Jessica Thompson

PhD Candidate in Cognitive Science and Neuropsychology

Contact

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Research Interests

Deep learning science, deep learning theory, computational neuroscience, philosophy of science, methods development

Core Competencies

Problem formulation, critical thinking, multi-disciplinary synthesis, open-mindedness

Computer Skills

Proficient with Python, MATLAB, Java, shell scripting, LaTeX

Facility with C/C++, Max/MSP, CSS, PHP

Database management and web application development using django, CouchDB, ElasticSearch, and PostgreSQL

Links

G Scholar://**TJweLP0AAAAJ**
Github://**thompsonj**
LinkedIn://**jessica-af-thompson**

Languages

English and French

Education

PhD Cognitive Science and Neuropsychology — Université de Montréal **2013–2020 (Expected)**
Supervised by Marc Schönwiesner and Yoshua Bengio

MA Digital Musics — Dartmouth College **2011–2013**
Supervised by Michael Casey

BA Psychology (Hons.), Computer Science, Music Technology — McGill University **2006–2011**
Supervised by Stephen McAdams, Evan Balaban and Robert Zatorre

Research Experience

Quebec Artificial Intelligence Institute (Mila) — Montréal, Canada **2014–Now**
PhD Researcher
Explore methods to compare deep networks to measurements of human neural activity

International Laboratory for Research on Brain, Music & Sound — Montréal, Canada **2013–Now**
PhD Researcher
Design and conduct study on the representation of spectro-temporal modulations using machine learning-based analysis of 7T fMRI responses to dynamic ripples.

Nuance Communications Canada Inc. — Montréal, Canada **2015–2018**
Mitacs PhD Fellow
Analyzed the transferability of intermediate features across languages in convolutional neural network-based acoustic models in automatic speech recognition systems

Department of Cognitive Neuroscience, Maastricht University — Maastricht, The Netherlands **2015–2016**
Visiting Researcher
Designed and conducted 7T fMRI study to model responses to native and non-native speech quilts with convolutional neural networks trained on natural speech

Bregman Media Labs, Dartmouth College — Hanover, USA **2011–2013**
Graduate Researcher
Conducted fMRI and EEG experiments about neural decoding of various acoustic and semantic music features

Distributed Digital Music Archives and Libraries Lab, McGill University — Montréal, Canada **2008–2011**
Programmer
Developed software in Java and Python for machine learning and information retrieval services with application to music research

Auditory Cognitive Neuroscience Lab, Montreal Neurological Institute — Montréal, Canada **2010–2011**
Student Researcher
Assessed the effect of circularity (non-independence) in fMRI region-of-interest (ROI) analysis

MEG Lab, Rotman Research Institute — Toronto, Canada **2010**
Student Researcher
Conducted MEG and behavioural experiments on binaural auditory beating

Department of Psychology, McGill University — Montréal, Canada **2010**
Student Researcher
Explored multivariate statistical data analysis techniques applied to biosignals

Music Perception and Cognition Lab, McGill University — Montréal, Canada **2008–2009**
Data Analyst
Employed continuous data analysis techniques to analyse psychophsyiological signals

Publications

Journal articles

Human cortical responses to slow and fast binaural beats reveal multiple mechanisms of binaural hearing
Ross, Bernhard, Takahiro Miyazaki, **Jessica Thompson**, *Shahab Jamali, and Takako Fujioka*
Journal of Neurophysiology 112.8 (Oct. 2014) pp. 1871–1884. 2014

Sound envelope encoding in the auditory cortex revealed by neuromagnetic responses in the theta to gamma frequency bands
Miyazaki, Takahiro, **Jessica Thompson**, *Takako Fujioka, and Bernhard Ross*
Brain Research 1506 (2013) pp. 64–75. 2013

Conference and workshop papers

The effect of task and training on intermediate representations in convolutional neural networks revealed with modified RV similarity analysis
Jessica Thompson, *Marc Schönwiesner, and Yoshua Bengio*
Cognitive Computational Neuroscience (CCN) Conference, 2019, Berlin, Germany

How transferable are features in convolutional neural network acoustic models across languages?
Jessica Thompson, *Marc Schönwiesner, Yoshua Bengio, and Daniel Willett*
Proceedings of the IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2019, Brighton, UK

Towards a common philosophy of explanation for artificial and biological intelligence
Jessica Thompson
Cognitive Computational Neuroscience (CCN) Conference, 2018, Philadelphia, USA

Conference ticket allocation via non-uniform random selection to address systemic biases
Jessica Thompson, *Laurent Dinh, Nicolas Le Roux, and Layla El Asri*
Neural Information Processing Systems (NeurIPS) workshop on Correcting and Critiquing Trends in Machine Learning, 2018

How can deep learning advance computational modeling of sensory information processing?
Jessica Thompson, *Yoshua Bengio, Elia Formisano, and Marc Schönwiesner*
Neural Information Processing Systems workshop on Representation Learning in Artificial and Biological Neural Networks (MLINI), 2016

Audio stimulus reconstruction using multi-source semantic embedding
Jessica Thompson, *Michael Casey, and Lorenzo Torresani*
Neural Information Processing Systems workshop on Machine Learning and Interpretation in Neuroimaging (MLINI), 2013, Lake Tahoe, USA

Digital document image retrieval using optical music recognition
Hankinson, Andrew, John Ashley Burgoyne, Gabriel Vigliensoni, Alastair Porter, **Jessica Thompson**, *Wendy Liu, Remi Chiu, and Ichiro Fujinaga*
Proceedings of the 13th Intl. Society for Music Information Retrieval Conference (ISMIR), 2012, Porto, Portugal

Musical neurosemantic decoding using online weighted approximate-rank pairwise loss optimization in a joint semantic space
Jessica Thompson, *Michael Casey, and Lorenzo Torresani*
Neural Information Processing Systems workshop on Machine Learning and Interpretation in Neuroimaging (MLINI), 2012

Music imagery information retrieval: Bringing the song on your mind back to your ears
Stober, Sebastian and **Jessica Thompson**
Proceedings of the 13th International Conference on Music Information Retrieval (ISMIR), 2012, Porto, Portugal

Population codes representing musical timbre for high-level fMRI categorization of music genres
Casey, Michael, **Jessica Thompson**, *Olivia Kang, and Thalia Wheatley*
Neural Information Processing Systems workshop on Machine Learning and Interpretation in NeuroImaging (MLINI), 2011, Sierra Nevada, Spain

Additions and improvements to the ACE 2.0 music classifier
Jessica Thompson, *Cory McKay, John Ashley Burgoyne, and Ichiro Fujinaga*
Proceedings of the 10th International Conference on Music Information Retrieval (ISMIR), 2009, Kobe, Japan

Using the ACE XML 2.0 file formats to store and share music classification data
McKay, Cory, John Ashley Burgoyne, **Jessica Thompson***, and Ichiro Fujinaga*
Proceedings of the 10th International Conference on Music Information Retrieval (ISMIR), 2009, Kobe, Japan

Oral and Poster Presentations

How transferable are intermediate acoustic representations of speech across languages in human and machine speech recognition?
Jessica Thompson*, Federico De Martino, Marc Schönwiesner, Yoshua Bengio, Elia Formisano, and Daniel Willett*
Montreal Artificial Intelligence and Neuroscience (MAIN) Conference, 2017, Montreal, Canada

Encoding of dynamic ripple mixtures in human auditory cortex using 7T fMRI
Jessica Thompson*, Federico De Martino, Marc Schönwiesner, and Elia Formisano*
Annual Meeting of the Organization for Human Brain Mapping (OHBM), 2016, Geneva, Switzerland

Reconstructing musical audio features from continuous single-trial EEG
Jessica Thompson *and Michael Casey*
Annual Meeting of the Organization for Human Brain Mapping (OHBM), 2014, Hamburg, Germany

Experience, perception, and physicality in experimental music: An argument for the role of neuroscience in music phenomenology
Jessica Thompson
Cognitio - Creative Minds: Cognitive Sources of Art and Discovery, 2013, Montreal, Canada

Reconstructing musical audio features from continuous single-trial EEG
Jessica Thompson
Cognitively-Based Music Information Retrieval (CogMIR) workshop, 2013, Toronto, Canada

Music information retrieval from neurological signals: Towards neural population codes for music
Jessica Thompson *and Michael Casey*
Conference of the Society for Music Perception and Cognition (SMPC), 2013, Toronto, Canada

Predicting crowdsourced musical tags from brain activity
Jessica Thompson*, Michael Casey, and Lorenzo Torresani*
Cognitively Based Music Information Retrieval (CogMIR), 2012, Toronto, Canada

Searching the Liber Usualis: Using CouchDB and ElasticSearch to Query Graphical Music Documents
Jessica Thompson*, Andrew Hankinson, and Ichiro Fujinaga*
Proceedings of the 12th International Conference on Music Information Retrieval (ISMIR), 2011, Miami, USA

Left and right auditory cortices contribute differently to perception of slow and fast binaural beats
Miyazaki, Takahiro, **Jessica Thompson***, and Bernhard Ross*
Annual Meeting of the Cognitive Neuroscience Society (CNS), 2011, San Francisco, USA

Transition from Transient to Steady-State Gamma-Band Responses: An MEG Study on Acoustic Beats
Miyazaki, Takahiro, **Jessica Thompson***, and Bernhard Ross*
Annual Meeting of the Organization for Human Brain Mapping (OHBM), 2011, Québec, Canada

Behavioural and Neuromagnetic Responses to Peripheral and Central Auditory Beats
Jessica Thompson*, Takahiro Miyazaki, and Bernhard Ross*
NSERC Auditory Cognitive Neuroscience summer workshop, 2010, Hamilton, Canada

Invited Talks

Theoretical motivations of deep learning as it relates to artificial intelligence and the brain Montréal, Canada **2016**
Breakout talk at the Canadian University Software Engineering Conference (CUSEC)

Jessica **Thompson**, PhD Candidate in Cognitive Science and Neuropsychology

Teaching Experience

Teaching Assistant Montréal, Canada **Winter 2020**
IFT 6135 - Representation Learning (Department of Computer Science and Operations Research, University of Montreal)
Prepare and grade practical and theoretical assignments for graduate level course on deep learning.

Educational course speaker Montréal, Canada **Nov 2019**
Montreal Artificial Intelligence and Neuroscience (MAIN) Conference
Gave didactic lecture on comparing activations in artificial and biological neural networks

Methods Workshop Organizer Montréal, Canada **Jun 2017**
Centre for Research on Brain, Language and Music
Designed and gave workshop on machine learning in python for psychologists and neuroscientists

Tutor/Teaching Assistant Maastricht, The Netherlands **Spring 2015**
PSY2027: Research: How to do it? (Faculty of Psychology and Neuroscience, Maastricht University)
Supervised a group of 2nd year undergraduate students while they carried out all aspects of a research project about auditory perception

Other Experience

Student Affairs Committee Member Montreal, Canada **2019-Now**
Unifying Neuroscience and Artificial Intelligence in Quebec (UNIQUE) research cluster
Represent student interests to the governance of UNIQUE and oversee the organization of an annual student symposium

Secretary, Chair of the Records Committee **2015–Now**
Women in Machine Learning Inc. Board of Directors
Lead short and long-term organizational planning • Maintain all private records, the public WiML directory, all internal and outward-facing communication, websites and social media accounts • Train and coordinate volunteers

Workshop organizer Vancouver, Canada **2019**
NeurIPS workshop 'Real Neurons and Hidden Units: Future Directors at the Intersection of Artificial Intelligence and Neuroscience'
Orchestrated the open submission and review system and participated in all aspects of event organization

Diversity and Inclusion Chair Montréal, Canada **2018**
Montreal Artificial Intelligence Symposium (MAIS)
Assisted the organizers to achieve their diversity and inclusion goals • Designed demographics questionnaire • Enforced and responded to violations of the code of conduct

Logistics Chair Montréal, Canada **2014**
Women in Machine Learning Workshop
Made local arrangements and participated in all aspects of event planning and fund raising

Administrative Assistant Montréal, Canada **2010–2011**
Distributed Digital Music Archives and Libraries Lab, McGill University
Assisted with preparing large-scale grant applications

Editor Montréal, Canada **2010–2011**
McGill Psychology Undergraduate Research Journal
Reviewed research article submissions

Relevant Coursework

Representation Learning • Functional Neuroimaging Fusion • Deep Learning • Machine Learning and Statistical Data Analysis • Computational Neuroscience • Computational Methods in Neuroimaging • Cognitive Neuroscience • Auditory Perception • Computational Psychology • Human Cognition and the Brain • Intro to Computer Systems • Digital Audio Signal Processing • Calculus 1–3 • Data Structures and Algorithms • Theoretical Principles of Deep Learning (audited)

Awards

Best Poster Award Montreal Artificial Intelligence and Neuroscience Conference **2019**
Local conference ($400)

Mitacs Accelerate PhD Fellowship Université de Montréaland Nuance Communications Inc. **2015–2018**
National competition ($30,000/yr)

Best Poster Award Montreal Artificial Intelligence and Neuroscience Conference **2017**
Local conference ($400)

Fonds de recherche du Québec - Nature et technologies (FRQNT) Doctoral scholarship Université de Montréal **2015–2016**
Provincial competition ($26,666)

Erasmus Mundus Mobility Fellowship in Auditory Cognitive Neuroscience Maastricht University **2015**
International competition (€17,000)

Natural Sciences and Engineering Research Council (NSERC) CREATE Graduate Fellowship in Auditory Cognitive Neuroscience Université de Montréal **2014–2015**
National competition ($21,000)

Dartmouth Fellowship Dartmouth College **2011–2013**
Full tuition scholarship ($55,000/yr) and research stipend ($20,000/yr)

NSERC-CREATE Undergraduate Student Research Award in Auditory Cognitive Neuroscience Rotman Research Institute **2010**
National competition ($4,600)

NSERC-CREATE Undergraduate Student Research Award in Auditory Cognitive Neuroscience McGill University **2009**
National competition ($4,600)

Reviewing

Cognitive Computational Neuroscience Conference (CCN) **2019**
Reviewed six conference submissions

International Conference on Learning Representations (ICLR) **2018**
Reviewed two conference submissions

Neural Information Processing Systems (NeurIPS) **2018**
Reviewed six conference submissions • Rated in the top 30% of reviewers

Women in Machine Learning Workshop (WiML) **2017**
Reviewed three abstracts

Hearing Research **2014**
Assisted with review of journal article