

The Science of Information Warfare

DSEI

How Psychology, Big Data & AI will Revolutionise Decision-Making
10 September 19



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1 Data driven influence campaigns

2 Cognitive manoeuvre

3 Out of the loop & off the team

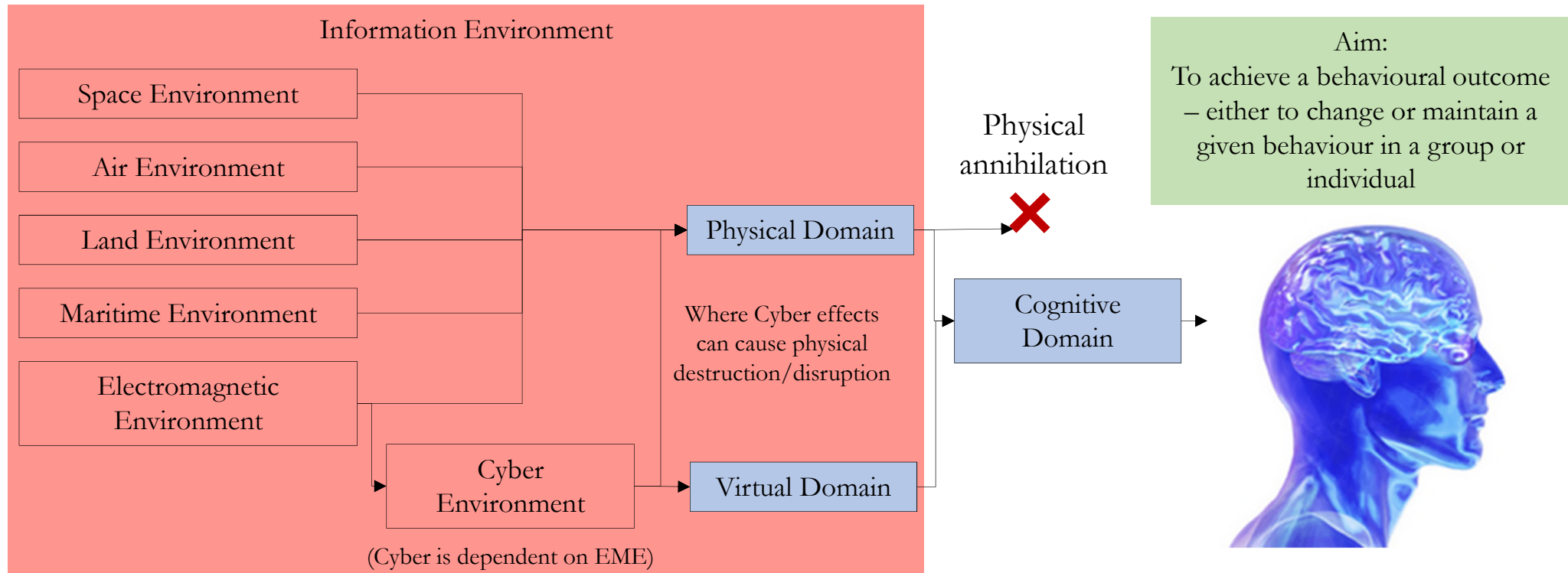
4 Otherworldly moves

5 Rigour

Psychology: the heart of future operational design

“War is merely the... ..the continuation of policy... ..of political intercourse carried on with other means”

Clausewitz, *On War*, Ch.1, Sect. 24, Princeton University Press translation (1976)



“[Violence’s] ...only purpose, unless sport or revenge, must be to influence somebody’s behaviour, to coerce his decision or choice.”

Thomas Schelling, *Arms and Influence* 1966.

You are just data



Living in the Panopticon

The Data on Data Brokers



4K data broker companies worldwide



Axiom, one of the largest data brokering companies, has:

- 23K servers collecting and analyzing consumer data
- Data for 500 million consumers worldwide
- 1.5K data points per person

1.4K+ "leading brands" sell information from store loyalty cards

80% of U.S. email addresses are on file on **towerd@ta**



38% of employed Americans' pay stub information is available on **EQUIFAX**



Databases like **Campaign GRID** and **PRO PUBLICA** have political information including party affiliation and campaign contributions for **80%** of registered American voters

Image Credit: Infographic created by WebpageFX: "What Are Data Brokers and What Is Your Data Worth" <https://www.webpagefx.com/blog/>

5200 GB per person by 2020* = 18.5 million books.

*Source: <https://www.computerworld.com/article/2493701/data-center/by-2020--there-will-be-5-200-gb-of-data-for-every-person-on-earth.html>

Google knows...

...every google ad you've seen, every app ever searched for, installed, launched or used & when + who you interacted with on them... ...every website ever visited and what time... ...**search history across all devices** even if you've deleted it... ...**the news you've read and the images you search for**... ...what time you sleep... ...your youtube history... ...bookmarks, emails sent & received, contacts, Google drive files... **all of the photos on your phone w/year, date, time, location**... ...the businesses you've bought from and anything you bought through Google... **your calendar, which of the meetings you showed up for and whether you were on time**... ...the music you listen to & books you've purchased... the websites you've created and phones you've owned...how many steps you take in a day.... ...it keeps everything you've save to you google drive including the google docs you've deleted...

...creates an ad profile based on location, gender, age, hobbies, career, interests, relationship status, possible weight, income.

Source: Twitter Dylan Curran @iamdylancurran

Data Driven Influence Campaigns



1. Machine learning personality assessments more accurate than:
 - co-worker after 10 likes,
 - friend or co-habitant after 150 likes,
 - spouse after 300 likes
2. Higher external validity in predicting life outcomes – substance abuse, political attitudes, physical health.
3. Sometimes better than self-rated personality surveys.
NB. Limitations: 10 item questionnaire.

OCEAN:

Openness
Conscientiousness
Extroversion
Agreeableness
Neuroticism

Personalised Propaganda & Weaponised Experimentation



Threat: Cognitive Security?
Opportunity...? (Ethics)

Mathematicians & Physicists?



Unprecedented Insight. Cognitive Manoeuvre? A Small Sample from the Science of Prediction

- **Predicting (Big Five) personality based on eye movements.** Hoppe, S., Loetscher, T., Morey, S. A., & Bulling, A. (2018). Eye movements during everyday behavior predict personality traits. *Frontiers in human neuroscience*, 12, 105.
- **Computer-based personality judgments are more accurate than those made by humans.** Youyou, W., Kosinski, M., & Stillwell, D. (2015). *Proceedings of the National Academy of Sciences*, 112(4), 1036-1040.
- **Machine learning shows that a single Facebook like can predict who you will vote for.** Kristensen, J. B., Albrechtsen, T., Dahl-Nielsen, E., Jensen, M., Skovrind, M., & Bornakke, T. (2017). Parsimonious data: How a single Facebook like predicts voting behavior in multiparty systems. *PloS one*, 12(9), e0184562.
- **Facebook data used to predict your degree of political engagement or activism.** Brandtzaeg, P. B. (2017). Facebook is no “Great equalizer” A big data approach to gender differences in civic engagement across countries. *Social Science Computer Review*, 35(1), 103-125.
- **Predicting your credit-worthiness based on your call data.** Agarwal RR, Lin CC, Chen KT, Singh VK (2018) Predicting financial trouble using call data—On social capital, phone logs, and financial trouble. *PLOS ONE* 13(2): e0191863.
- **Data scientists given anonymous credit card data could name shoppers with just four random pieces of information from social media sites.** De Montjoye, Y. A., Radaelli, L., & Singh, V. K. (2015). Unique in the shopping mall: On the reidentifiability of credit card metadata. *Science*, 347(6221), 536-539.
- **Determining how many close friendships you can maintain from mobile (cell) phone data.** Saramäki, J., Leicht, E. A., López, E., Roberts, S. G., Reed-Tsochas, F., & Dunbar, R. I. (2014). Persistence of social signatures in human communication. *Proceedings of the National Academy of Sciences*, 111(3), 942-947.
- **Predicting emotional states from social media post content.** Kross, E., Verduyn, P., Boyer, M., Drake, B., Gainsburg, I., Vickers, B., ... & Jonides, J. (2018). Does counting emotion words on online social networks provide a window into people's subjective experience of emotion? A case study on Facebook. *Emotion (Washington, DC)*.
- **Categorising emotion based on eye movements.** Raudonis, V., Dervinis, G., Vilkauskas, A., Paulauskaite-Taraseviciene, A., & Kersulyte-Raudone, G. (2013). Evaluation of human emotion from eye motions. *Evaluation*, 4(8).
- **Predicting Surprise attacks based on leaders languages.** Suedfeld, P., & Bluck, S. (1988). Changes in integrative complexity prior to surprise attacks. *Journal of Conflict Resolution*, 32(4), 626-635.
- **Mood forecasting& predicting PTSD, depression, & schizophrenia from how you swipe and tap your touchscreens, or from phone and wrist-band (fitbit or apple watch style devices) data,** Kaplan, M. (2018), Happy with a 20% chance of sadness., *Nature* 563, 20-22.
- **Atrocity Forecasting,** <http://politicsir.cass.anu.edu.au/research/projects/atrocity-forecasting>
- **Suicide Prevention,** How Facebook AI Helps Suicide Prevention, 10 Sep 18. <https://newsroom.fb.com/news/2018/09/inside-feed-suicide-prevention-and-ai/>
- **Pre-Crime?** <https://www.thejc.com/news/news-features/israel-leads-the-way-in-brave-new-world-of-ai-artificial-intelligence-1.460264>

Out of the Loop & Off the Team

1. Data Deluge. '*Swimming in sensors, drowning in data, thirsting for insight*'.
2. Humans are limited: overcoming cognitive, attentional and physical limitations.
e.g. Uruzgan & info overload (*necessity, distinction, proportionality, humanity*)
3. Speed. London-New York's financial industries trades in less than 400 microseconds - a 1 millisecond delay costs >US\$100m a year.
4. Human-Machine teaming is only a short-term answer.

Other-Worldly Moves

“There’s some inhuman element in the way AlphaGo plays... ..Because it’s so hard to try to attach a story about what AlphaGo is doing.”

Michael Redmond.



AlphaGo vs Ke Jie, May 2017

<https://www.theatlantic.com/technology/archive/2017/10/alphago-zero-the-ai-that-taught-itself-go/543450/>

And: <https://www.linkedin.com/pulse/through-glass-darkly-future-character-conflict-john-dowdy/>

Heider, F., & Simmel, M. (1944). An experimental study of apparent behavior. *The American journal of psychology*, 57(2), 243-259.

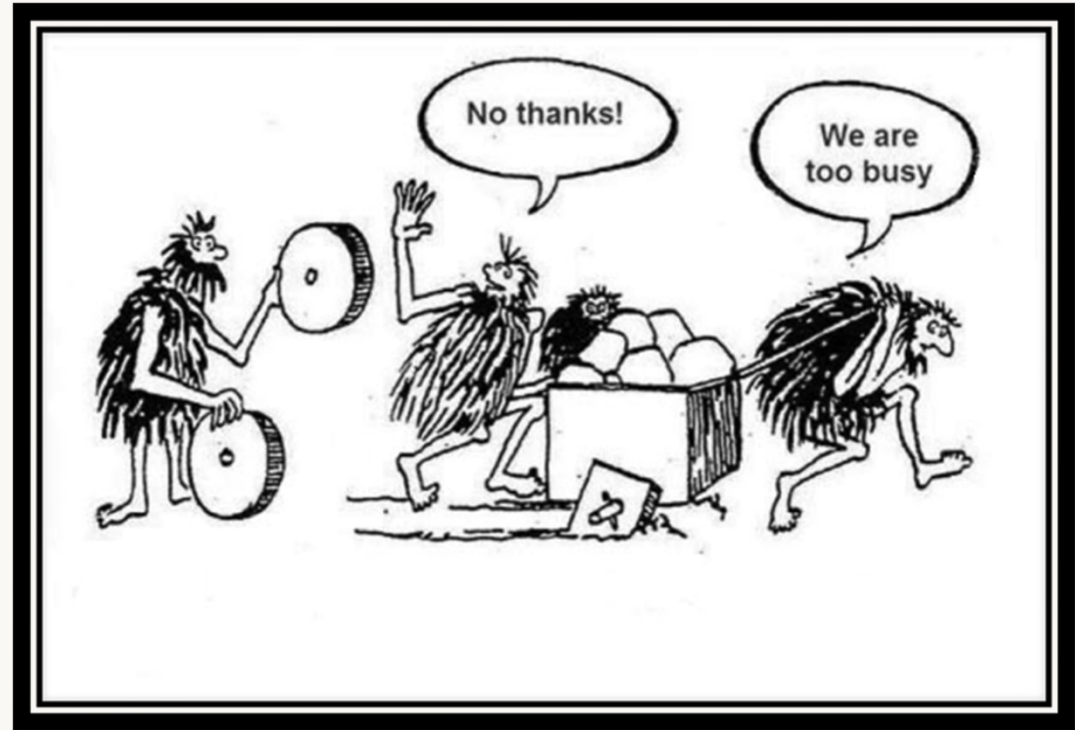
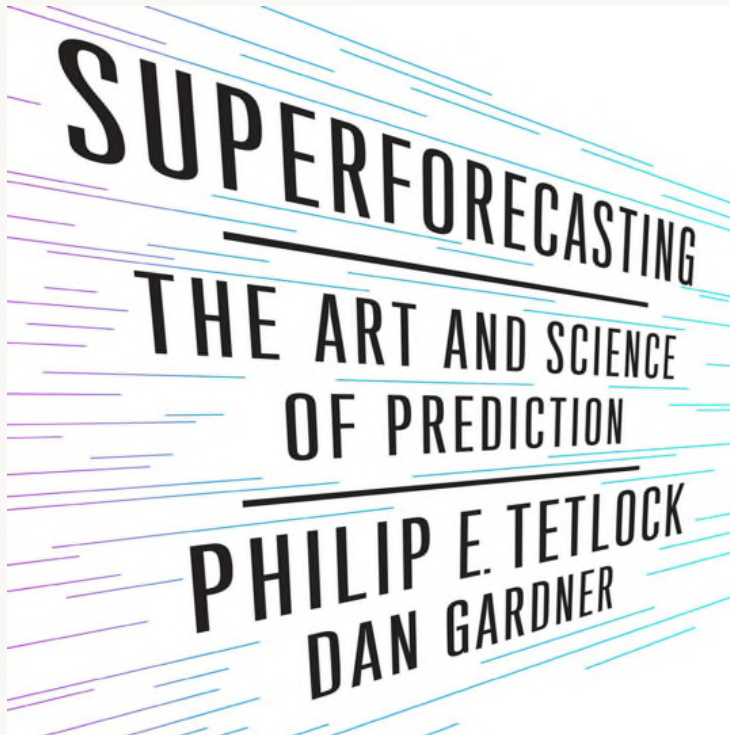
AlphaStar, E-sports, Starcraft II

“...early on... ..[AlphaStar]...favoured... ..risky strategies... ..discarded as training progressed, leading to other strategies: for example, gaining economic strength by over-extending a base with more workers, or ...disrupt[ing] an opponent's workers and economy. This process is similar to the way in which players have discovered new strategies, and were able to defeat previously favoured approaches...”



- **Game theory**
- **Imperfect information**
- **Long term planning**
- **Real time**
- **Large action space**

How good are we?



Baselining:

- Forecasting accuracy;
- Decision confidence.

Science of Information Warfare

QUESTIONS

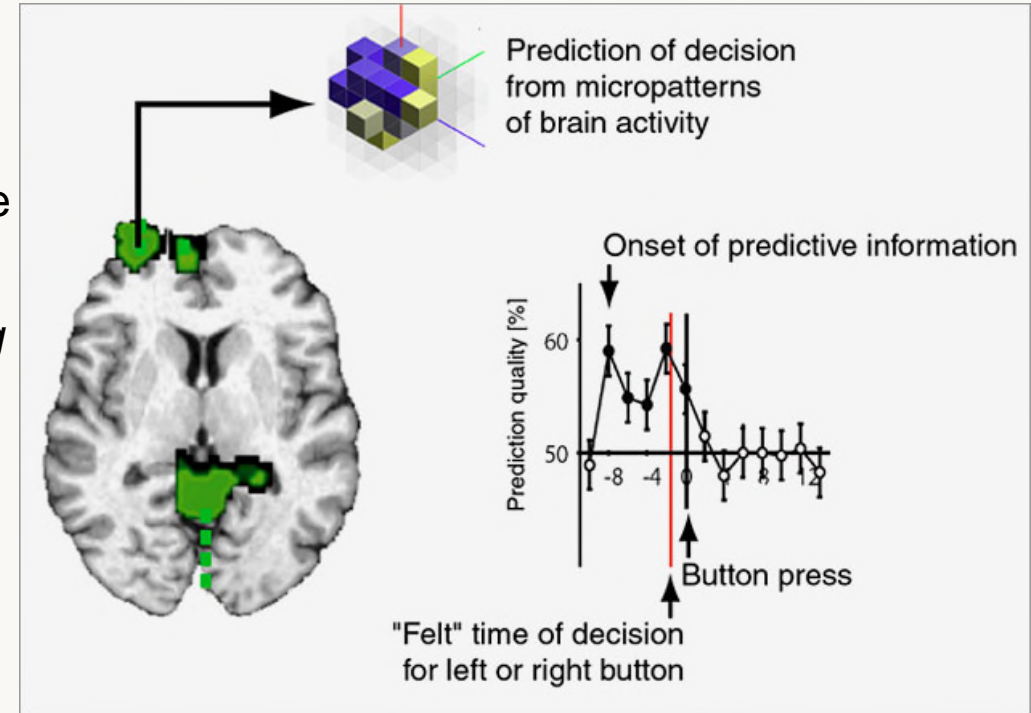
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Who's in Charge?

- Libet et al. (1983) & Soon et al. (2008).
- Haidt - moral instincts.
- Gazzaniga – left brain interpreter (confabulator vs the right brain literalist)
- Trivers, R. (2011). *Deceit and self-deception: Fooling yourself the better to fool others*. Penguin UK.



Soon, C. S., Brass, M., Heinze, H. J., & Haynes, J. D. (2008). Unconscious determinants of free decisions in the human brain. *Nature neuroscience*, 11(5), 543.

Libet, B., Gleason, C. A., Wright, E. W., & Pearl, D. K. (1983). Time of conscious intention to act in relation to onset of cerebral activity (readiness-potential) the unconscious initiation of a freely voluntary act. *Brain*, 106(3), 623-642.

Haidt, J. (2001). The emotional dog and its rational tail: a social intuitionist approach to moral judgment. *Psychological review*, 108(4), 814.

Gazzaniga, M. S. (2000). Cerebral specialization and interhemispheric communication: Does the corpus callosum enable the human condition?. *Brain*, 123(7), 1293-1326.

A Rising Tide



“The human won — but not before the machine had proved itself able to produce compelling and coherent arguments, form rebuttals to Mr Natarajan’s statements, make a closing argument and even throw in a few jokes for good measure.”



Image credit: Ben Edwards Medium Blog (*What do we mean by intelligence, artificial or otherwise?*) illustration of Hans Moravec’s “landscape of human competence” <https://alltext.com/what-do-we-mean-by-intelligence-artificial-or-otherwise-e5f72fbe8698>, original taken from Tegmark, M. (2017). *Life 3.0: Being Human in the Age of Artificial Intelligence*. Knopf. p.53