ALONA FYSHE

Assistant Professor
Department of Computing Science & Department of Psychology
University of Alberta

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Edmonton, AB

RESEARCH INTERESTS

Machine learning, neuroscience, natural language processing (NLP)

EDUCATION

Carnegie Mellon University   Pittsburgh, PA, USA
PhD Machine Learning   *2009-2015*

Thesis: "Corpora and Cognition: The Semantic Composition of Adjectives and Nouns in the Human Brain"

Supervisor: Tom Mitchell

University of Alberta   Edmonton, AB, Canada
MSc Computing Science   *2004-2006*

Thesis: "Term Generalization and Synonym Resolution for Biological Abstracts"

Supervisor: Duane Szafron

University of Alberta   Edmonton, AB, Canada
BSc Computing Science   *2000-2004*

EMPLOYMENT

2018-PRESENT | **Assistant Professor** at **University of Alberta**, Edmonton, AB

2015-2018 | **Assistant Professor** at **University of Victoria**, Victoria, BC

2007-2009 | **Software Engineer** at **Google**, Pittsburgh, PA

Used machine learning to improve *Google Shopping*.

PUBLICATIONS

*Advisees marked with asterisks

Journals

[J1] Brent D. Davis, Dawn E. Mcknight*, Daniela Teodorescu*, Anabel Quan-haase, Rumi Chunara, Alona Fyshe & Daniel J. Lizotte (2022). Quantifying depression-related language on social media during the COVID-19 pandemic. *International Journal of Population Data Science*, 5(4), March 2022

[J2] Chris Foster*, Chad C Williams, Olav E Krigolson, Alona Fyshe. Using EEG to decode semantics during an artificial language learning task. *Brain and Behavior* June 2021

[J3] Dhanush Dharmaretnam*, Chris Foster*, Alona Fyshe. Words as a window: Using word embeddings to explore the learned representations of Convolutional Neural Networks. *Neural Networks* 137, 63-74pp, January 2021

[J4] Maryam Honari-Jahromi*, Brea Chouinard*, Esti Blanco-Elorrieta, Liina Pylkkänen, Alona Fyshe. Neural representation of words within phrases: Temporal evolution of color-adjectives and object-nouns during simple composition. *PLoS ONE* 16 (3), e0242754, March 2021

[J5] Callie Federer, Haoyan Xu*, Alona Fyshe, Joel Zylberberg. Improved object recognition using neural networks trained to mimic the brain's statistical properties. *Neural Networks* 131, 103-114, July 2020

[J6] Alona Fyshe, Gustavo Sudre, Leila Wehbe, Nicole Rafidi and Tom M Mitchell. The Lexical Semantics of Adjective Noun Phrases in the Human Brain. *Human Brain Mapping* 2019 https://onlinelibrary.wiley.com/doi/full/10.1002/hbm.24714

[J7] Alona Fyshe. Studying Language in Context Using the Temporal Generalization Method. *Philosophical Transactions of the Royal Society B* 375:20180531 2019 http://doi.org/10.1098/rstb.2018.0531

[J8] Leila Wehbe, Brian Murphy, Partha Talukdar, Alona Fyshe, Aaditya Ramdas, Tom Mitchell. Simultaneously Uncovering the Patterns of Brain Regions Involved in Different Story Reading Subprocesses. *PLoS ONE* 9(11): e112575. 2014

[J9] John J Grefenstette, Shawn T Brown, Roni Rosenfeld, Jay DePasse, Nathan TB Stone, Phillip C Cooley, William D Wheaton, Alona Fyshe, David D Galloway, Anuroop Sriram, Hasan Guclu, Thomas Abraham and Donald S Burke. FRED (a Framework for Reconstructing Epidemic Dynamics): an open-source software system for modeling infectious diseases and control strategies using census-based populations. *BMC public health.* 13(1):940, 2013

[J10] Gustavo Sudre, Dean Pomerleau, Mark Palatucci, Leila Wehbe, Alona Fyshe, Riitta Salmelin, Tom Mitchell. Tracking Neural Coding Of Perceptual And Semantic Features Of Concrete Nouns. *Neuroimage*, 62(1) 451-463, 2012

[J11] Alona Fyshe, Yifeng Liu, Duane Szafron, Russ Greiner, and Paul Lu. Improving Subcellular Localization Prediction using Text Classification and the Gene Ontology. *Bioinformatics*, 24(21):2512-2517 2008

[J12] Paul Lu, Duane Szafron, Russell Greiner, David S. Wishart, Alona Fyshe, Brandon Pearcy, Brett Poulin, Roman Eisner, Danny Ngo and Nicholas Lamb. PA-GOSUB: a searchable database of model organism protein sequences with their predicted Gene Ontology molecular function and subcellular localization. *Nucleic Acids Research*, 33:D147-D153, 2005

[J13] Duane Szafron, Paul Lu, Russell Greiner, David S. Wishart, Brett Poulin, Roman Eisner, Zhiyong Lu, John Anvik, Cam Macdonell, Alona Fyshe, and David Meeuwis. Proteome Analyst: Custom Predictions with Explanations in a Web-based Tool for High-throughput Proteome Annotations. *Nucleic Acids Research*, 32:W365-W371 2005

Conferences (Journal quality, acceptance rates $<\sim 25\%$)

[C1] Bruce Nie, Hélène Deacon, Alona Fyshe, Carrie Demmans Epp. Predicting Reading Comprehension Scores of Elementary School Students. *Educational Data Mining* July 2022

[C2] Bilal Ghanem*, Lauren Lutz Coleman, Julia Rivard Dexter, Spencer McIntosh von der Ohe*, Alona Fyshe. Question Generation for Reading Comprehension Assessment by Modeling How and What to Ask *Findings of the Association for Computational Linguistics (ACL)* Dublin, Ireland. May 2022

[C3] Kirby Banman, Garnet Liam Peet-Pare*, Nidhi Hegde, Alona Fyshe, Martha White. Resonance in Weight Space: Covariate Shift Can Drive Divergence of SGD with Momentum *The Tenth International Conference on Learning Representations (ICLR)* (Virtual). April, 2022

[C4] Maryam Hashemzadeh*, Greta Kaufeld*, Martha White, Andrea E. Martin, Alona Fyshe. From Language to Language-ish: How Brain-Like is an LSTM's Representation of Nonsensical Language Stimuli *Findings of the Empirical Methods in Natural Language Processing (EMNLP)*. Virtual. November, 2020

[C5] Qingfeng Lan*, Yangchen Pan, Alona Fyshe, Martha White. Maxmin Q-learning: Controlling the Estimation Bias of Q-learning. *International Conference on Learning Representations (ICLR)* Addis Ababa, Ethiopia. April 30, 2020

[C6] Dhanush Dharmaretnam*, Alona Fyshe. The Emergence of Semantics in Neural Network Representations of Visual Information. *The North American Chapter of the Association for Computational Linguistics - Human Language Technologies (NAACL HLT 2018) - New Orleans, Louisiana*, 2018

[C7] Haoyan Xu*, Brian Murphy, Alona Fyshe. BrainBench: A Brain-Image Test Suite for Distributional Semantic Models. *Empirical Methods for Natural Language Processing (EMNLP)*, Austin, TX. 2016

[C8] Cole Peterson*, Alona Fyshe. Poet Admits // Mute Cypher: Beam Search to find Mutually Enciphering Poetic Texts. *Empirical Methods for Natural Language Processing (EMNLP)*, Austin, TX. 2016

[C9] Alona Fyshe, Leila Wehbe, Partha Talukdar, Brian Murphy, Tom Mitchell. A Compositional and Interpretable Semantic Space. *The Conference of the North American Chapter of the Association for Computational Linguistics - Human Language Technologies (NAACL HLT 2015)*, Denver, Colorado. 2015

[C10] Alona Fyshe, Partha Pratim Talukdar, Brian Murphy and Tom M Mitchell. Interpretable Semantic Vectors from a Joint Model of Brain- and Text- Based Meaning. *The 52nd Annual Meeting of the Association for Computational Linguistics (ACL)*, Baltimore, Maryland. 2014

[C11] Evangelos E. Papalexakis, Alona Fyshe, Nicholas Sidiropoulos, Partha Pratim Talukdar, Tom Mitchell, Christos Faloutsos. Good-Enough Brain Model: Challenges, Algorithms and Discoveries in Multi-Subject Experiments. *ACM Special Interest Group on Knowledge Discovery and Data Mining (SIGKDD)*, New York City, USA. 2014

[C12] Alona Fyshe, Partha Talukdar, Brian Murphy and Tom Mitchell. Documents and Dependencies: an Exploration of Vector Space Models for Semantic Composition *International Conference on Computational Natural Language Learning (CoNLL 2013)*, Sofia, Bulgaria, 2013.

[C13] Alona Fyshe, Emily Fox, David Dunson and Tom Mitchell. Hierarchical Latent Dictionaries for Models of Brain Activation. *Fifteenth International Conference on Artificial Intelligence and Statistics (AIStats)*, 2012

[C14] Brett Poulin, Roman Eisner, Duane Szafron, Paul Lu, Russ Greiner, D.S. Wishart, Alona Fyshe, Brandon Pearcy, Cam MacDonell and John Anvik. Visual Explanation of Evidence in Additive Classifiers. *Eighteenth Conference on Innovative Applications of Artificial Intelligence (IAAI)*, July 2006

Book Chapters

[B1] Leila Wehbe, Alona Fyshe, Tom Mitchell. Language processing in the brain: Mapping neural activity to language meaning. *Human Language: from Genes and Brains to Behavior*, MIT Press. 2019

[B2] Brian Murphy, Leila Wehbe, Alona Fyshe. Decoding Language from the Brain. *Language, Cognition, and Computational Models*, Cambridge University Press. 2018 https://doi.org/10.1017/9781316676974.003

In Preparation / Under Review

[I1] Rohan Saha*, Jennifer Campbell, Janet F. Werker, Alona Fyshe. Insights into Early Word Comprehension: Tracking the Neural Representations of Word Semantics in Infants. *bioRxiv* 2021.10.28.466334; doi: https://doi.org/10.1101/2021.10.28.466334

[I2] Qingfeng Lan, Luke Kumar, Martha White, Alona Fyshe. Predictive Representation Learning for Language Modeling. *arXiv*:2105.14214 [cs.CL] https://doi.org/10.48550/arXiv.2105.14214

[I3] Joseph C.Y. Lau, Alona Fyshe, Sandra R Waxman. Rhythm may be key to linking language and cognition in young infants: Evidence from machine-learning.

[I4] Sarah S. Sheldon, Alona Fyshe, and Kyle E. Mathewson. Connecting Covert Attention and Visual Perception to the Spatiotemporal Dynamics of Alpha Band Activity, Cross-Frequency Coupling (CFC), and Functional Connectivity using Multivariate Pattern Analysis (MVPA).

[I5] Han Wang, Archit Sakhadeo, Adam White, James Bell, Vincent Liu, Xutong Zhao, Puer Liu, Tadashi Kozuno, Alona Fyshe, Martha White. No More Pesky Hyperparameters: Offline Hyperparameter Tuning for Reinforcement Learning.

WHITE PAPERS/REPORTS

[1] Werker, J. F., et al. Impact of COVID-19 on Language and Literacy in Canada. *Royal Society of Canada.* 2021 link

NON-ACADEMIC PUBLICATIONS

[1] Fyshe, Alona; Werker, Janet. Psychology research during the pandemic: The upside of being online. *The Globe and Mail* (2021 Jan) Link

[2] Four Lessons for Starting a Research Lab. *Science Careers* (2018, Aug) Link

[3] Surviving your first year on the tenure track. *University Affairs* (2017 March) Link

Presentations

- **Invited Plenary Panel** Alona Fyshe, Cian O'Donnell, Sara A. Solla, Anthony M. Zador. Dual Perspectives: Can Artificial Intelligence (AI) Provide a Theoretical Framework For Understanding the Brain or Is It Too Far Removed From Physiology To Be Useful? Society For Neuroscience Annual Meeting. Virtual, 2021
- Panel Moderator, Shaping AI for good: Canadian AI ecosystem. Women in AI Global Summit, Edmonton, Canada. (2021)
- Do we need to understand the brain before AI can benefit?. ICLR Workshop, "How Can Findings About the Brain Improve AI Systems", Virtual (2021).
- Panel Member, Inside Look at Career Journeys in Research AI. WaiTalk Edmonton, Women in AI, Virtual, Canada, (2021)
- Invited Commentary. CIFAR AI + Consciousness Meeting, Virtual, Canada, (2021)
- NLP and machine learning Panel. AICan, Virtual, Canada, (2021)
- Using EEG to Decode Semantics During an Artificial Language Learning Task. Duolingo Research Colloquium, Pittsburgh, United States, (2020)
- Alona Fyshe, Daniel Lizotte. Using AI / ML to Track Mental Health During the Coronavirus Pandemic. Data for Good, Virtual (2020)
- Do computers understand language?. The Walrus Talks Exploration, Calgary (2020)
- Convergence: How neural networks and brains represent the world. LTI Colloquium, CMU, Pittsburgh, United States (2020)
- The Brain's Representation of Semantics During an Artificial Language Learning Task. NIMH sponsored talk series "Machine Learning in Brain Imaging, Neuroscience, and Psychology", Bethesda (Virtual), United States (2020)
- Neural Language Models. Oxford Machine Learning Summer School, Virtual, Canada. (2020)
- How can brain imaging data guide model training?. Montreal AI & Neuroscience (MAIN), Virtual, (2020)
- Machine Learning and the Brain - Research and Clinical Language Examples. Models, Inferences, Algorithms Speaker Series, Broad Institute, Virtual, Canada (2020)
- Deep Learning for Natural Language Processing. Deep Learning Reinforcement Learning Summer School (DRLSS), Edmonton, Canada (2019)
- General Value Functions for LSTMs. CIFAR Learning in Machines and Brains Program Meeting, Vancouver, Canada (2019)
- Research in Alberta (Panel). CIFAR Board of Directors Meeting, Calgary, Canada (2019)
- Finding language (and language learning) in the brain. Kavli Brain Forum, Georgia, United States. (2018)
- Alona Fyshe, Craig Chapman, Jake Stauch. Sponsored session: The Future of VR: Neuroscience and Biosensor Driven Development.Game Developer's Conference, San Francisco, United States (2018)
- The Emergence of Semantics in Neural Network Representations of Visual Information. Simon Fraser University NLP Seminar, Vancouver, Canada (2018)
- TGMs to Study Language Composition in the Brain. Towards mechanistic models of meaning composition Symposium, Trondheim, Norway (2018)
- **Invited Plenary Session:** Data Driven Everything. Cognitive Neuroscience Society Annual Meeting, Boston, United States. (2018) Video (talk) Video (debate)
- Understanding CNNs Using Word Embeddings. West Coast NLP, Organised by Facebook, Menlo Park, United States. (2018)
- Natural Language Processing. AI 4 ALL, Vancouver, Canada (2018)
- Using Semantic Models to understand CNN Representations. Facebook: West Coast Natural Language Processing (WeCNLP), Palo Alto, United States (2018)
- **Invited Plenary Tutorial**: Artificial Intelligence. Cognitive Computational Neuroscience, New York, United States. (2017) Video
- What Does Language Look Like In The Brain?. Engineering Institute of Canada / Canadian Society for Senior Engineers (EIC / CSSE), Victoria, Canada (2016)
- Corpora, Cognition and Composition. Johns Hopkins / University of Maryland Computational Linguistics Institute Seminar., Baltimore, United States (2016)

Podcast Interviews

- Understanding computer "brains" and human brains. AI4Society Podcast, (2021)
- Using Brain Imaging to Improve Neural Networks with Alona Fyshe. TWIML (This week in machine Learning) Podcast, (2021)
- Decoding words within phrases. NeLLab Spotlight Podcast, (2021)
- Language and the Brain, with Alona Fyshe. NLP Highlights Podcast (Allen Institute for Artificial Intelligence), (2020)

Supervision

Post Doctoral	Thomas Ferguson	2022-Present
	Bilal Ghanem	2021-Present
	Richard Gerum	2021-Present
	Brea Chouinard	2018-Present
	Niko Rebenich	2016-2017
Doctoral	Rohan Saha	2022-Present
	Saeed Najafi	2020-Present
Master's	Daniela Teodorescu	2021-Present
	Spencer von der Ohe	2021-Present
	Cory Efrid	2021-Present
	Varshini Prakash	2020-Present
	Dhruv Mullick	2020-Present
	Sijie Ling	2020-Present
	Cassidy Pirlot	2019-Present
	Dawn McKnight	2019-Present
	Garnet Liam Peet-Pare	2019-2022
	Rohan Saha	2019-2022
	Archit Sakhadeo	2019-2021
	Maryam Hashemzadeh	2019-2021
	Qingfeng Lan	2018-2020
	Maryam Honari-Jahromi	2016-2019
	Cole Peterson	2016-2019
	Chris Foster	2016-2018
	Dhanush Dharmaretnam	2016-2018

Undergraduate	Castor Shem	2022-Present
	Natalie Hanas	2021-Present
	Spencer von der Ohe	2020-2021
	Daniela Teodorescu	2020-2021
	Mitchell Holmes	2020-Present
	Davina Kam	2019-2020
	Adnan Houque	2019
	Jeong Ung Song	2019-2021
	Steve Hoff	2018
	Emily Pierera	2017
	Alix Voorthuyzen	2016
	Sebastien Guillemont	2016
	Luke McLauren	2016
	Chris Cook	2016
	Haoyan Xu	2016
	Sophia Chan	2016
Highschool Interns	John Thompson	2021
	Arnav Kumar	2021
	Will Henderson	2021
	Disen Kottage	2021
	Andrija Ikovic	2021

Awards

Name	Period
Google Cloud Innovator	2022
Canada CIFAR AI (CCAI) Chair	2018-2023
Top 40 under 40 (Edify Magazine)	2020
Global Scholar	2016-2018

Grants

Name	Amount	Period
NSERC Discovery	$205,000	2022-2027
CIFAR Catalyst Covid-19 (Co-PI with Dr. Daniel Lizotte)	$15,000	2020-2021
NFRF-Exploration (Co-PI with Dr. Joel Zylberberg)	$250,000	2020-2023
SSHRC Partnership (Co-applicant)	$2,500,000	2020-2027
Canada CIFAR AI Chair	$1,300,310	2018-2023
CIFAR Catalyst (Co-PI with Dr. Janet Werker)	$40,000	2019-2021
CIFAR Catalyst (Co-PI with Dr. Joel Zylberberg)	$50,000	2018-2020
NSERC Engage Plus	$25,000	2017
University of Victoria, Internal Research Grant (Co-PI with Dr. Brianna Turner)	$10,000	2017
CIFAR Catalyst (Co-PI with Dr. Craig Chapman)	$110,000	2017-2019
NSERC Engage	$25,000	2016
CIFAR Global Scholar	$100,000	2016-2018
NSERC Discovery	$110,000	2016-2022
University of Victoria, Internal Research Grant	$7,000	2015

Academic Service

Conference/Workshop Organization

Mentor	CIFAR Neuroscience of Consciousness Winter School	2022
Co-Organiser	Dynamical Principles of Biological & Artificial Neural Networks, Workshop	2022
Lecturer	Neuromatch Academy (Deep Learning)	2022
Committee Member	Steering Committee, CCAI AICan	2020-2021
Area Chair	Neural Information Processing Systems (NeurIPS), Conference	2019-2022
Area Chair	International Conference on Learning Representations (ICLR), Conference	2020
Co-Organiser	The Summer Institute on AI and Society, Workshop	2019
Co-organizer	Mind-Machine Links workshop, Workshop	2019
Scientific Committee	Association for the Scientific Study of Consciousness Conference (ASSC)	2019
Co-Area Chair	Empirical Methods in Natural Language Processing (EMNLP)	2017
Area Chair	Women in Machine Learning (WiML, NeurIPS workshop)	2017

Editorial Activities

Associate Editor	Neurons, Brains, Data Analysis and Theory, Journal	2018-Present
Standing Reviewer	Transactions of the ACL, Journal	2017-Present
Associate Editor	PLOS Computational Biology, Journal	2019-2021

Memberships

Member	Royal Society of Canada Working Group on Language and Literacy	2020-Present
Co-Director	SSHRC Partnership Grant	2020-Present
Committee Member	Advanced Computational Neuroscience (Campus Alberta Neuroscience) Advisory Committee	2020-2021

Reviewing

Nature Neuroscience, Nature Human Behavior, Cognition, Neuroimage, Public Library of Science (PLoS), Association for the Advancement of Artificial Intelligence (AAAI), International Conference on Machine Learning (ICML), Neural Information Processing Systems (NeurIPS), Association for Computational Linguistics (ACL), European Chapter of the Association for Computational Linguistics (EACL), North American Association for Computational Linguistics (NAACL), Empirical Methods in Natural Language Processing (EMNLP), Artificial Intelligence

University Service

Committee Member	Faculty of Science EDI Committee	2020-Present
Committee Member	Amii EDI Committee	2020-Present
Co-chair	Amii Resource Allocation Panel (RAP) Committee	2019-Present
Committee Member	Management Advisory Board, Amii	2019-Present

Department Service

Committee Member	Computing Science Graduate Admissions Committee	2019-2022
Organizer	Undistinguished Lecture Series	2021-Present

Teaching

F: fall semester, W: winter semester, S: summer semester

University of Alberta	CMPUT 466/566: *Introduction to Machine Learning*	W2021
	PSYCO 576: *Machine Learning for Psychology*	F2020
	PSYCO 354: *Foundations of Cognitive Science*	W2020, W2022
	CMPUT 655: *Machine Learning and the Brain*	F2018,F2019,F2021
University of Victoria	SENG 474/CSC 578D: *Data Mining*	F2018, F2016, F2016
	CSC 485E/SENG 480C/CSC 581A: *Introduction to NLP*	S2017
	CSC 106: *The Practice of Computer Science*	W2017, F2015