Bias, Skill and Decisions

I study learning and decision making. Much of my research looks at simple decision making, and simple skill learning, using measures of behaviour informed by work done in computational theory, robotics and neuroscience. More recently a strand of my research looks at complex decisions, and bias in decision making. In this talk I will discuss two recent projects which demonstrate the power of combining psychological theory with computer science techniques:

The first, a promising method which uses timing and error data from typing to infer something about neurological health:


The second, a study of racial bias in soccer referees which also tells us something about biases in the scientific process:

Engineering
GREEN
Say “Red” or “Green”
Say “Red” or “Green” (think) “Red” (think) “Green” Colour perception Word reading
Goal-directed and habitual control in the basal ganglia: implications for Parkinson’s disease


Abstract | Progressive loss of the ascending dopaminergic projection in the basal ganglia is a fundamental pathological feature of Parkinson’s disease. Studies in animals and humans have identified spatially segregated functional territories in the basal ganglia for the control of goal-directed and habitual actions. In patients with Parkinson’s disease the loss of dopamine is predominantly in the posterior putamen, a region of the basal ganglia associated with the control of habitual behaviour. These patients may therefore be forced into a progressive reliance on the goal-directed mode of action control that is mediated by comparatively preserved processing in the rostromedial striatum. Thus, many of their behavioural difficulties may reflect a loss of normal automatic control owing to distorting output signals from habitual control circuits, which impede the expression of goal-directed action.

That’s what I think

thing

Let’s save the date

data

Blues have

Blue shave
Reduced Habitual Intrusions: An Early Marker of Parkinson's Disease?
Current work

Online testing of more patients and controls
  traditional keyboard + tablets/phones
  more data + “in the wild” test of concept

Deep learning classifier
  what is maximum discrimination from typing data
  does classifier recover language representations?
    what is contribution of timing / space / language info?

Predict status (patient vs control), disease progression, medication response
  even disease onset?
  generalise to free-form (not copy) typing

Gelman, A., & Loken, E. (2013). The garden of forking paths: Why multiple comparisons can be a problem, even when there is no “fishing expedition” or “p-hacking” and the research hypothesis was posited ahead of time. *Department of Statistics, Columbia University.*

Mat Evans
Computational Neuroscientist, Nottingham

Tim Heaton
Statistics, Sheffield

Colin Bannard
Computational Linguistics, Liverpool
most refs are only involved in a small number of dyads, many officiated over thousands. A median of 11 indicates that more than half of the refs officiated less than one game!
Same Data, Different Conclusions
Twenty-nine research teams were given the same set of soccer data and asked to determine if referees are more likely to give red cards to dark-skinned players. Each team used a different statistical method, and each found a different relationship between skin color and red cards.

Referees are three times as likely to give red cards to dark-skinned players.

Statistically significant results showing referees are more likely to give red cards to dark-skinned players.

Twice as likely

Equally likely

Non-significant results

95% CONFIDENCE INTERVAL

ONE RESEARCH TEAM

SOURCE: BRIAN NOSEK ET AL.

https://fivethirtyeight.com/features/science-isnt-broken/#part1
Conclusions

There is variation, but within limits

Locus of bias is still unclear

For good analysis:

  Team diversity

  visualisation

  domain knowledge
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