Ezekiel Williams

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CURRENT POSITION

PhD candidate, Applied Math, University of Montreal and Mila, Quebec Artificial Intelligence (AI) Institute.
Supervisor: Guillaume Lajoie

EDUCATION

- MSc, Mathematics & Statistics, University of Ottawa, 2020. Thesis: *An Information Theoretic Analysis of Neural Multiplexing*. Supervisors: Richard Naud, Maia Fraser
- BSc, Neuroscience, Carleton, 2017. Thesis: *The Role of Network Connectivity in the Speed of Neural Synchronization*. Supervisor: John Lewis

PUBLICATIONS

- C Bredenberg, E Williams, et al. *Formalizing locality for normative synaptic plasticity models.* NeurIPS (2023)
- E Williams, C Bredenberg, G Lajoie. *Flexible phase dynamics for bio-plausible contrastive learning*. PMLR (2023)
- E Williams, A Payeur, A Gidon, and R Naud. *Neural burst codes disguised as rate codes*. Scientific Reports (2021)
- E Williams, A R Shifman, and J E Lewis. *Connectivity for rapid synchronization in a neural pacemaker network.* bioRxiv (2020).

TALKS

- 2023 - *Flexible Phase Dynamics for Bio-Plausible Contrastive Learning*, UNIQUE Student Symposium, Quebec
- 2020 - *Burst Coding Despite a Unimodal Interspike Interval Distribution*, Neuromatch 2.0, international (online)
- 2020 - *Robustness of a Multiplexed Neural Code*, Gatsby Computational Unit, UCL, London, UK
- 2019 - Panalist: *Future of Neuro-AI training*, Montreal Artificial Intelligence and Neuroscience (MAIN) Conference, Quebec

TEACHING AND MENTORING EXPERIENCE

- 2021 - Content consultant at Neuromatch Academy, international Summer school in deep learning: helped prepare tutorials on recurrent neural networks, transformers, and reinforcement learning.
- 2021 - Content consultant at Neuromatch Academy, international Summer school in computational neuroscience: helped TAs understand generalized linear methods and reinforcement learning.
- 2020 - TA at Neuromatch Academy, international Summer school in computational neuroscience: lead python tutorials in applied math and machine learning methods, and provided guidance during research projects for 8 students.
- 2018 - TA at University of Ottawa: lead tutorials for first year linear algebra.
- 2018 - TA at University of Ottawa: marked assignments for first year applied math, and second year ordinary differential equations.
- 2018 - DEGREE program mentor, University of Ottawa: shadowed by undergrad student interested in pursuing graduate studies.
- 2016 - Peer Assisted Study Session Facilitator, Carleton: lead and developed supplimentary workshops for Intro to Stats for Psych.
- 2015 - Peer Assisted Study Session Facilitator, Carleton: lead and developed supplementary workshops for Biology I.

AWARDS

- 2022 - National Science & Engineering Research Council (NSERC) PhD Scholarship - $ 105,000
- 2022 - Fonds de Recherche du Quebec Nature et Techologies (FRQNT) PhD Scholarship - $ 70,000
- 2022 - ICLR ML Evaluation Standards Workshop Outstanding Reviewer Award - $ 200
- 2021 - Unifying Neuroscience and AI; Québec (UNIQUE) Graduate Excellence PhD Scholarship - $ 15,000
- 2019 - Ontario Graduate Scholarship (OGS) Masters Award, UOttawa – $15,000
- 2019 - Graduate Excellence Scholarship, UOttawa – approx. $10,000 (tuition)
- 2018 - National Science & Engineering Research Council (NSERC) CGS Masters Award, UOttawa – $17,500
- 2018 - Ontario Graduate Scholarship (OGS) Masters Award, UOttawa – $15,000
- 2017 - NSERC Undergraduate Student Research Award (declined), UOttawa – $4500
- 2016 - J. Lorne Gray Scholarship, Carleton – $1000
- 2016 - NSERC Undergraduate Student Research Award, UOttawa – $4500
- 2015 - A. Davidson Dunton Scholarship, Carleton – $1000
- 2013 - Part-time Scholarship, Carleton – $375
- 2013/.../17 - Deans honour list student, Carleton

CONFERENCE POSTERS

- *Flexible Phase Dynamics for Bio-Plausible Contrastive Learning* E. Williams*, C. Bredenberg, G. Lajoie; International Conference on Machine Learning (ICML), 2023, Hawaii, US.
- *A Wake Sleep Sampling Algorithm for Bio-plausible Contrastive Learning*. E. Williams*, & G. Lajoie; Montreal Artificial Intelligence and Neuroscience Conference (MAIN), 2022, Montreal, Quebec.
- *Information Theoretic Analysis of a Multiplexed Neural Code.* E. Williams*, M. Fraser & R. Naud; Montreal Artificial Intelligence and Neuroscience Conference (MAIN), 2019, Montreal, Quebec.
- *Proposed strategies for simultaneous cognitive and motor state estimation for an intracortical brain-computer interface with sensors in prefrontal and motor cortices*. C. Boulay*, A. Rouzitalab, E. Williams, R. Naud & A. J. Sachs; BCI Society 17th International Meeting, 2018, Pacific Grove, California.

- *The Role of Network Connectivity in the Speed of Neural Synchronization.* E. Williams* & J. Lewis; Canadian Association for Neuroscience Conference, 2017, Montreal, Quebec.

LEADERSHIP & COMMUNITY

- 2023 - Founder & Student Member of Mila Sustainability Committee
- 2022 - Joined Canadian academic collective: Low Carbon Research Methods Group `http://lowcarbonmethods.com/`
- 2022 - Co-organized Unifying Neuroscience and Artificial Intelligence in Quebec (UNIQUE) Student Symposium `https://unique-students.github.io/pastevents.html`
- 2022 - Elected to serve as Mila Lab Representative `https://mila.quebec/en/mila-lab-reps/`
- 2022 - Reviewed paper for ICLR ML Evaluation Standards Workshop `https://ml-eval.github.io/`
- 2021 - Mila social media and research communication committee member
- 2021 - Co-organized Symposium on Explanation in Neuro and AI: `https://sites.google.com/mila.quebec/senai/home`
- 2018/19/20 - Organized inter-departmental journal club in mathematical neuroscience and machine learning, UOttawa.
- 2018/19 - Most Valuable Player, UOttawa Nordiq (Varsity Nordic Ski Club), UOttawa

OTHER

Nordic Skiing 3x Canadian Junior Champion; represented Canada at 2013 World Junior Championships; multiple Provincial titles
Music Grade 8 Royal Conservatory Piano; multiple Kiwanis music festival awards
Languages English: Native. French: learning.
Coding Languages Python, R, Matlab, LaTeX