

Emma K. Towlson

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- EMPLOYMENT**
- Assistant Professor, Network (Neuro)Science** Jul. 2020 - present
Department of Computer Science, University of Calgary
Department of Physics and Astronomy, University of Calgary
Hotchkiss Brain Institute (HBI)
Alberta Children's Hospital Research Institute (ACHRI)
Complexity Science Group, Department of Physics and Astronomy
Computational Neuroscience Platform
- Research Affiliate** Apr. 2018 - Apr. 2020
Massachusetts Institute of Technology (MIT)
P.I.: Prof. Ed Boyden
- Associate Research Scientist** Jan. 2018 - Aug. 2020
Part-time Lecturer Sep. 2016 - Sep. 2019
Postdoctoral Research Associate Apr. 2015 - Jan. 2018
Center for Complex Network Research (CCNR), Northeastern University (NEU)
P.I.: Prof. Albert-László Barabási
- EDUCATION**
- PhD Physics, Network Science** Oct. 2011 - Mar. 2015
University of Cambridge. Cavendish Laboratory (Theory of Condensed Matter (TCM) Group) and Girton College.
Supervisor: Dr. Sebastian Ahnert
Collaborating with Prof. Ed Bullmore and the Brain Mapping Unit (BMU)
Funded by the Engineering and Physical Sciences Research Council (EPSRC)
Associate member of the Institute of Physics
TCM graduate representative
- MMathPhys (First Class Honours)** Oct. 2007 - Jun. 2011
University of Warwick
4th Year project "Superfluidity in Strongly Coupled Light-Matter Systems"
Supervisor: Dr. Marzena Szymanska
- Undergraduate Research Scholarship Scheme** Jul. 2010 - Sep. 2010
University of Warwick
Supervisor: Prof. Sandra Chapman
- FUNDING & AWARDS**
- NSERC CREATE** Mar. 2024
Details pending
Title: Training bio-students in Data Sci
PI: Artur Luczak (University of Lethbridge)
Role: Co-Applicant
- Alberta Innovates** Feb. 2024 - Feb. 2027

Amount awarded: \$750,000
Title: Developing an improved computer model of healthy and impaired visual processing
PI: Nils Forkert
Role: Co-Applicant

Outstanding Achievement Award Nov. 2023
University of Calgary
\$1650

Heart and Stroke Foundation of Canada (HSFC) Grant-in-Aid (GIA) Jul. 2021 - Jun. 2024
Amount awarded: \$235,000
Title: The PREVENT VCI Study
PI: Philip Barber
Role: Co-Applicant

New Frontiers in Research Fund - Exploration Mar. 2022 - Mar. 2024
Amount awarded: \$250,000
Title: Precision brain network modeling towards a unifying model of mental illness risk
Role: PI

Owerko Centre Research Catalyst Grant Aug. 2021 - Aug. 2023
Amount awarded: \$75,000
Title: Heterogeneity in brain networks in children born preterm and the relation to risk of behavioural and mental disorders
Role: Co-PI with Signe Bray

NSERC Discovery Grant Apr. 2021 - Mar. 2026
Amount awarded: \$157,500 (\$29,000 per year, plus one time \$12,500 Discovery Launch Supplement)
Title: A computational approach to network control in the brain
Role: PI

NSF NCS-FO: Collaborative Research Oct. 2017 - Oct. 2019
Amount awarded: \$237,499 USD (of the \$707,296 USD total awarded to four groups).
Title: Ground-Truth Analysis and Modeling of Entire Individual *C. elegans* Nervous Systems
P.I.s: Prof. Edward Boyden (MIT), Prof. Albert-László Barabási (NEU), Prof. Max Tegmark (MIT), and Prof. Steven Flavell (MIT).
Role: Responsible for the proposal and research in the Barabásilab component of the grant, both in terms of writing the proposal and carrying out the research given its success.

Network Neuroscience Satellite Jun. 2017
James S. McDonnell Foundation (JSMF) sponsored \$20,000 USD.

EPSRC Scholarship 2011
Awarded for research proposal for graduate study at the University of Cambridge.

Warwick Postgraduate Research Scholarship (WPRS) 2011
Selected for a prestigious scholarship for further study at the University of Warwick, one of around 15 available university wide.

Undergraduate Research Scholarship Scheme (URSS) 2010
Awarded £1000 for summer research proposal at the University of Warwick.

PROFESSIONAL Homeward Bound Nov. 2018 - Dec. 2019
DEVELOPMENT Selected as one of 95 women to be part of the 4th cohort of Homeward Bound: a ground-breaking leadership initiative, set against the backdrop of Antarctica, which aims to heighten the influence and impact of women in making decisions that shape the future of our planet. The 10-year vision is to create a 1000-strong network of women scientists, ready and able to exert their influence on global policy. Engaged with a year-long leadership program that was conducted remotely and culminated in an intensive in-person 3-week training session on the largest ever all-women Antarctic voyage in Dec. 2019.

PUBLICATIONS Neuroscience needs Network Science

Dániel L Barabási, Ginestra Bianconi, Ed Bullmore, Mark Burgess, SueYeon Chung, Tina Eliassi-Rad, Dileep George, István A. Kovács, Hernán Makse, Christos Papadimitriou, Thomas E. Nichols, Olaf Sporns, Kim Stachenfeld, Zoltán Toroczkai, Emma K. Towlson, Anthony M Zador, Hongkui Zeng, Albert-László Barabási, and György Buzsáki. *Journal of Neuroscience*, 2023, 43(34):5989-5995.

Dissecting the Functional Organization of the *C. elegans* Serotonergic System at Whole-Brain Scale

Ugur Dag, Ijeoma Nwabudike, Di Kang, Matthew Gomes, Jungsoo Kim, Adam Atanas, Eric Bueno, Cassi Estrem, Sarah Pugliese, Ziyu Wang, Emma K. Towlson, and Steven Willem Flavell. *Cell*, 2023, 186(12):2574-2592.

Maximizing Brain Networks Engagement via Individualized Connectome-wide Target Search

Arianna Menardi, Davide Momi, Antonino Vallesi, Albert-László Barabási, Emma K. Towlson†, and Emiliano Santarnecchi†. *Brain Stimulation*, 2022, 15(6):1418-1431.

† *These authors contributed equally to this work.*

Multi-Subject Stochastic Blockmodels for Adaptive Analysis of Individual Differences in Human Brain Network Cluster Structure

Dragana M. Pavlović, Bryan Guillaume, Emma K. Towlson, Soroosh Afyouni, Petra E Vértes, Thomas Yeo, Edward T. Bullmore, and Thomas E. Nichols. *NeuroImage*, 2020, 116611.

Synthetic ablations in the *C. elegans* nervous system

Emma K. Towlson and Albert-László Barabási. *Network Neuroscience*, 2020, 4(1).

The final frontier in connectomics: Forward engineering brain networks: Comment on “What would a synthetic connectome look like?” by Ithai Rabinowitch

Emma K. Towlson. *Physics of Life Reviews*, 2019.

Brain Networks Reveal the Effects of Antipsychotic Drugs on Schizophrenia Patients and Controls

Emma K. Towlson, Petra E. Vértes, Ulrich Müller, and Sebastian E. Ahnert. *Frontiers in Psychiatry*, 2019, 10: 611.

Effect of antipsychotics on the community structure of brain functional networks

Ryan Flanagan, Lucas Lacasa, [Emma K. Towlson](#), Sang Hoon Lee, and Mason A. Porter. *Journal of Complex Networks*, 2019, doi:10.1093/comnet/cnz013.

***Caenorhabditis elegans* and the network control framework - FAQs**

[Emma K. Towlson](#), Gang Yan, Petra E. Vértés, Yee Lian Chew, Denise S. Walker, William R. Schafer, and Albert-László Barabási. *Phil. Trans. R. Soc. B*, 2018, 373(1758).

NiCE Teacher Workshop: Engaging K-12 Teachers in the Development of Curricular Materials That Utilize Complex Networks Concepts

[Emma K. Towlson](#), Lori Sheetz, Raluca Gera, Jon Roginski, Catherine Cramer, Stephen Uzzo, and Hiroki Sayama. *Complicity*, 2018, 15(1).

Editorial: Bridging Scales and Levels

[Emma K. Towlson](#) and Fabrizio De Vico Fallani. *Network Neuroscience*, 2018, 2(3):303-305.

Network control principles predict neuron function in the *C. elegans* connectome

Gang Yan[†], Petra E. Vértés[†], [Emma K. Towlson](#)[†], Yee Lian Chew, Denise S. Walker, William R. Schafer, and Albert-László Barabási. *Nature*, 2017, 550: 519-523.

[†] *These authors contributed equally to this work.*

Recordings of *Caenorhabditis elegans* locomotor behaviour following targeted ablation of single motoneurons

Yee Lian Chew, Denise S. Walker, [Emma K. Towlson](#), Petra E. Vértés, Gang Yan, Albert-László Barabási, and William R. Schafer. *Scientific Data*, 2017, 4: 170156.

The Rich Club of the *C. elegans* Neuronal Connectome

[Emma K. Towlson](#), Petra E. Vértés, Sebastian E. Ahnert, William R. Schafer, and Edward T. Bullmore. *The Journal of Neuroscience*, 2013, 33(15): 6380-6387.

SUBMITTED

Structural measures reveal power-law distributed node-heterogeneity in lottery ticket multilayer perceptrons

Chris Kang, Jasmine A. Moore, Samuel Robertson, Mattias Wilms, [Emma K. Towlson](#)[†], and Nils Daniel Forkert[†]. *Under review*, 2024.

[†] *These authors contributed equally to this work.*

Rich club behaviour and analyses in the human brain connectome as novel early biomarkers of cognitive decline

George S. Tadros, Jen Guo, Noaah Reaume, Connor C. McDougall, [Emma K. Towlson](#)[†], and Philip A. Barber[†]. *Under review*, 2024.

[†] *These authors contributed equally to this work.*

IN
PREPARATION

The social network of the Reddit homeless community

Fatima Liaqat and [Emma K. Towlson](#). *In preparation*, 2024.

“Anti-Rich Clubs” in functional brain networks of children with Autism Spectrum Disorder

Yifan Zhang, Kieran J. Fitness, and [Emma K. Towlson](#). *In preparation*, 2024.

Neuronal Wiring of the *Drosophila* Larval Brain

Yanchen Liu, [Emma K. Towlson](#), Albert Cardona, and Albert-László Barabási. *In*

preparation, 2024.

Spatial properties of the mouse brain network

Jose Brum, Albert-László Barabási, and Emma K. Towlson. *In preparation*, 2024.

Diversify Network Science: The State of Race and Gender Diversity in Network Science Scholarship

Emma K. Towlson, Syed Haque, Dina Mistry, Matthew Simonson, Sarah Shugars, and Brooke Foucault-Welles. *In preparation*, 2024.

**CONFERENCE
PROCEEDINGS**

What Antarctica taught us: How a program for women in STEM is changing the leadership narrative for the well-being of our planet

Alexandra Leeper, Jana K. Schniete, Louise Batts, Karen Spenley, and Emma K. Towlson. *Proceedings of the 18th International Conference of Women Engineers and Scientists*, 2021.

Cultivating Tipping Points: Network Science in Teaching

Catherine Cramer, Raluca Gera, Michaela Labriole, Hiroki Sayama, Lori Sheetz, Emma K. Towlson, and Stephen Uzzo. *Complex Networks IX: Proceedings of the 9th Conference on Complex Networks CompleNet 2018*, Springer Proceedings in Complexity, pp 175-183.

Centrality Clubs and Concepts of the Core: Decoding the Communicative Organisation of the Brain

Emma K. Towlson, Petra E. Vértés, Sebastian E. Ahnert, and Edward T. Bullmore. *Proceedings of the European Conference on Complex Systems 2012*, Springer Proceedings in Complexity 2013, pp 497-501.

**INVITED
TALKS**

TBD

NetSci-X, Indian Institute of Technology (IIT), Indore (Jan. 2025)

Identifying behavioural subnetworks from neuronal dynamics of the *C. elegans* nervous system

The 2024 International Symposium on Nonlinear Theory and its Applications (NOLTA) (Dec. 2024)

TBD

Simon Fraser University (Fall 2024)

TBD - Neuroscience Focus Session

NetSci, Québec City (Jun. 2024)

Human brain subnetwork activation via individualized target search and network control theory in structural and functional connectivity

Recent advances in whole-brain, connectome-based neurophysiological modelling of brain stimulation symposium at OHBM, Montreal (Jul. 2023)

Negative correlations in large-scale functional brain networks reveal an “anti-rich club” which is disrupted in Autism Spectrum Disorder

Canadian Applied and Industrial Mathematical Society (CAIMS), New Brunswick (Jun. 2023)

Mental illness: Vulnerability and intervention

Computational Neuroscience Annual Meeting, University of Calgary (May. 2023)
Network Science Meets Neuroscience, a salon meeting with thought leaders in Network Science and Neuroscience
The Kavli Foundation, Los Angeles (Sep. 2022)

Large scale human brain networks and brain disorders

Data Science Day, University of Calgary (Jun. 2023)
Monash University (Jul. 2022)

A network of networks approach to describing the *Drosophila* larva brain

Multiplex Brain Networks, Banff International Research Station (Apr. 2022)

Understanding brain structure and function through the lens of network science

Sigma Xi public talks, University of Calgary (Feb. 2022)

Maximizing subnetwork engagement in the human brain via individualized target search and network control theory

Canadian Symposium for Computational Neuroscience, online (Oct. 2021) Controlling Complex Networks satellite, NetSci, online. *Postponed from Jul. 2020, Università la Sapienza di Roma, due to covid-19.* (Jul. 2021)

Hotchkiss Brain Institute Research Day (May 2021)

Second edition of the Canadian Computational Neuroscience Spotlight, online (May 2021)

Department of Computer Science, University of Calgary (Feb. 2021)

Panelist: Presentation skills, leadership, and diversity for Women in Computer Science

CalgaryHacks online hackathon attended by more than 700 participants (Feb. 2021)

Understanding brain structure and function through the lens of network science

Department of Physics and Astronomy Colloquium Speaker Series, University of Calgary (Oct. 2020)

Women in Data Science conference, University of Calgary (Mar. 2021)

Panelist: Charting the space between: Pioneers at the Intersections of Neuroscience, Computational Methods, and Machine Intelligence

Neuro Nexus, Alberta-wide competition in which multidisciplinary teams take on challenges in neuroscience and create technological solutions. (Nov. 2020)

Lessons for the classroom from Antarctica: What a new kind of leadership programme taught me about education

Network Science in Education (NetSciEd), online (Oct. 2020)

Lessons from Antarctica: Women in STEM changing the narrative of leadership

Diversify NetSci satellite, NetSci, online (moved from Università la Sapienza di Roma due to covid-19) (Sep. 2020)

Network neuroscience lecture at NetSci 2019 school

NetSci, University of Vermont Complex Systems Center (May 2019)

Introduction to Complex Networks & Controllability

Brainhack-Networks, University of Vermont Complex Systems Center (May 2019)

Panelist: Diversify Network Science 2020 and Beyond

Diversify NetSci satellite, NetSci, University of Vermont Complex Systems Center (May 2019)

Network control theoretic approaches to understanding brain structure and function

Biology Department colloquium series, NEU (Apr 2019)

Introduction to network control: Concepts, methods, and applications to neuroscience

Educational lecture at OHBM, Singapore (Jun. 2018)

Control principles in the *Caenorhabditis elegans* nervous system

Talks at Network Neuroscience satellite, NetSci, Paris (Jun. 2018) and Analysis and Interpretation of Connectomes, Janelia Research Campus (May 2018)

Network Science

Talk at the Genetics Bootcamp, Harvard Medical School (Jan. 2018)

How “rich” is your brain?

Contribution to the Minute Madness competition to celebrate the 10th anniversary of women@CL. The Computer Laboratory, University of Cambridge (May 2014).

**TALKS &
CONFERENCE
CONTRIBUTIONS**

Synthetic essentiality: Muscle controllability following multiple neuronal ablations in the *C. elegans* nervous system

Poster at the 22nd International *C. elegans* Conference, University of California, Los Angeles (UCLA) (Jun. 2019). Lightning talk and poster at Network Neuroscience satellite, NetSci, University of Vermont Complex Systems Center (May 2019)

Network Science Tutorial

Boyden Lab retreat, MIT (Sep. 2018)

NiCE Teacher Workshop: Engaging K-12 Teachers in the Development of Curricular Materials That Utilize Complex Networks Concepts

Talk at ICCS, Hyatt Regency Hotel, Cambridge MA (Jul. 2018)

Control principles in the *Caenorhabditis elegans* nervous system

Talks at CompleNet, NEU (Mar. 2018) and Janelia Research Campus (Apr. 2016).

¿Six degrees of separación?: Experiences from designing and implementing an intensive, interdisciplinary, and project-based network science course in Guadalajara

Talk at NetSci, The JW Marriott Hotel, Indianapolis (Jun. 2017).

Experimental Test of Network Control: Functional predictions in the *C. elegans* nervous system

Poster at NetSci, The JW Marriott Hotel, Indianapolis (Jun. 2017)

Spatial Characteristics of Mesoscopic Connections in the Mouse Brain Network

Talk at NetSci, The K-Hotel, Seoul (Jun. 2016).

Connectivity in the Mouse Brain

Talk at Dana-Farber Cancer Institute, Harvard Medical School (Nov. 2015).

A Short Introduction to Networks/Graph Theoretical Analyses

Lecture at the first Summer Workshop on the Dynamic Brain, Friday Harbor Laboratories. Co-hosted by the Allen Institute for Brain Science and the Computational Neuroscience Program at the University of Washington (Sep. 2014).

Brain networks reveal the effects of antipsychotic drugs on schizophrenia patients and controls

Talk at NetSci, University of California Berkeley (Jun. 2014).

The Globally Integrative Rich Club of the *C. elegans* Neuronal Connectome

Talk at 25th IUPAP International Conference on Statistical Physics, Seoul National University (Jul. 2013); poster at NetSci, Copenhagen (Jun. 2013).

Large Scale Brain Networks

Talk at Graduate Research Seminar, Girton College, University of Cambridge (Feb. 2013).

“Networks: Complex Futures”, LERU BRIGHT Conference

Representative for the University of Cambridge, University of Amsterdam (Aug. 2012)

Centrality Clubs and Concepts of the Core: Decoding the Communicative Organisation of the Brain

Talk at ECCS, Université Libre de Bruxelles (Sep. 2012); poster at NetSci, Northwestern University (Jun. 2012).

Constructing Dynamic Networks and State Spaces from High Resolution Trading Data: Information Theoretic Approaches

Poster at the 4th Annual Oxford University SIAM Student Conference (Feb. 2011).

EDITORIAL SERVICE

Network Neuroscience, MIT Press
Associate Editor.

Aug. 2019 - present

PLOS Computational Biology
Guest editor.

Jul. 2020, Apr. 2021

Network Neuroscience, MIT Press

Jun. 2017 - Jun. 2018

Guest editor for Focus Feature “Bridging Scales and Levels” dedicated to participants of the Network Neuroscience satellite at NetSci 2017.

PEER REVIEW

National Science Foundation (NSF) panel: Served on Advisory Panel

Funding proposals: Reviewed for NSF, The City College of New York and Memorial Sloan-Kettering Cancer Center (CCNY-MSK) Partnership, The Templeton Foundation, The Army Research Office (ARO), and The Israel Science Foundation (ISF).

Journals: *Nature*, *Nature Communications*, *Nature Neuroscience*, *PNAS*, *Neuron*, *PLOS Computational Biology*, *Network Neuroscience*, *Scientific Reports*, *The European Physical Journal B (EPJ B)*, *IEEE’s Transactions on Network Science and Engineering*, *TopiCS*, *EPJ Data*, *Biosystems*, and *Human Brain Mapping*.

Conference calls: IC2S2 2021, NetSci2020, NERCCS2020, IC2S2 2020, NetSciX

2020, IC2S2 2019, NERCCS 2019, ICCS 2018, NetSci 2018, IC2S2 2018, NetSciX 2018, CompleNet 2016 & 2017. Poster judge at Scientista Symposium 2019, NetSci 2018. Oral presentation judge at the 6th Annual PHAS Symposium (University of Calgary).

ORGANISATIONAL LEADERSHIP

Canadian Brain Research Strategy Neuroscience-AI Interface Task Force Jun. 2022 - present

Invited to join a national team of experts to scope the future of the interface between Neuroscience and AI in Canada.

Research Vision Committee Jan. 2022 - present

Invited to join a group of 6 academics to scope the future of research at the HBI.

Network Neuroscience Satellite Jun. 2024

Lead organizer. Québec City.

Canadian Symposium for Computational Neuroscience 2021

Organising committee.

Network Neuroscience Satellite Jul. 2022

Remote NetSci conference hosted from Shanghai.

Chair.

Program Co-Chair

NetSci conference, remote and hosted from Shanghai.

Co-chaired the program for NetSci, the flagship conference of the Network Science Society with around 800 attendees annually. With Gang Yan and Marton Karsai.

Network Neuroscience Satellite 2018 - 2021, 2023

Organising committee.

The International Conference on Complex Systems 2020 Jul. 2020

Executive Committee Member. Nashua, NH.

The International Conference on Complex Systems 2018 Jul. 2018

Special sessions chair with Dr. Marc Santolini. The Hyatt Regency, Cambridge.

CompleNet 2018 Mar. 2018

Local organising chair. NEU, Boston.

Network Neuroscience Satellite Jun. 2017

The JW Marriott Hotel, Indianapolis.

Spearheaded the timely development of a Brain Networks NetSci associated satellite that had been running for 2 years into a larger Network Neuroscience satellite. Led the committee of ~ 20 experts in the field to achieve this, and sustained over 120 attendees throughout the day, making it one of the largest satellites NetSci has hosted to date. Continued coordination of expansion for following conferences.

Cavendish Graduate Student Conference 2013 Dec. 2013

Chair of the organising committee for this one day conference for c.150 young physics researchers at Cambridge. Plenary speaker Dr. Simon Singh and sponsored by BP.

Organiser, Cambridge Networks Network (CNN) Jul. 2013 - Mar. 2015

Primarily conglomerated events by liaising with networks groups across the UK.

“The 3 Peaks Challenge: Warwick in Africa... in Wales?!” Jul. 2011

Organised for and inspired 60 people to climb Ben Nevis, Scafell Pike and Snowdon in 24 hours. The event was covered in local media and raised around £15,000.

Warwick MathPhys Society May 2008 - Jun. 2011

Co-founded the society, authored 2 revision guides and delivered lectures to undergraduates. By 2011, the society held over 200 members and had secured sponsorship from Teach First.

SERVICE

Computational Neuroscience Education Committee Sep. 2022 - present

Co-Lead from Mar. 2024 with Wilten Nicola.

Representative for the Departments of Physics and Computer Science. Introduced this new interdisciplinary graduate specialization to Computer Science.

Equity, Diversity, Inclusion, and Accessibility Task Force Mar. 2024 - present

Department of Computer Science

WISEPlanet Jan. 2023 - present

Completed NSERC-backed leadership program for women in STEM. Continuing project “Decolonizing the syllabus at scale” to develop an approach to make university course materials more representative of and sensitive to diverse populations.

Equity, Diversity, and Inclusion representative Sep. 2022 - present

Representative for the Department of Computer Science to the Faculty of Science

Research and Planning Committee Jul. 2020 - present

Member

Assistant Head Undergraduate Curriculum Jul. 2021 - Jul. 2023

Hiring committee: Canada Research Chair Tier 2 in Data 2024

Integration and Information Visualization in Digital Health

Hiring committee: Open rank faculty position in 2022

Applied Data Science

Hiring committee: Canada Research Chair Tier 1 in Complex 2021

Neural Circuits

Hiring committee: Assistant Professor in Fundamental Data Science 2021

Hiring committee: Canada Research Chair Tier 2 in Complex 2021

Neural Systems

COMPUTER SKILLS

Languages & Software: Extensive experience with Python programming, Bash scripting, and Matlab. Limited experience with C++.

Working knowledge of network related software (including NetworkX, Cytoscape, Gephi, and GraphViz), L^AT_EXtypesetting, Microsoft Office, and OpenOffice. Exposure to image processing software (AFNI and SUMA).

Large-Scale Computing: Experience with cluster computing (Warwick University, Northeastern University), and the Google Cloud Platform.

Operating Systems: Mac OS X, UNIX/Linux, Raspbian, and Windows.

Courses: C++: Programming in Modern C++, University Computer Service Training, University of Cambridge (Oct. 2014 - Mar. 2015).

Algorithms: Design and Analysis Part I, online course provided by Stanford University (Oct. 2014 - Dec. 2014).

HACKATHONS & STUDENT COMPETITIONS

Computational Neuroscience Hackathon May 2023, 2024

Co-organizer with Wilten Nicola, University of Calgary.

Calgary Hacks 2021 Feb. 2021

Judge of student projects in this 24 hour hackathon attended by >700 participants.

Neuro Nexus Challenge Champion Oct.-Nov. 2020

Led a team of seven students in a six week project to prototype a real-time visualisation of functional brain networks derived from EEG-data. Neuro Nexus is an Alberta-wide competition in which multidisciplinary teams take on challenges in neuroscience and create technological solutions. The team presented their project at the Network Neuroscience satellite conference (Jun. 2021).

Hackathon Team Expert May 2019

Brainhack-Networks, University of Vermont Complex Systems Center

EDUCATION RESEARCH & DEVELOPMENT **Teaching and Learning Practices, Theories, and Assessment** Jan. 2023 - Apr. 2023
Course with Taylor Institute for Teaching and Learning.

Online and Blended Learning Sep. 2021 - Dec. 2021
Completed course with Taylor Institute for Teaching and Learning.

Network Science Solutions Book Apr. 2020
Solutions for the problems sets in Network Science by Albert-László Barabási.

Networks in Classroom Education (NiCE) Teacher Workshop Jul. 2017
United States Military Academy (USMA), West Point
Led sessions in a workshop for ~ 30 K-12 teachers of various subjects, aiming to introduce Network thinking to the classroom and as a curriculum development tool.

Network Science Summer Course Jun. 2017
Universitat Politècnica de Catalunya (UPC), Barcelona
Designed and delivered a week long summer course introducing Network Science to ~ 30 Masters level students in the Statistics department.

Network Science Summer Course Jun. 2017
Signa Lab, Instituto Tecnológico y de Estudios Superiores de Occidente (ITESO), Guadalajara
Designed and co-delivered a 6 week long summer course introducing Network Science to ~ 20 undergraduates from diverse disciplinary backgrounds. The course is highly interactive, including hands-on activities with toy networks, drones, and Lego.

SUPERVISION & MENTORSHIP **Postdoc** Apr. 2023 - present
Hongye Wang (Computer Science and Radiology). Mathison Centre Postdoctoral Scholarship in Mental Health (\$25,000 annually for two years).

Postdoc Mar. 2023 - present
David Vanier (Computer Science and Radiology). Alberta Innovates Postdoctoral Fellowship (\$70,000 annually for two years).

MSc Student Jan. 2022 - present
Xining Chen (Computer Science). Alberta Graduate Excellence Scholarship (AGES) (\$22,000) and Alberta Innovates Scholarship (\$21,000).
Thesis title: Vulnerability to brain disorders as identified from large-scale connectivity.

MSc Student Sep. 2023 - present
Claudeth Hernández Alvarez (Physics, Specialization in Computational Neuroscience).

MSc Student Sep. 2023 - present
Fatemeh Soleymani Moghadam (Physics).

Msc Student Jan 2022 - Jan 2024
Banafsheh Khazali (Computer Science). Thesis title: *C. elegans* control backbones and behavioural repertoires.

Summer Research Student May 2023 - Sep. 2023
Alison Frayne (Physics undergraduate) awarded Alberta Innovates Summer Research Studentship (AI SRS) of \$7500.
Project title: Functional brain network connectivity changes with hormone levels

Summer Research Student May 2022 - Sep. 2022, May 2023 - Sep. 2023
Ghadeer Abdul Hsaien (Neuroscience undergraduate) awarded two Alberta Innovates Summer Research Studentship (AI SRS) of \$7500 each.
Project title: A network neuroscience approach to depressive brain states

Summer Research Student May 2022 - Sep. 2022
Katja Nell (Physics undergraduate at University of British Columbia) awarded an NSERC Summer Research Studentship of \$6000.
Project title: Characterizing the control energy landscape underlying healthy brain dynamics

Summer Research Student May 2021 - Sep. 2021
Dongheok Lee (Computer Science undergraduate) awarded an Alberta Innovates Summer Research Studentship (AI SRS) of \$6000.
Project title: Web Based Tool for Human Brain Structure for Healthy Aging

Summer Research Student May 2021 - Sep. 2021
Brandon Chau (Physics undergraduate) awarded a Program for Undergraduate Research Experience (PURE) studentship of \$6000.
Project title: The role of extrasynaptic connections in network control in the *C. elegans* connectome

Undergraduate theses

Alison Frayne (Physics)	2024-2025
Ghadeer Abdul Hsaien (Neuroscience)	2023-2024
Fatima Liaqat (Computer Science)	2023
George Tadros (Neuroscience)	2022-2023
Chaten Jessel (Neuroscience)	2021-2022
Sam Robertson (Computer Science)	2021-2022
Dongheok Lee (Computer Science)	2021-2022
Jen Guo (Health Sciences)	2021-2022

Visiting undergraduates and high school students

Yifan Zhang, Dana Hall High School 2021 - present
Zhang has remarkably presented at three conferences while still a high school student (NetSciEd 2021, HBI Research Day 2021, and NetSci 2022) and achieved second best lightning talk at the HBI Research Day from a pool of graduate students and postdocs. She is now preparing a manuscript.

Claudeth Hernández (University of Sonora)	2022
Alexandra Cheytanova, St. Paul's Girls School	2021

Network Science Graduate Course (PHYS5116) Sep. 2016 - Sep. 2019
Co-instructed with Prof. Albert-László Barabási.
CCNR, Department of Physics, Northeastern University.

Summer Internship Jun. 2019 - Sep. 2019
Supervised a bioinformatics student on a project investigating the organisation of functional brain networks in health, depression, and anxiety.

Visiting Faculty Aug. 2016 - 2018
Collaborated with and supported Prof. Jose Brum's career change from Director-General of the Brazilian Association for Synchrotron Light Technology to brain research.

Visiting Graduate Students Aug. 2015 - Sep. 2019
Supervised and co-supervised 4 students on brain networks visiting CCNR.

Summer Student Jun. 2013 - Sep. 2013

Co-supervised a student working on network community structure with Dr. Sebastian Ahnert.

TEACHING

Connectomics (CPSC 601.04) 2024
New graduate course. Department of Computer Science, University of Calgary.

Fundamentals of Social Network Analysis and Data Mining (CPSC 572/672) 2021 - present
Department of Computer Science, University of Calgary.

Introduction to Computer Science for Multidisciplinary Studies I (CPSC 217) 2024
Department of Computer Science, University of Calgary.

Working with Data and Visualization (DATA 601) Fall 2021, 2022
Department of Computer Science, University of Calgary.

Information Introduction to Information Visualization (CPSC 583) Jan. 2021 - Apr. 2021
Department of Computer Science, University of Calgary.

Information Introduction to Information Visualization (CPSC 583) Jan. 2021 - Apr. 2021
Department of Computer Science, University of Calgary.

Network Neuroscience guest lecture: Systems Neuroscience and Neuropathology (MDSC 619) Jan. 2021 - 2023
Cumming School of Medicine, University of Calgary.

The Interdisciplinary Contest in Modeling (ICM) Mar. 2019
Grader for ICM competition, sponsored by the Consortium for Mathematics and its Applications (COMAP).

Mathematics IA/B/Biology and Physics Supervisor for Natural Sciences Tripos Students Oct. 2011 - Mar. 2015
324 hours, King's, Trinity, Corpus Christi, and Pembroke Colleges, University of Cambridge.

IB Physics Lab Demonstrator Oct. 2011 - Dec. 2011
Cavendish Laboratory, University of Cambridge.

Mathematics Supervisor Oct. 2010 - Jun. 2011
60 hours, University of Warwick.

OUTREACH

Science in the Cinema Jan. 2023
Invited to be a panellist following this mental health themed public event near Bell Let's Talk Day. Panel discussion to follow screening of the Disney movie Inside Out.

Bell Let's Talk Day - Graduate Students' Association Jan. 2023
Invited to be a panellist at this event organised by the Mental Health and Wellness Subcommittee to talk about my research and my own lived experiences.

50 Inspirational Women in STEM Jun. 2022
Approached by a high school student in Vancouver and interviewed to be featured in a book of women scientists to inspire young girls.

"The Art of Science" window project Feb. 2021
Partnered with student artist Camryn Carnell from Alberta University of the Arts for this project for the Chinook Blast festival. Camryn painted a mural inspired by my research in a business window in Downtown Calgary. The festival was attended by nearly 400,000 people.

What the Tech? Nov. 2020
Appeared on podcast for the Department of Computer Science, University of Calgary.

When brains meet circuits: What is a neural network anyways? Sep. 2020

Delivered a virtual interactive talk to the public on brain networks and neural networks with Kath Blair as part of a Science Takeover event at Calgary Public Library.

Modern Women in STEM

Jun. 2019

Contributed a personal story for a book on women scientists, aiming to inspire girls aged 8-13 years.

“What is so exciting about physics?”

Sep. 2015

Featured in a booklet produced by Cavendish Inspiring Women (CiW) and distributed to high schools across the UK.

Physics at Work

Sep. 2012

Gave talks on behalf of TCM to teenagers at the Cavendish Laboratory.

Physics Olympiad

Jul. 2012, Jul. 2013, Jul. 2014

Coached team of 17-18 year-olds selected to represent the UK in the Physics Olympiad.

**VOLUNTEER
WORK**

Warwick in Africa Project

Aug. 2009 - Aug. 2013

- Visited South Africa (Johannesburg and Stellenbosch) 5 times to lead classes and work with the African teachers to improve mathematics education in deprived townships.
- With 11 other volunteers opened a Winter School during the public sector strikes (Aug. 2010) to prepare finalists for their exams which was attended by more than 300 students. Received thanks from the South African Department of Education.
- During a small pilot scheme established links with Stellenbosch University (Jul. 2011) and following a personal ambition arranged for the first set of students from Makapula High School to be entered in the South African Mathematics Olympiad (Mar. 2012).
- Part of the interview panel for 2012 student teacher candidates.
- Co-ordinated the expansion of the scheme in Stellenbosch to involve the National University of Singapore, lecturers from the University of Warwick, and corporate volunteers from Ernst & Young and Standard Chartered (Jul. 2012).