 WHO member states or more



52 %

MY ALARMS

FORUM

NEWS

Mar 23, 2020 04:31

linch:



New forecast:

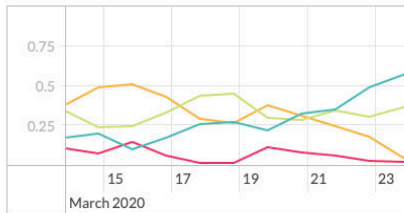
- 15 WHO member states or fewer: 0
- 16-30 WHO member states: 0
- 31-45 WHO member states: 2

1%

1%

7%

92%



91
forecasters

CROWD
FORECAST

DISCUSSION

MY
FORECAST



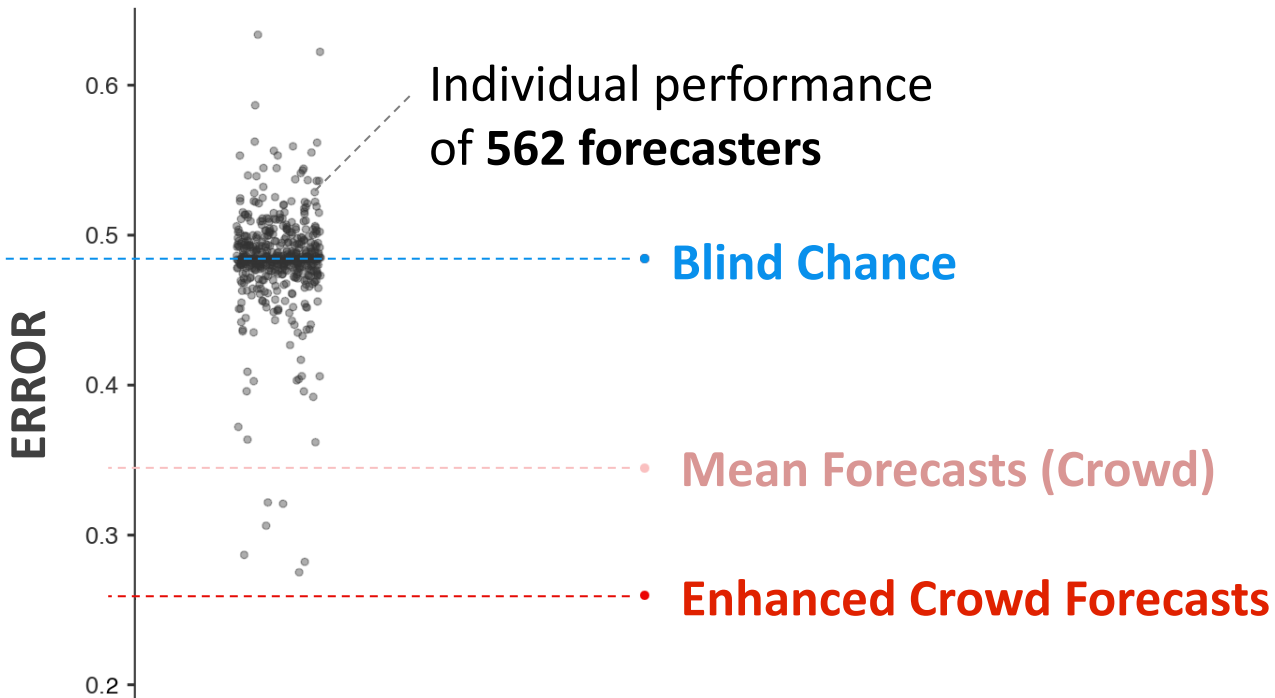
DISEASE PREDICTION



JOHNS HOPKINS
BLOOMBERG SCHOOL
of PUBLIC HEALTH

Center for
Health Security

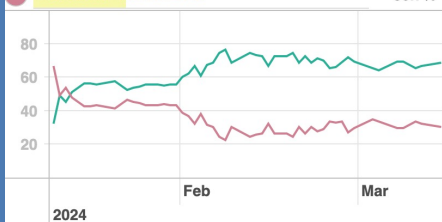
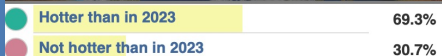
hypermind



Climate



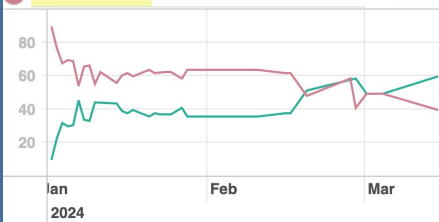
What will be the average global temperature of the Earth in 2024?



Geopolitics



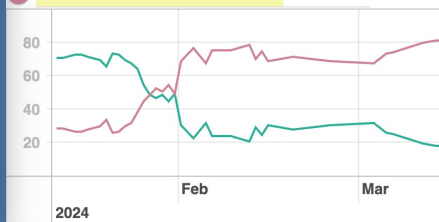
In 2024, will Israeli army tanks enter Lebanon?



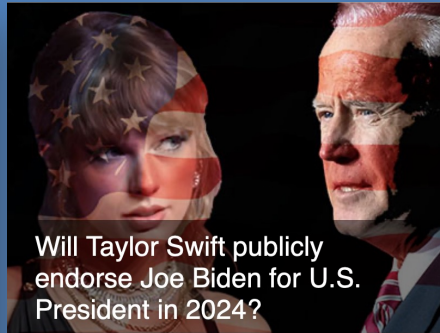
Economy



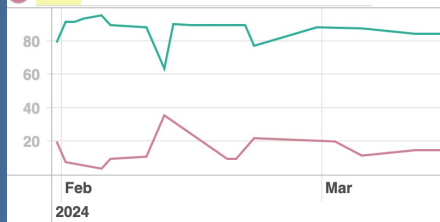
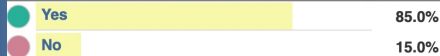
At the end of 2024, will Elon Musk still be the richest multi-billionaire (Forbes)?



Politics



Will Taylor Swift publicly endorse Joe Biden for U.S. President in 2024?



Reality aligns with the collective predictions

DATA SET

9.5 years (June 2014 - December 2023)

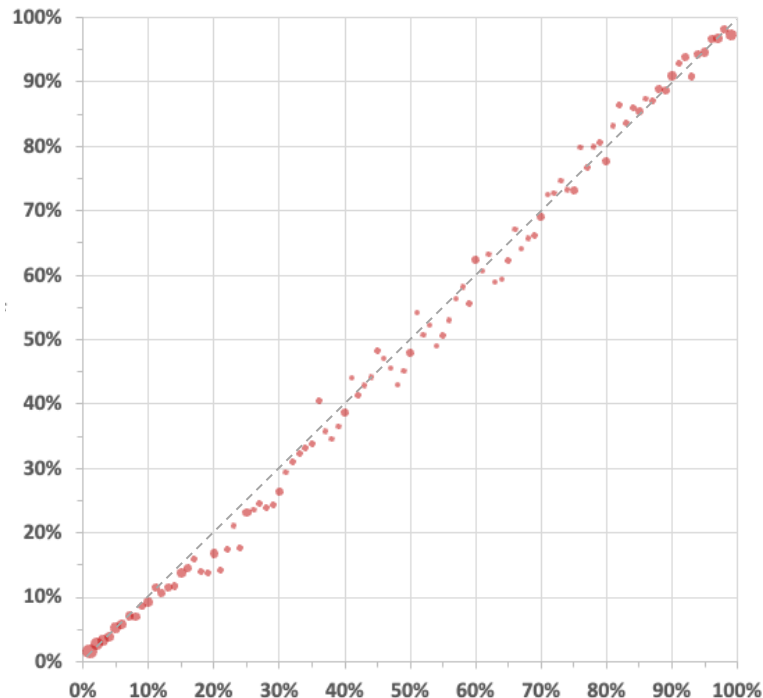
884 questions (political, geopolitical, economic)

2,732 possible outcomes

901,092 predictions

REALITY

Frequency of
occurrence
of predicted
outcomes



CROWD'S PROBABILITY FORECASTS

Companies use prediction markets as digital crystal balls



Forecasts are
73% likely to be more accurate
21% accuracy improvement
compared to classic methods



How **diversity** makes
~~everyone~~ **ME** **smarter**

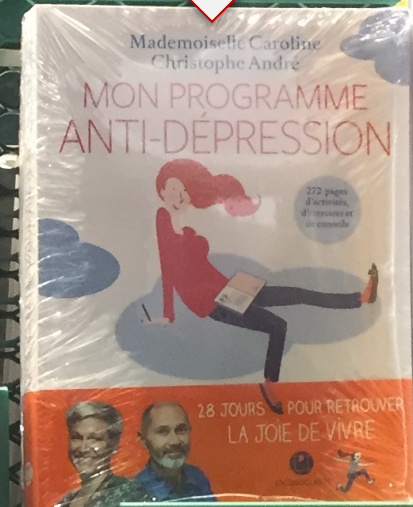
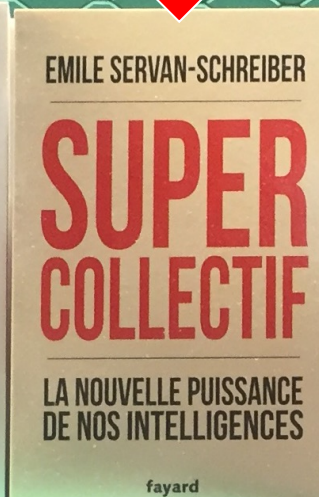
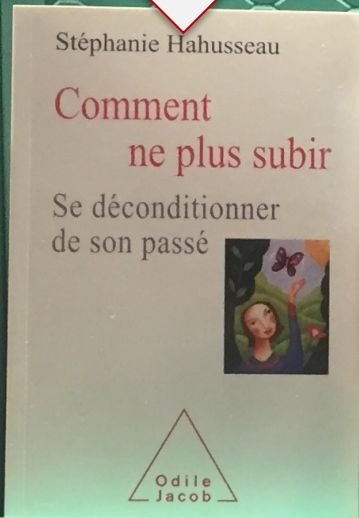
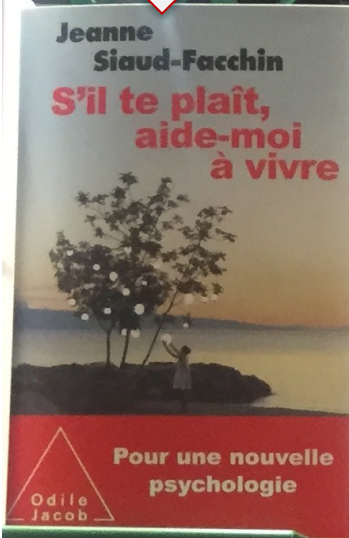
Please,
help me live

How to stop
being a victim

In praise of **atypical**
intelligences

MY PROGRAM
AGAINST
DEPRESSION

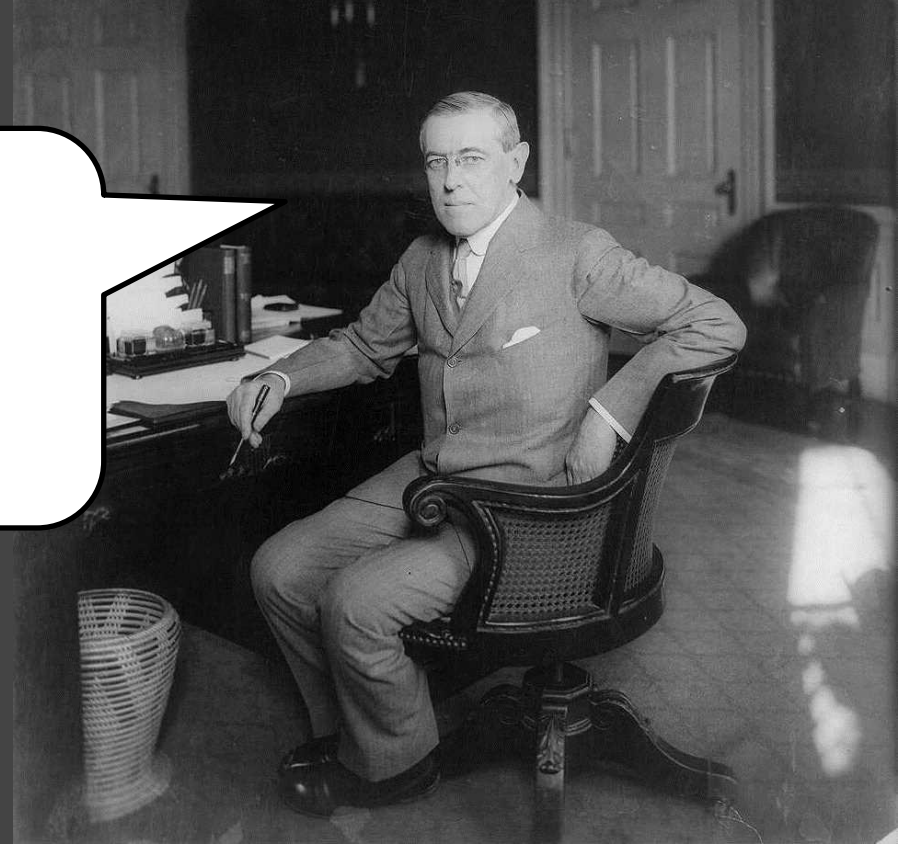
?!?



The secret of intelligence

I not only use all the
brains that I have, but
all that I can borrow.

Woodrow Wilson
28th U.S. president



*I think
therefore I am*



René Descartes, **1637**

*I think **with many**
therefore I am **smarter***



René Descartes, **2024**

*The more **inclusive** I am*

*The more I benefit from
cognitive **diversity***

*The **smarter** I can be*



René Descartes, **2024**



www.hypermind.com

Forecast **better** and prioritize **faster**
with collective **intelligence**



Open Forecasting Contests



Champion Forecasting Panel



Crowd Forecasting Platform



Crowd Storming Platform

Collective intelligence tools for decision makers, since 2000