XAVIER ROBERTS-GAAL

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EDUCATION

Harvard University   **2022 – present**
PhD, Psychology. Supervisor: Fiery Cushman

- Research areas: Social cognition, computational cognitive science, cultural evolution, judgment and decision making, AI safety, morality

University of Oxford (New College), Oxford, UK   **2017 – 2020**
BA (Honours) Psychology & Philosophy, First Class Honours (4.0 GPA equivalent).

- Thesis title: 'Two rival pictures of social cognition'. Supervisor: Anita Avramides
- Key classes: Clinical Social Cognitive Neuroscience; How to Build a Brain (Neuroscience + AI); Memory, Attention & Information Processing; Cognitive Neuroscience; Developmental Psychology; Social Psychology; Probability & Statistics; Philosophy of Mind; Knowledge & Reality; Wittgenstein; Kant; Post-Kantian Philosophy
- Activities: Oxford Nightline (crisis hotline) volunteer as well as lead for new volunteer training, IT, and publicity/marketing; college rowing; debate coaching; ReproducibiliTEA Open Science discussion group; LGBTQ+Soc; Oxford American Society; Oxford Australia-New Zealand Society; Oxford Union (won speaking prize in debate); Philosophy Undergraduate Joint Consultative Committee; Psychology Subject Representative for New College

RESEARCH EXPERIENCE

Moral Psychology Research Lab (link)   **Aug 2022 – present**
PhD Student – PI: Fiery Cushman. Ongoing projects:

- Investigating how cultural evolution and environmental uncertainty determine which social learning strategies we use when, and how we flexibly arbitrate between them
- Understanding the structure of moral concepts as embedded in AI systems
- Characterizing how people make decisions under prudential and moral uncertainty

Human Information Processing and Neurotheory Labs, Oxford, UK (link)   **Jun 2020 – Nov 2020**
Research Assistant – PIs: Chris Summerfield, Andrew Saxe

- Investigated the learning dynamics of deep neural networks parameterized by Hebbian and top-down feedback components to identify which rules yield qualitative signatures of humanlike learning (e.g., stagelike transitions in loss function, illusory correlations)
- Used formal analysis, representational similarity analysis, and multidimensional scaling, and developed pipelines in Python (JAX, TensorFlow)
- Scaled up experiment using texture synthesis patterns and naturalistic computer graphics
- Worked on project implementing meta-learning of intrinsic reward to model mood disorders
- Contributed to journal club and lab activities

Bird Lab, Oxford, UK (link)   **Apr 2019 – Jun 2020**
Research Assistant – PI: Geoff Bird

- Co-authored a new validation protocol for low-cost eye-trackers used in psychophysics (Gazepoint GP3HD and biometric package). Identified ways to minimize data loss
- Gathered data for experiments on interoception, emotional gaze in autism, and empathy
- Built an R-Shiny web app to process and analyze data, improving the lab's workflow efficiency

JOURNAL PUBLICATIONS

- Cuve HC, Stojanov J, **Roberts-Gaal X**, Catmur C, & Bird G. (2021). Validation of Gazepoint low-cost eye-tracking and psychophysiology bundle. *Behavior Research Methods*, 1-23. (link)
- **Acknowledged in** Cuve HC, Castiello S, Shiferaw B, Ichijo E, Catmur C, Bird G. (2021). Alexithymia explains atypical spatiotemporal dynamics of eye gaze in autism. *Cognition* 212, 104710. (link)

CONFERENCE PUBLICATIONS

- "Computational principles of cultural learning." *Cognitive Science Society*, Sydney, Australia, July 26, 2023 (Talk, **accepted**)
- "The role of uncertainty in moral judgment." *Society for Philosophy and Psychology*, University of Pittsburgh, June 22, 2023 (Poster, **accepted**)
- **Acknowledged in** Cao Y, Summerfield C, & Saxe A. (2020). Characterizing emergent representations in a space of candidate learning rules for deep networks. *Advances in Neural Information Processing Systems* 33. (link)
- "Much Ado About Nothing? Asexual identity formation and its challenges in adolescence" presented at **TORCH** (The Oxford Research Centre in the Humanities) Queer Studies Research Network Undergraduate Symposium, The Queen's College, Oxford, UK, April 2018

SERVICE

- Facilitator, **Harvard AI Safety Team**, teaching AI safety fundamentals to Harvard/MIT undergrads (curriculum)
- Mentor, **PPREP** (supporting PhD/RA applicants from groups historically minoritized in STEM)
- Convening interdisciplinary PhD reading group on **compositionality** in cognition, Spring 2023
- Created professional PowerPoint templates for lab

WORK EXPERIENCE

McKinsey & Company, London, UK; Global projects   **Nov 2020 – Jun 2022**
Business Analyst

- Helped manage creation and deployment of 4 machine learning models driving £200m revenue impact for top UK bank. Won key stakeholder support. Identified, designed, and implemented 3 marketing initiatives to capture high potential customer segments
- Defined technical architecture, governance, and data ethics approach for cross-govt data linking effort (50+ datasets) joining up social services to support vulnerable individuals
- Created P&L model and identified ~£50m store productivity uplift for UK retailer's strategy
- Designed and modelled incentives to boost efficacy of £200m spend for top-5 auto group

- Conducted 3 due diligences, on packaging, ecommerce/fashion, and translation companies
- Led training sessions for 10k employees in largest Agile transformation in the energy sector
- Consistently ranked in top quintile of performance. Contributed to 3 proposal wins

Summer Business Analyst   **Jun 2019 – Aug 2019**

- Implemented analytics system in top-10 EU corporate bank to improve capital management
- Conducted growth strategy and due diligence for heritage footwear company which later IPO'd

Moonshot Global Consulting, Washington, DC, USA; Global projects   **Jan 2018 – Jun 2019**
Intern

- Supported on monitoring and evaluation projects for Australian, USA, and UK development agencies, incl. AUD 15 million project growing the APAC impact investing ecosystem
- $400,000 World Bank project implementing a mechanism for private sector feedback on public services, and $45 million, 4.5-year open innovation project funded by USAID, DfID, Sida, and Omidyar Network

Oxford Development Consultancy, Oxford, UK, and Myanmar   **Oct 2018 – Feb 2019; Sep 2019**
Assistant Team Leader

- Improved VisionFund Myanmar's small business loan and coaching program through analyzing participant experiences and consolidating best practices, including the use of applied psychology to support effective decision-making and resilience. Ran follow-on workshop with staff teaching design thinking and measuring entrepreneurial traits in September

Debate Coach, Oxford, UK   **Oct 2017 – May 2018**

- Taught Lincoln-Douglas debate to students at 3 high schools in the USA, including preparing philosophy curricula, running practices, and judging and coaching at tournaments

Lifeguard and Certified Swimming Pool Operator, Bethesda, MD   **Summers 2015 – 2018**

- Guarded patrons, supervised other lifeguards, managed pool chemistry. CPR certified

SKILLS

Analytical	Statistical modeling (incl. Bayesian methods), neural networks, representational similarity analysis, manifold techniques (e.g., multidimensional scaling), PCA, computational cognitive and evolutionary modeling, interpretability techniques
Languages (programming)	Python (TensorFlow, JAX, NumPy, Pandas, Scikit-Learn, PsychoPy, PyGaze), R (Shiny, Tidyverse, Tidytext, gazeR), Julia (Zygote, Gen), intermediate MATLAB
Software	Tableau, SPSS, JASP, Alteryx, Word, Excel, PowerPoint, Qualtrics, Gorilla, Git, Atlassian tools (e.g., Jira, Confluence, Trello, Bitbucket), Azure DevOps
Hardware	Gazepoint GP3HD eye-tracker and biometrics bundle, Biopac, learning fMRI
Languages (human)	Native English, intermediate Mandarin
Interpersonal	Leadership, project management, empathic/crisis listening, senior executive communication, coaching, workshop facilitation, and interviewing

AWARDS AND HONORS

- **NDSEG** Fellowship sponsored by Office for Naval Research, >$200,000, *accepted* 2023
- **NSF** Graduate Research Fellowship, >$150,000, awarded 2023, *declined* in favor of NDSEG
- **Harvard** Mind Brain Behavior Interfaculty Initiative, Graduate Student Award ($820), for "Compositionality in cognition: the language of thought and its discontents", 2023
- **New College, Oxford** Examination Prize for scholarship in Finals, 2020
- USA **National Merit Scholar** Finalist, 2017
- **NCFL** Grand National Tournament, Semifinalist 2015 and 2016 (top 3 high school Lincoln-Douglas debater in the USA at national championship)

ADDITIONAL INFORMATION

Citizenship | USA and Australia citizenship

Interests | Rowing, travel (5 continents), swimming, poetry, piano, tea, reading, and thinking a lot about minds

Volunteering | Co-organizer of McKinsey London Effective Altruism, co-founded Mentors Against Covid (social mobility mentorship network); advised Taimaka, a Nigeria-based hunger/poverty charity (recipient of D-Prize, funded by USAID)