UNIVERSITY of GUELPH

CENTRE FOR
ADVANCING RESPONSIBLE
& ETHICAL ARTIFICIAL INTELLIGENCE

Annual Report
AUGUST 2019 – JULY 2020

Table of Contents

Message from Centre for Advancing Responsible and Ethical Artificial Intelligence (CARE-AI)'s Academic Director

What a privilege it is to write the first of many letters as the academic director for CARE-AI. This has been a year of firsts: we have welcomed our first cohort of Collaborative Specialization in AI (CSAI) graduate students, established a research seed funding program, launched a successful Seminar Series, and formed our stellar Advisory Board.

CARE-AI's mission is to advance multidisciplinary AI training, research, and responsible application to improve life. CARE-AI aims to further its leadership in:

1. Studying the ethical implications that arise from the growing influence of AI in our lives.
2. Building responsible, innovative AI systems that serve human values and society.
3. Applying AI research advancements to problems that are central to the human condition and society.
4. Training the next generation of AI professionals in core technical AI, and the societal and ethical implications of these emerging technologies.

Our strategic priorities include: training and academic programming, research collaborations, and community engagement and outreach.

CARE-AI also provides a hub for industry to partner through research, community engagement, academic programming and/or investments to further facilitate their needs to grow while practicing responsible corporate citizenship. Our partners gain opportunities to participate in training and workshops; network with U of G's students, graduates, and faculty; engage in industry-focused research projects, take part in CARE-AI community events and collaborate with leading AI researchers.

To everyone who has worked tirelessly over the last year I thank you for your part in the CARE-AI community. To those who are new, I welcome you and look forward to collaborating with you over the next year.

Graham Taylor
Academic Director
CARE-AI

Graham Taylor
Academic Director

Graham Taylor holds a PhD in Computer Science from the University of Toronto, where he was advised by Geoffrey Hinton and Sam Roweis. Graham has worked at the University of Guelph since 2012, where he is an associate professor in the School of Engineering and serves as our academic director of CARE-AI. Graham is a Tier 2 Canada Research Chair and a Canada CIFAR AI Chair. Outside the university, Graham is the academic director of NextAI, a non-profit founder development program for early-stage AI startups. In 2018, he was honoured as one of Canada's Top 40 under 40. He spent 2018-2019 as a Visiting Faculty member at Google Brain, Montreal.

Carter Cousineau
Managing Director

Carter Cousineau holds a Master of Technology and Innovation from the Booth School of Engineering Practice at McMaster University. She has worked with top international technology start-ups and is affiliated with a variety of not for profit, SMB and Fortune500 companies. She has conducted research in multi-disciplinary settings; encouraged an entrepreneurial mindset in academia; prepared business plans and various types of proposals; and successfully delivered presentations on new ventures and programs in post-secondary institutions and the community.

Advisory Board Members

Anthony de Fazekas
Head of Technology and
Innovation - Canada
Norton Rose Fullbright

Heather Evans
Director of Frontier
Technology Research
Asia Society Northern
California

Saadia Muzaffar
CEO, Founder
TechGirls

Lara O'Donnell
Executive Director
W. Garfield Weston
Foundation

Ofer Shai
Chief AI Officer
Deloitte

Steve Woods
Senior Engineering Director
and Site Lead
Google

Administrative Team

Farrah Trahan
Administrative
Assistant

Affiliated Faculty

Felix Arndt:
Department of Management

Daniel Ashlock:
Department of Mathematics and Statistics

Andrew Bailey:
Department of Philosophy

Scott Brandon:
School of Engineering

Neil Bruce:
School of Computer Science

Ataharul Chowdhury:
School of Environmental Design
and Rural Development

Rozita Dara:
School of Computer Science

Ali Dehghantanha:
School of Computer Science

Ibrahim Deiab:
School of Engineering

John Fryxell:
Department of Integrative Biology

Andrew Gadsden:
School of Engineering

Bahram Gharabaghi:
School of Engineering

Minglung Gong:
School of Computer Science

Andrew Hamilton-Wright:
School of Computer Science

Hadis Karimipour:
School of Engineering

Hassan Khan:
School of Computer Science

Stefan Kremer:
School of Computer Science

David Kribs:
Department of Mathematics and Statistics

Anna Lawniczak:
Department of Mathematics and Statistics

Lei Lei:
School of Engineering

Ed McBean:
School of Engineering

Khurram Nadeem:
Department of Mathematics and Statistics

Mihai Nica:
Department of Mathematics and Statistics

Kieran O'Doherty:
Department of Psychology

Stacey Scott:
School of Computer Science

Joshua Skorburg:
Department of Philosophy

Petros Spachos:
School of Engineering

Lana Trick:
Department of Psychology

Eran Ukwatta:
School of Engineering

John Walsh:
School of Languages and Literatures

Youbin Zheng:
School of Environmental Sciences

Graduate Training

AI Methodology

My research collaboration with CARE-AI has provided my graduate students with the opportunity to explore the applications of AI in other fields and industries and offers unique learning environments and networking opportunities.
- Dr. Andrew Gadsden (SOE)

AI Applications

I think the CSAI program has encouraged me to consider broader ethical implications of applying AI solutions within the medical imaging field. This focus will be invaluable going forward as issues related to respecting patient data privacy and ensuring the fairness of any AI solution are highly relevant to solving healthcare problems.
- Anush Agarwal, MASc.ENG+AI

AI Responsibility

As a lawyer, I thoroughly enjoyed Dr. Joshua (Gus) Skorburg's (DOP) AI ethics course. I now understand how crucial it is to integrate law, ethics, business and technology so that humanity can truly flourish in this brave new world of AI.
- Josephine Yam, J.D., LLM.

Training and Academic Programming

CARE-AI takes great pride in offering training and academic opportunities for students, in-career workers and the community at large. From academic to non-academic learning opportunities, our objective is to provide additional pathways to further cross-disciplinary training in AI methodologies, applications and responsibility.

We work with departments to encourage academic programs to integrate more hands-on learning. We also work with industry partners to shape learning opportunities that facilitate an understanding of AI principles and implications within their organizations. Our plan is to continue to build collaborative learning initiatives aimed at bringing faculty expertise to the pressing ethical and automation issues in the broader community.

Affiliated Programs

Collaborative Specialization in Artificial Intelligence (CSAI**)**
CSAI is a thesis-based master's program designed for students with a diverse and comprehensive knowledge base in AI. CSAI students learn from an inter-disciplinary team of faculty experts in fundamental and applied deep learning and machine learning, while conducting AI-related research guided by a faculty supervisor. The courses offered are a combination of online learning, lectures, team-based problem-solving and experiential learning opportunities. Our students gain expertise in machine learning and AI and essential skills in programming and algorithmic thinking, mathematical foundations and statistical analysis for AI, optimization, and data visualization. The program is unique as it offers students to also gain understanding on policy, regulatory and ethical issues related to AI.

CSAI's first cohort started in September 2019 with 10 transfer students and 12 new students. Four of these students received a Vector Scholarship in artificial intelligence.

CSAI's second cohort will start September 2020 and we are proud to announce two students have received Vector Scholarships in artificial intelligence. These prestigious merit-based awards provided by the Vector Institute, a Toronto-based, not-for-profit organization dedicated to advancing artificial intelligence research in Canada, recognize exceptional entrance level master's students.

2020 Vector AI Institute Scholars

This year's Vector AI Institute Scholars are Sara-El Shawa and Mahmoud Salem who have joined the Machine Learning Research Group (MLRG) led by Dr. Graham Taylor (SOE). Sara El-Shawa will work at the intersection of machine learning and biodiversity, joining the BIOSCAN initiative led by Canada Research Chair and inventor of DNA barcoding, Dr. Paul Hebert (IB). She will interface between the MLRG and the Centre for Biodiversity Genomics (CBG), led by Hebert. Mahmoud Salem's research will focus on making AI systems more robust to unintended inputs, for example, attacks created by an adversary. He will work alongside MLRG PhD student Angus Galloway, and collaborators at SRI International in Princeton, USA.

2019 Vector AI Institute Scholars

The students' research covers a range of areas in AI. Our 2019 Vector AI Institute Scholars are featured below. Valerie Bowman works under the supervision of Dr. Scott Brandon (SOE) on machine learning for biomechanics. Abdelrahman Allam is conducting research in the Robotics Institute with Dr. Medhat Moussa (SOE) to detect different types of defects on industrial gears for a manufacturing plant in Guelph. Shashank Shekhar works with Dr. Graham Taylor and Vector Institute postdoctoral fellow Dr. Eric Taylor to use methods from cognitive psychology as a means to enhance explainable AI. Jeremy Foxcroft works with Dr. Luiza Antonie (SoCS) on applying record linkage to product matching in a retail environment.
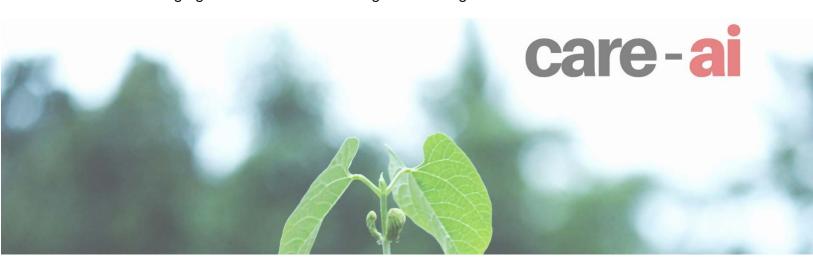
Research Collaborations

Research at CARE-AI is a strategic priority. It is our objective is to support collaborations between inter-disciplinary research teams in AI both internally and externally.

CARE-AI SEED FUND

The CARE-AI research seed funding program includes **AI Inspire Grants** and **AI Innovation Grants.**

- **AI Inspire Grants** support workshops, events, hackathons or seminars that bring thought leaders in AI methodology, AI applications and/or AI responsibility to U of G. CARE-AI can assist in raising visibility and awareness of the initiative by circulating it through the CARE-AI community.
- **AI Innovation Grants** support the formation of interdisciplinary research collaborations that have the potential to achieve recognition on the national or international stage. These grants are intended to spearhead new research initiatives by helping to fund the development of a prototype, feasibility study or research sprint. Leveraging other sources of funding is encouraged.

Inaugural AI Innovation Grant Winners

The CARE-AI Seed Fund Committee was pleased with the number of applications and the diversity of the proposed research. The following projects were this year's AI Innovation Grant Winners:

Gigapixel-Scale Image Analysis for Ecological Monitoring
Dr. Stefan Kremer, (SoCS)

Artificial Intelligence Based Methods for Computer Aided Detection of Kidney Cancer
Dr. Eranga Ukwatta, (SOE)

Improving Food Processing Efficiency Based on Deep Learning and the Internet of Things
Dr. Erica Pensini, (SOE)

Legal and Ethical Aspects of Deploying Artificial Intelligence to Combat Climate Change
Dr. Ataharul Chowdhury, School of Environmental Design and Rural Development (SEDRD)

Campus Partnerships

CARE-AI and OHI SEED FUND

In partnership with One Health Institute, **Responsible AI for One Health Grants** were developed to support the formation of research collaborations between CARE-AI and OHI researchers. CARE-AI and OHI will jointly provide support for new master's students engaged in a novel research initiative that will identify, integrate and/or expand the role for responsible AI in the context of optimal health for people, animals, plants and our environment.

Inaugural Responsible AI for One Health Grant Winners

Exploration of COVID-19 Morbidity and Mortality in Relation to Air Pollution Associated with Intensive Livestock Farming
Dr. Olaf Berke, Department of Population Medicine (DoPM)

User-driven Design of an Integrated Surveillance System for Avian Influenza Outbreaks
 Dr. Rozita Dara, (SoCS)

Community Engagement and Outreach

Our objective is to build, develop and support a community through hosted events that bring recognized thought leaders to campus to share knowledge with students, faculty, and the public. Our affiliated faculty and senior leadership also engage the community through outreach including tutorials, speaking initiatives and advisory work.

Events

September Mixer

CARE-AI hosted the first annual September Mixer welcoming students in the CSAI program. This successful event granted students the opportunity to mingle with their peers from the new CSAI program along with CSAI and CARE-AI affiliated faculty.

Mary Wells - Dean, College of Engineering and Physical Sciences talking with students at CARE-AI September Mixer

Seminar Series

The CARE-AI Seminar Series is a bi-monthly event bringing key thought leaders from academia and industry to campus to discuss issues pertinent to CARE-AI's mission. It is a great opportunity for students, faculty and alumni to connect with one another and learn together in an intimate luncheon event.

Our inaugural guest speaker, Jutta Treviranus, director of the Inclusive Design Research Centre, and professor at OCAD University in Toronto, gave an intriguing lecture titled "We Count: Unlearning to Include & Innovate".

Jutta Treviranus giving keynote address

Our spring Seminar Series was postponed due to the COVID-19 pandemic just as we were set to welcome Nisarg Shah from the University of Toronto for his talk titled "Making the World Fairer: Fair Division Theory & Applications". Plans are underway to transition the series to a virtual format. We hope to kick off the virtual series in September 2020 with Shah's talk.

Neural Networking Event

CARE-AI kicked off the new year with a networking event - over 100 expert researchers, industry leaders, faculty, and students. This event featured flash talks led by some of our new CARE-AI faculty hires, Dr. Lei Lei (SOE) and Dr. Joshua (Gus) Skorburg (DOP).

Attendees listening to CARE-AI's vision. Photo credit: Magdalena Sobol

Speaking Initiatives

CARE-AI's leadership team regularly speaks about the centre at national and international events:

- Data Effect Conference, June 6, Ottawa, Canada, 2019.
- Credit Institute of Canada Conference, June 13, Niagara Falls, Canada 2019.
- Media Ethics Conference: The 20th Annual Convention of the Media Ecology Association, June 27, Toronto, Canada, 2019.
- Agri-Food Excellence Symposium, University of Guelph, July 21, Guelph, Canada, 2019.
- CIFAR Summer Institute on AI & Society, July 22, Edmonton, Canada, 2019.
- AI for Engineering Summer School, August 13, Toronto, Canada, 2019.
- TD Bank Executives Off-Site, September 16, Elora, Canada, 2019.
- AI Squared Forum, September 22, Toronto, Canada, 2019.
- Receivables Management Association Canada Annual Conference, November 13, Toronto, Canada, 2019
- Master of Management & Professional Accounting Conference, University of Toronto Mississauga, November 15, Mississauga, Canada, 2019
- Natural Resources Canada and MaRS Discovery District. Syntenic Intelligence Forum, December 6, Toronto, Canada, 2019.

Our Advisory Work

Our leadership team contributed in an advisory capacity to several initiatives:

- 3MT College of Engineering and Physical Sciences at University of Guelph
- AI X-Prize
- ANR "ChairesAI" (France's equivalent to CIFAR AI Chairs)
- Brookfield Institute
- Creative Destruction Lab
- Data Utility Group, Smart Cities at the City of Guelph
- International Conference for Sustainable Entrepreneurs
- Natural Resources Canada and MaRS Discovery District
- Reviewer, Canadian Conference on Artificial Intelligence
- Reviewer, Conference on Computer and Robot Vision (CRV)

Media Engagement

Christopher Reynolds. Canadian AI gurus warn of war by algorithm as they win tech's 'Nobel'. The Toronto Star. March 28, 2019.

Reproducibility and Revisiting History. Talking Machines Podcast. May 23, 2019. https://www.thetalkingmachines.com/episodes/reproducibly-and-revisiting-history

The Dark Side of Alexa, Siri and Other Personal Digital Assistants. *University of Guelph News.* December 16, 2019 https://news.uoguelph.ca/2019/12/the-dark-side-of-alexa-siri-and-other-personal-digital-assistants/

AI and Voice Activated Devices. The Morning Edition — K-W with Craig Norris. December 19, 2019.

CARE-AI: What's Next? *College of Engineering and Physical Sciences News.* January 30, 2020, https://www.uoguelph.ca/ceps/care-ai-whats-next

Food Prices Remain Stable Despite COVID-19, Update Reveals. University of Guelph News. March 31, 2020. https://news.uoguelph.ca/2020/03/food-prices-remain-stable-despite-covid-19-new-report-reveals/

Keriann McGoogan. Seeing Clearly. *College of Engineering and Physical Sciences News.* April 4, 2020 https://www.uoguelph.ca/ceps/news/2020/04/seeing-clearly

Seeds of Change. *College of Engineering and Physical Sciences News.* June 25, 2020. https://www.uoguelph.ca/ceps/news/2020/06/seeds-change

Responsible AI for One Health. *College of Engineering and Physical Sciences News.* July 13, 2020.