
The Promise of Psychometric Analytics in Procurement Intelligence

The CoE Club, Barcelona, 7 March 2017
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The University of Cambridge Psychometrics Centre



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The Psychometrics Centre



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The Psychometrics Centre

History

- Founded by Prof John Rust in 1989; Moved to Cambridge 2005; Joined Cambridge Judge Business School in 2016
- Multidisciplinary team of psychologists, statisticians, mathematicians, computer scientists, linguists, engineers and entrepreneurs from across the University

Mission

- To establish Cambridge University as an international centre of excellence in psychometrics

Expertise

- Psychological assessment
- Digital footprint analysis
- Bespoke test development
- Executive Education
- Big Data & Machine-learning
- Unstructured Text Analytics
- Facial rec. & Image Analysis
- Open-source initiatives

Psychometrics in Procurement

1. Real-time psychological assessment
2. Evaluation of supplier fit and performance
3. Risk detection and compliance
4. Privacy, transparency and auditability

1. Real-time psychological assessment

Instant and accurate measurement of psychological traits will be integral to cost reduction and opportunity identification for always-on and data-rich procurement tools



6mil individual psych & social media profiles



30 validated psychometric tests



All data collected through opt-in

The world's largest and richest social science database



Data shared with 80+ Universities worldwide



Feedback was the only incentive



40+ peer-reviewed articles since 2011

Home > Early Edition > Michal Kosinski

Private traits and attributes are predictable from digital records of human behavior

Michal Kosinski^{a,1}, David Stillwell^a, and Thore Graepel^b



Current Issue
E-mail Alerts
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“Digital records of behavior can be used to automatically and accurately predict a range of highly sensitive personal attributes”
March 2013

Institution: Cambridge University

Home > Current Issue > vol. 112 no. 4 > Wu Youyou, 1036–1040, doi: 10.1073/pnas.1418680112



Computer-based personality judgments are more accurate than those made by humans

Wu Youyou^{a,1,2}, Michal Kosinski^{b,1}, and David Stillwell^a

This Issue



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Masthead (PDF)
Table of Contents

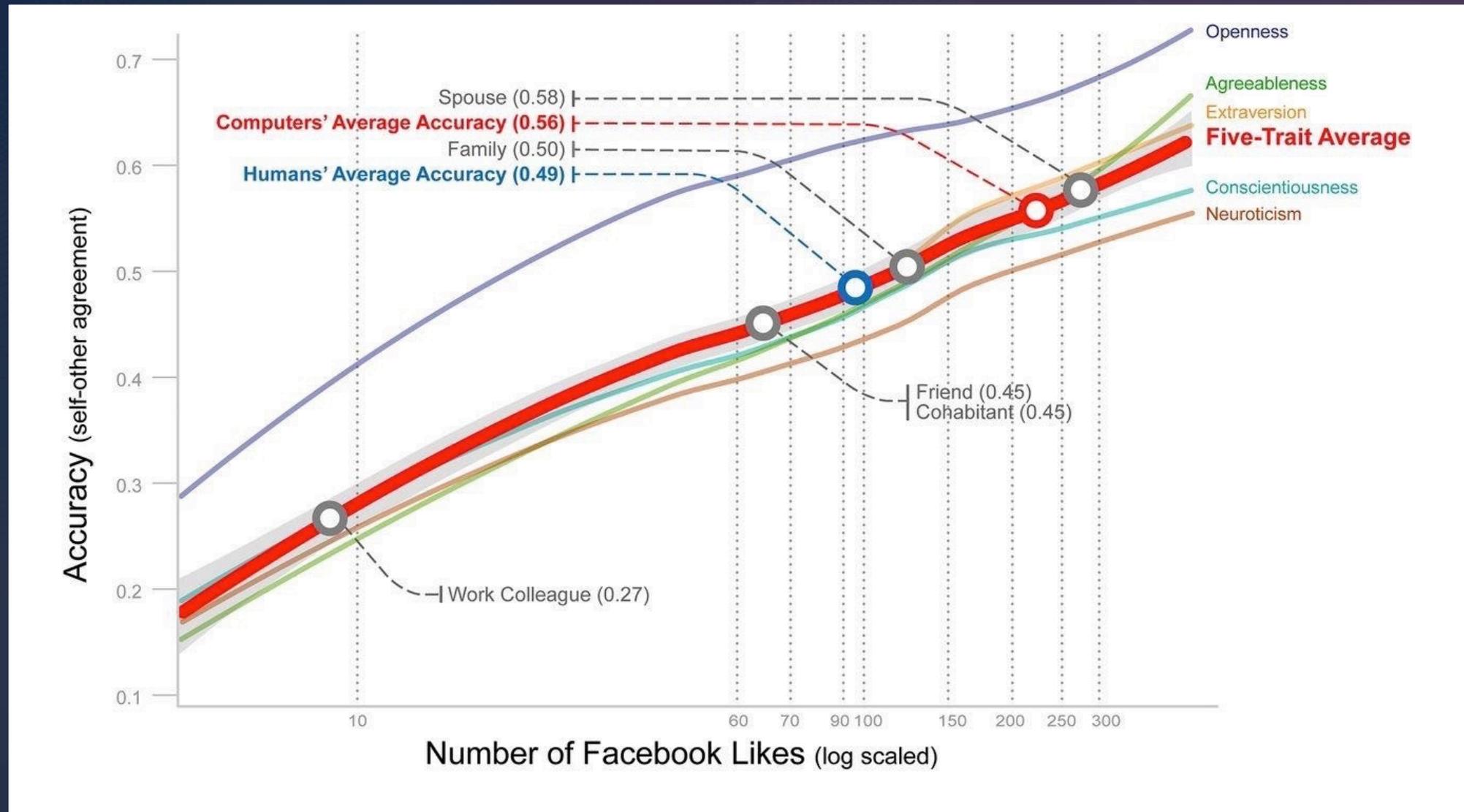
“Computers’ judgments of people’s personalities based on their digital footprints are more accurate and valid than judgments made by their close others (...)
For some outcomes, they even outperform the self-rated personality scores”

January 2015

Prediction accuracy with machine learning

Trait	AUC Accuracy
Openness	0.77
Conscientiousness	0.68
Extraversion	0.71
Agreeableness	0.72
Neuroticism	0.58

Personality prediction algorithms are surpassing humans



You Are What You Like

High IQ



The Godfather



Mozart



Thunderstorms



The Daily Show



To Kill a Mockingbird



Lord of the Rings



Science

Low IQ



Jason Aldean



Tyler Perry



Sephora



Chiq



Bret Michaels



Harley-Davidson



Bebe

You Are What You Like

High Openness



Oscar Wilde



Sylvia Plath



Leonardo Da Vinci



John Waters



American Gods



Plato

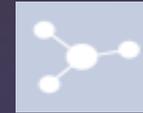


Leonard Cohen

Low Openness



NASCAR



I don't read



Justin Moore



ESPN2



The Bachelor



Oklahoma State Uni.



Teen Mom 2

Service Personalisation

Instant psychological assessment enables psychological personalisation in the moment, changing image and language to suit individual profile



“Dance like no one’s watching - but they totally are.”



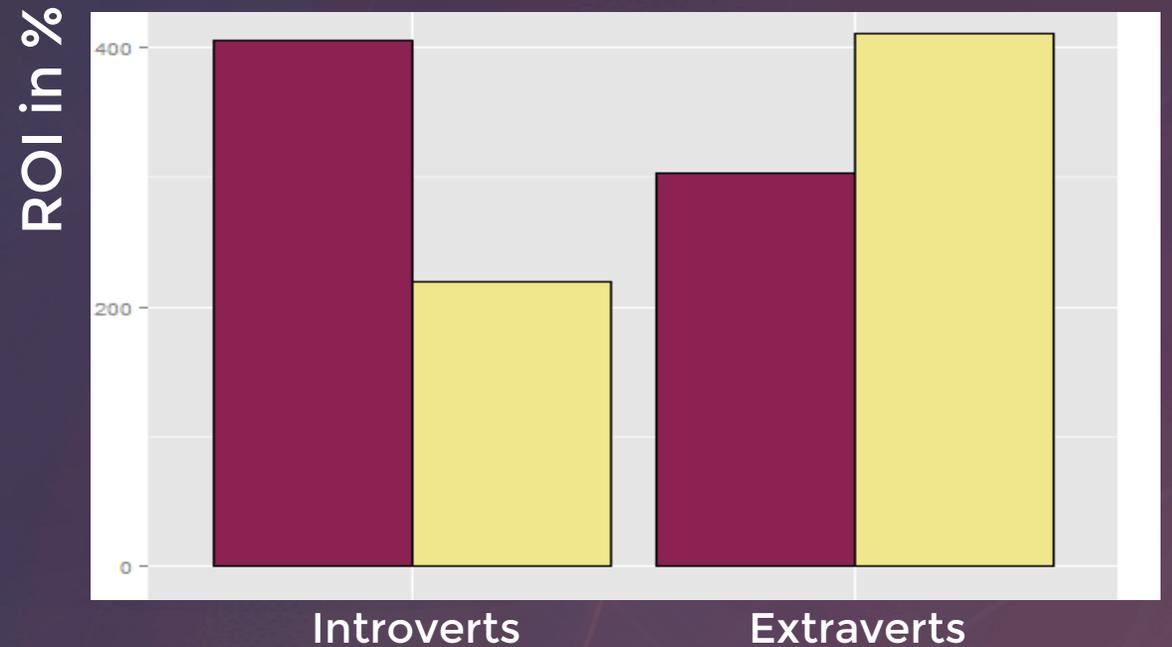
“Beauty doesn’t have to shout.”

Service Personalisation

Personality-optimised ads were twice as profitable

		Target Group	
		Introverts	Extraverts
Ad Variant	Introverted	<u>CONGRUENT</u>	INCONGRUENT
	Extraverted	INCONGRUENT	<u>CONGRUENT</u>

RETURN ON INVESTMENT



Ad Variant:  Introverted  Extraverted

Images and Copy Tailored for High Extraversion



Hilton HHonors

23 June at 01:27 · 🌐

E1

Summer's here, so it's time for fun times and good vibes. With more than 300 hotels and up to 33% off rooms across Europe, the Middle East and Africa, those good times are closer than you might think. So, what are you waiting for? Press play on summer!



Hilton Summer Sale

MAKE THIS SUMMER SENSATIONAL with UP to 33% OFF AT OVER 300 HOTELS IN EUROPE, THE MIDDLE EAST & AFRICA.

WWW.HILTONWEEKENDS.CO.UK/SUMMERSALE

Book Now



Hilton HHonors

23 June at 01:27 · 🌐

E2

Excited about summer? If you're not, you should be! We have more than 300 hotels and up to 33% off room rates across Europe, the Middle East and Africa. That means more money in your pocket to have fun with...



Hilton Summer Sale

MAKE THIS SUMMER SENSATIONAL with UP to 33% OFF AT OVER 300 HOTELS IN EUROPE, THE MIDDLE EAST & AFRICA.

WWW.HILTONWEEKENDS.CO.UK/SUMMERSALE

Book Now

Like · Comment · Share

Images and Copy Tailored for High Agreeableness



Hilton HHonors

23 June at 01:27 · 🌐

A1

School's out for summer! That means it's time to corral the family for the annual trip. With more than 300 hotels and up to 33% off room rates across Europe, the Middle East and Africa, you'll be able to find a great place to pitch your wagons.



Hilton Summer Sale

MAKE THIS SUMMER SENSATIONAL with UP to 33% OFF AT OVER 300 HOTELS IN EUROPE, THE MIDDLE EAST & AFRICA.

WWW.HILTONWEEKENDS.CO.UK/SUMMERSALE

Book Now



Hilton HHonors

23 June at 01:27 · 🌐

A2

Don't just feel the sun's embrace this summer. Take some time out for you and your partner. With more than 300 hotels across Europe, the Middle East and Africa, you're bound to find a special slice of happiness at a price you can smile at.



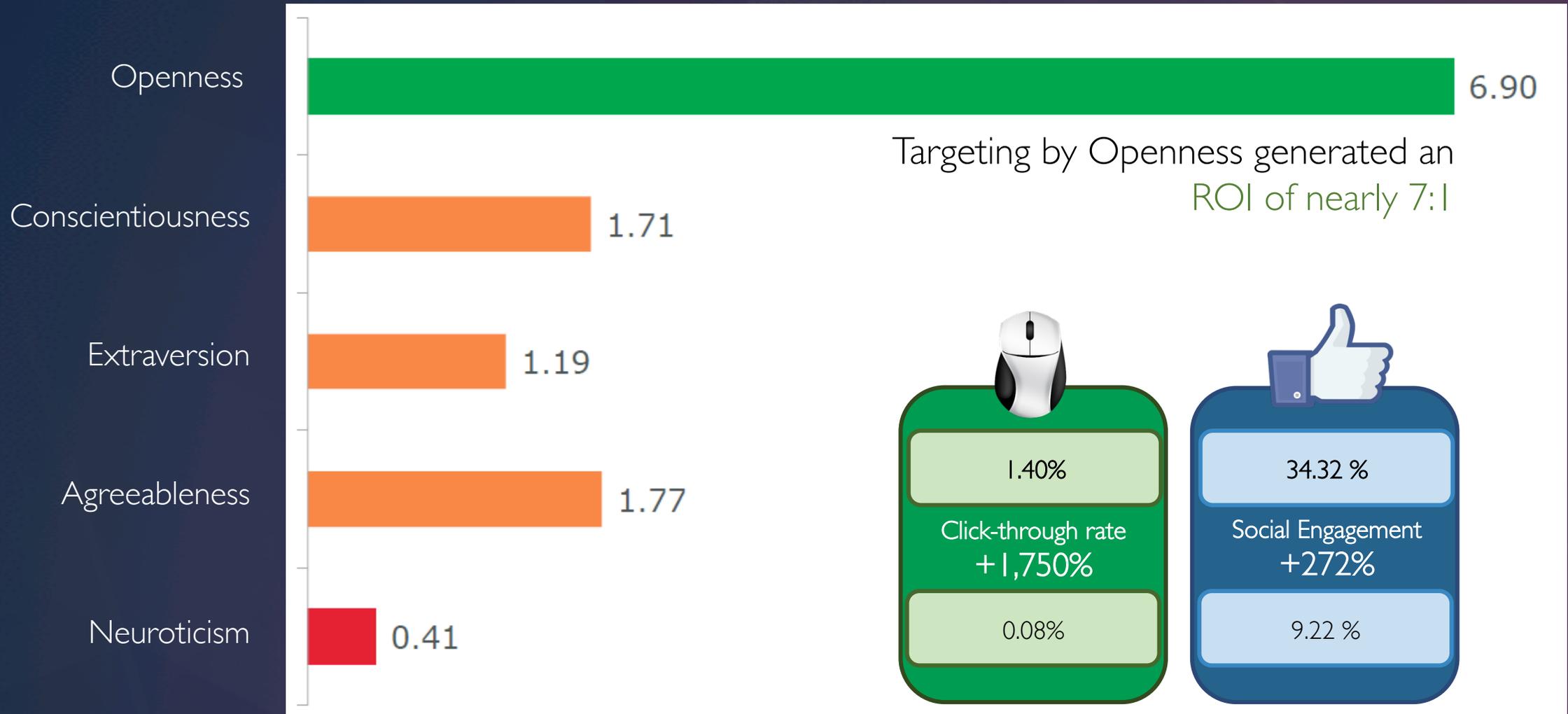
Hilton Summer Sale

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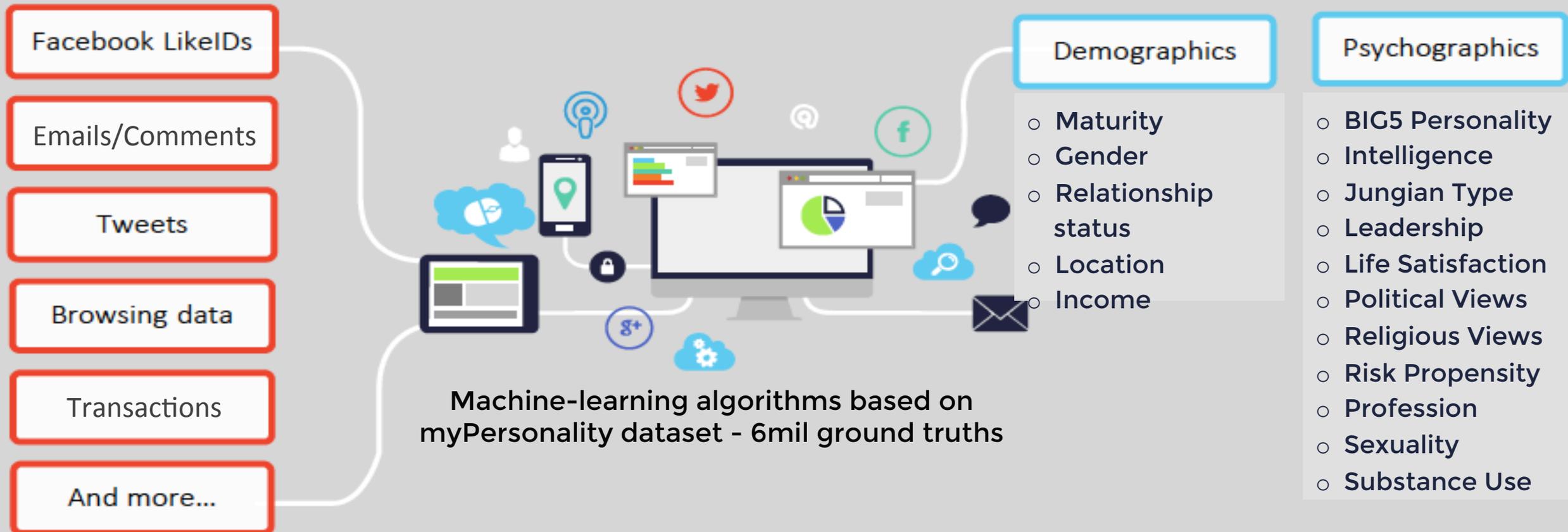
Book Now

ROI and CTR Higher for Congruent Groups



Psychological Optimisation via Apply Magic Sauce API

Embedded psychometric analytics can supply on-going, real-time insights into the profiles of suppliers, customers and employees. They will support procurement professionals and virtual assistants in making psychologically-optimised decisions



2. Evaluation of supplier fit and performance

Objective psychometric assessment could add reliability and validity to virtual supplier markets, whether automated or semi-automated, creating a virtuous feedback loop that improves ROI

Barriers to AI-enabled Procurement in Virtual Supplier Market

Data availability

Legacy systems

Admin overheads

Training requirements

Building trust

Performance evaluation

Unreliable pricing mechanisms

Low supplier-task fit

```
graph TD; A[Assess ability] --> B[Match task]; B --> A;
```

Assess ability

**New psychometric tools enable
much faster assessment and
recommendation**

Match task

```
graph TD; A[Assess ability] --> B[Match task]; B --> A;
```

Assess ability

Automatic and iterative learning

Uses machine learning to hone in on optimum supplier attributes and market conditions

Accelerates and informs decision-making in high-choice procurement environments

Match task

Assess ability

Shorter engagement time

Higher data relevancy

Control over scheduling

In-built reputation system

Motivation to over-perform

Fair and objective assessment

Dynamic pricing tied to market

Self-matching to requirements

Match task

3. Risk detection and compliance

Psychometric analytics can aid internal threat detection by improving the interpretability of actuarial systems. Insight and compliance work together to drive cross-business value from intelligence systems

Procurement increasingly responsible for data utility

Opportunities

- More relevant and detailed supply chain data using IoT
- Streamlined admin and enforceability on the blockchain
- Shorter initiation process, faster performance data retrieval
- Dynamic pricing from large and unstructured data resources
- Business model innovation incorporating alternative forms of data

Challenges

- Rapid assessment of data authenticity and quality
- Distributed network vs centralised trusted suppliers
- Cyber-security and information governance

Procurement increasingly responsible for data utility

- Most data retained by companies is overwhelmingly useless
- 54% is unidentified and may contain non-compliant information
- Of the remaining 46% of data which has been classified and tagged, 32% is still redundant, obsolete or trivial. That leaves only 14% of corporate data classifiable as business-critical
- A mid-sized UK organisation that holds 1,000 terabytes of information spends **£435,000 a year on redundant, obsolete or trivial information** which is known to be useless, meaning just 12% of the cost of data storage is known to be business-critical

Psychology and compliance

The Dark Triad

Paulhus, D.L. & Williams, K.M. (2002). The dark triad of personality. *Journal of Research in Personality*, 36, 556-563

- Machiavellianism (“Keep your enemies close”)
- Narcissism (“Watch out for injured pride”)
- Psychopathy (“Inability to feel remorse or shame”)

The Dark Side

Assessing leadership: A view from the dark side. Hogan, R and Hogan, J. (2003) *International Journal of Selection and Assessment*, 9, 40-51.

- Sceptical: sensitive to criticism, expecting betrayal (Machiavellianism)
- Bold: overly self-confident, arrogant and entitled (Narcissism)
- Excitable: moody, hard to please and emotionally volatile (Psychopathy)

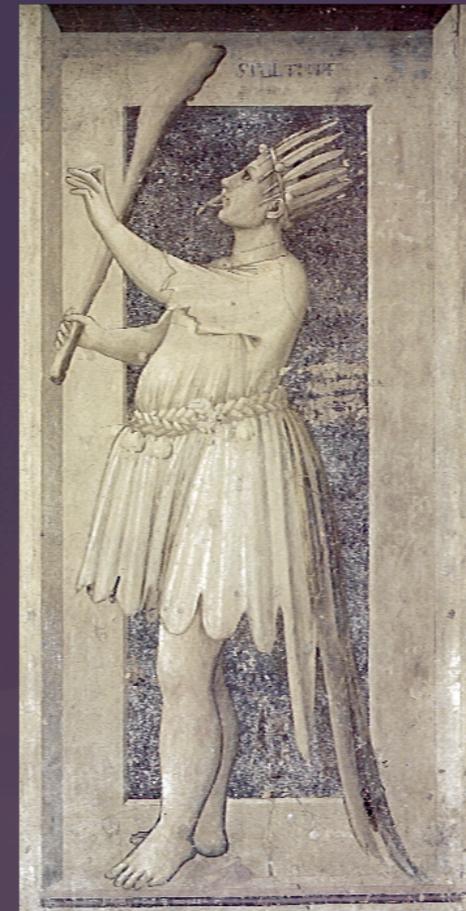
Prudence

Proficiency: Careful and sensible when carrying out given tasks



Foolishness

Carelessness: May be careless in dealing with mundane tasks



Justice

Fair-mindedness: Balanced and impartial in decision-making



Injustice

Subversion: Tends to be suspicious of the intentions of others



Insider Threat

- More than a third of the workforce would sell their firm's intellectual property, including customer data, for between £1,000 and £10,000
- 35% of staff would be prepared to sell company information for "the right price". Of those, 3% would consider selling out their organisation for just £100, 18% for £1,000 and 29% for £10,000
- More than 40% of the respondents admitted they have access to sensitive corporate data, while 35% can access sensitive information that is, in theory, above their pay grade.
- The average company experiences 9.3 insider threats each month

Predicting corruption and fraud from digital behaviour

Berry, Ones & Sackett (2007) in a meta-analysis of 30 studies

	Ope.	Consc.	Ext.	Agr.	Neu.
Organizational deviance e.g. intentionally working slowly, damaging company property, sharing confidential company information	-.04	-.42	-.09	-.32	-.23
Interpersonal deviance e.g. violence, gossip, theft from co- workers	-.09	-.23	.02	-.46	-.24

Sced (2004) reviewed 16 studies of police corruption and found “weak to moderate” links between psychological traits and objective measures of corruption (termination, suspension, reprimands, etc.)

Boes, Chandler & Timm (1997) “The predictive scales did very poorly during the attempted cross-validation.” ... “The subjects were probably motivated to hide past problems and issues during the psychological testing phase.”

4. Privacy, transparency and auditability

The procurement systems of the future will make even greater use of potentially sensitive data about customers and third parties. Ethical data practices and effective communication will be paramount.

Algorithmic bias is everywhere

Racism is Poisoning Online Ad Delivery, Says Harvard Professor

Google searches involving black-sounding names are more likely to serve up ads suggestive of a criminal record than white-sounding names, says computer scientist

Insurance

Millions of Britons paying 'ethnic minority penalty' for car insurance

Drivers in areas with high density of minority ethnic households are each charged up to £450 a year more, says study

ALGORITHMIC INEQUITY 7/8/15 1:33 PM

Google showed women ads for lower-paying jobs

Supreme Court vs. Neighborhood Segregation

In a surprising move on Thursday, the United States' highest court ruled that policies even inadvertently relegating minorities to poor areas violate the Fair Housing Act.

Machine Bias

The Tiger Mom Tax: Asians Are Nearly Twice as Likely to Get a Higher Price from Princeton Review

A blot on the profession

Discrimination in medicine against women and members of ethnic minorities has long been suspected,^{1,2} but it has now been proved. St George's Hospital Medical School has been found guilty by the Commission for Racial Equality of practising racial and sexual discrimination in its admissions policy.⁴ The commission decided not to serve a non-

reassuring as it r
other schools.

The commis
about this par
schools can avo
where a compu

‘As a society, we must be able to look into the ‘black box’ of big data analytics in order to ensure that any particular analytics application can be safely installed and will benefit us all’

**European Data Protection Supervisor Opinion 7/2015
“Meeting the Challenges of Big Data”**



WE ASKED 34,267 PEOPLE HOW THEY WANTED BIG DATA & PREDICTIVE TECH TO BE USED



43% Europe, **27%** North America, **15%** South America. Top countries were USA **23%**, UK **8%**, Brazil **7%**, France **5%**



13% of the participants were marketing or communications professionals



27% would pay \$3/month to use Facebook without being tracked



58% thought that smart fridge data should be used to warn them about unhealthy dietary habits.



Only **29%** thought that most companies with access to their personal data use it ethically. There is still much work to do.

www.predictivedataproject.com

Privacy concerns are more universal than we expected



58% of participants reported having not used a digital service at least once because of privacy concerns

Individual differences accounted for less than 2% of the variance in yes/no answers regarding the acceptability of Big Data predictions



PERSONALITY



GENDER



AGE



LOCATION

Psychometric analytics complement Big Data

Ethics

- Identify & prevent historical prejudice
 - Reduce & explain false positives
 - Inform interventions at individual level
 - Know what data you actually need
 - 'Black box' approach could be illegal
-
- Meeting the Challenges of Big Data, European Data Protection Supervisor Opinion 7/2015
 - Big Data: Seizing Opportunities, Preserving Values, White House Report, May 2015
 - Using sensitive personal data may be necessary for avoiding discrimination in data-driven decision models, Zliobaite & Custers 2016

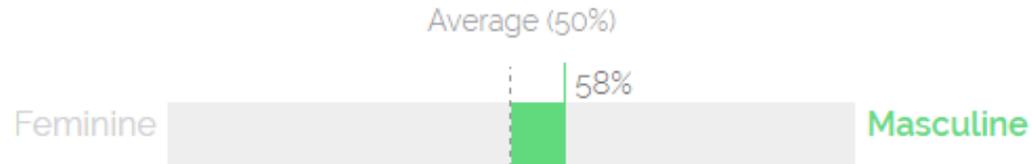
Psychometric analytics complement Big Data

Performance

- Explain why your model works
 - Personalise experience at individual level
 - Relate findings to prior research
 - Tackle 'cold start' problem with new domains
 - Differentiate from competitors
 - Optimising psychological fit increases ROI
- Personality-optimised ads twice as profitable (Online Beauty Retailer)
 - Click-through up 1,750% and social engagement up 272% (Hilton Summer Sale)
 - Personality targeting 2x better than agency; 85% higher conversion (Insurance brand)
 - Psychological fit 4x stronger effect on happiness than total income (2016 Psych Science)

My psychological profile based on 64 of my Facebook Likes

Psychological Gender ?



Your Likes are fairly androgynous; they suggest you're probably Male but you don't repress your feminine side.

These Likes make you appear **more feminine**:



These Likes make you appear **more intelligent**:



These Likes make you appear **more masculine**:

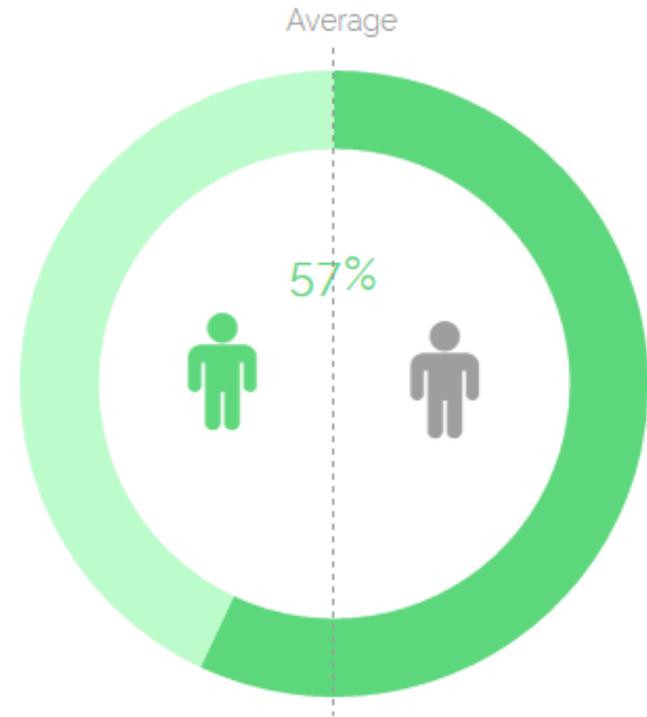


These Likes make you appear **less intelligent**:



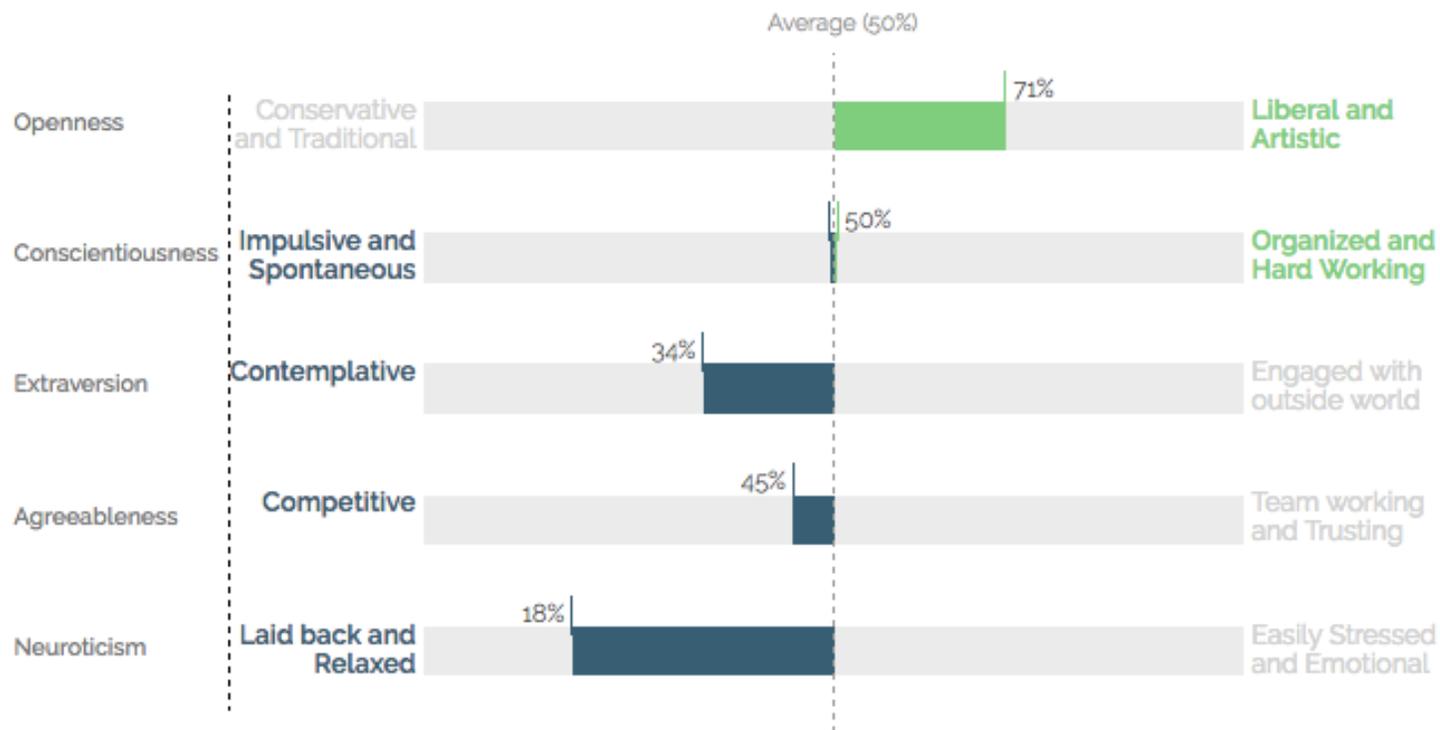
Intelligence ?

Take IQ test



You are more intelligent than 57% of the population

Big 5 Personality (Predictions are expressed as percentiles) ?



These likes make you appear **conservative and traditional**:



These likes make you appear **contemplative**:



These likes make you appear **impulsive and spontaneous**:



These likes make you appear **competitive**:



These likes make you appear **liberal and artistic**:



These likes make you appear **organized and hard working**:



These likes make you appear **engaged with outside world**:



These likes make you appear **team working and trusting**:



These likes make you appear **easily stressed and emotional**:



Try it for yourselves at www.applymagicsauce.com

Psychometrics in Procurement

1. Real-time psychological assessment
2. Evaluation of supplier fit and performance
3. Risk detection and compliance
4. Privacy, transparency and auditability



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Thank You!



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