

An Integrated Network

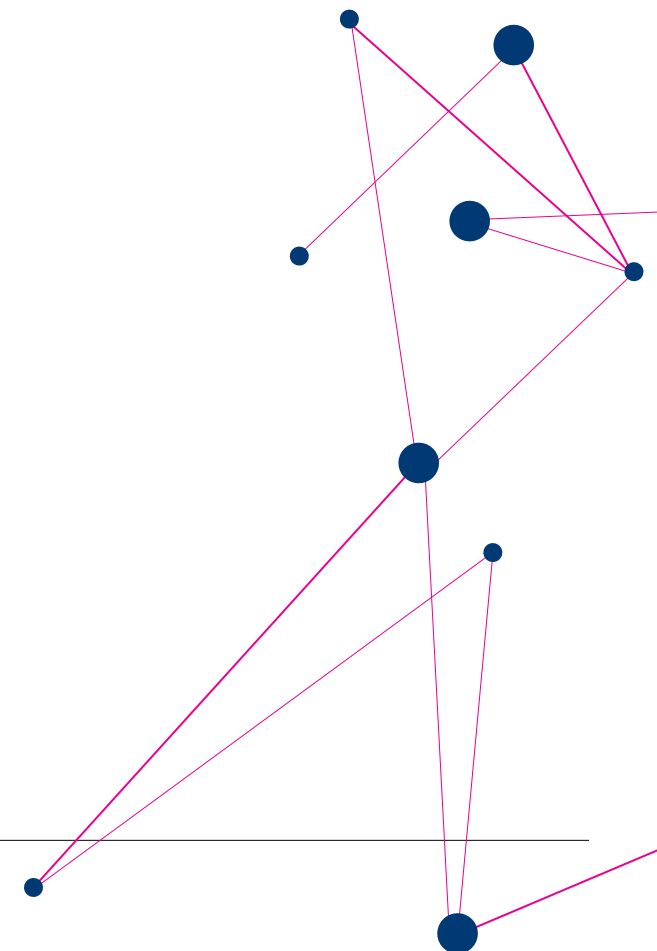
Privacy, security and big data
Three-Year Report





Privacy & Big Data Institute

The Privacy and Big Data Institute (PBDI) at Ryerson University is a unique multidisciplinary hub for data-driven research, innovation and education. The institute is focused on connecting three areas that have historically been isolated from one another: data analytics, privacy and cybersecurity. Three years since its launch, PBDI is on its way to become the preeminent institution of its kind in Canada and an international leader in socially responsible policy development and technology innovation. This report offers a detailed look at the exciting progress and range of activities that have come out of the first three years of the institute, including a range of industry-academic collaborations, research projects, events and partnerships.



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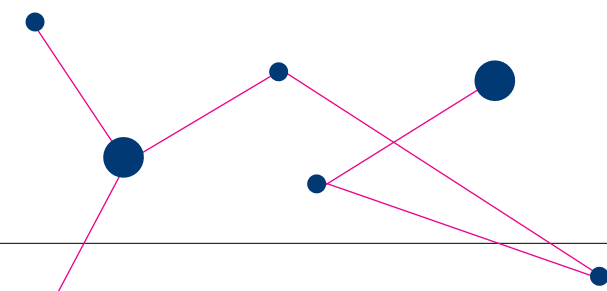
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In the News

User mistrust

Canadian Bar Association
 “Regulators should be out there, speaking to companies, talking about embedding privacy. At the moment, business views privacy as a negative, but in reality, privacy breeds innovation.”

Dr. Ann Cavoukian,
 Executive Director,
 PBDI

Smart devices

Global News
 “I’ve been telling people for years to beware of the consequences of allegedly smart devices. You don’t know where the information collected is going, how broadly it’s being shared, what third parties are accessing the data.”

Dr. Ann Cavoukian

Bring your own device policies

Investment Executive
 “Nowadays, information comes from different sources, and that information doesn’t stay in one place. We used to require people to come to work and use the machine assigned to them.”

Dr. Ali Miri,
 Research Director,
 PBDI

RCMP tracking cell phone data in criminal investigations

Toronto Star
 “Who’s auditing this? You need independent eyes on this, someone completely unrelated to law enforcement to do an exhaustive audit and oversight. There’s no independent oversight over this.”

Dr. Ann Cavoukian

Ransomware and data hacks

Canadian Business
 “The only way to proceed is to show the criminals that this is not an effective way for them to do business. It’s a brutal suggestion, but the best thing to do is pick up the pieces and move on.”

Dr. Avner Levin,
 Director of Privacy &
 Cyber Crime, PBDI

Terms and conditions

The Fader
 “If they presented the information to you with more transparency, more examples, interactivity along the way, so that you know at key decision points exactly what you want to do with your information, people would react very differently. But if it’s presented as an obstacle that you just have to click through it to get what you want to do, then of course people will just click ‘I Accept.’”

Dr. Avner Levin

PBDI by the Numbers



500+ speaker series, roundtable and workshop attendees since 2014

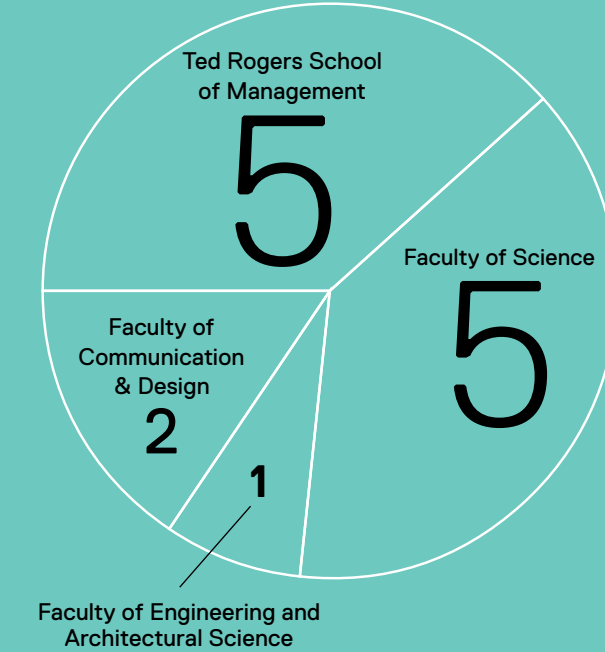
5 Privacy by Design certifications completed or in progress as of May 2017

250+ media quotes since 2014

200+ speaking events since 2014

200+ consulting hours with industry partners

Members from 4 Ryerson faculties:



Privacy & Big Data Institute

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Message from Our Research Director

A Multidisciplinary Network

Changing the way we think about data analytics, privacy and cybersecurity is a complex effort that requires extensive collaboration.

It has been a successful three years for the Privacy and Big Data Institute, and everyone involved can take pride in what we have achieved. We have been highly successful in facilitating research, promoting education, and engaging with industry and community partners. The institute has had discussions with more than 100 businesses, government entities and other organizations, ranging from international corporations to local community groups. Together, we have explored existing and emerging needs in an effort to directly address the challenges of the rapidly integrating technological landscape.

We have also engaged in extensive internal outreach, encouraging researchers from across Ryerson to join the institute. This inclusive approach is necessary given the range of industries, communities and perspectives impacted by data security. An important part of our strategic approach was to successfully merge with the Privacy and Cyber Crime Institute, which created a focal point within Ryerson for privacy and security research that will enable us to fulfill our multidisciplinary mission.

Our events program has offered forums for relevant and interesting speakers from Ryerson and the external community who have engaged with audiences to exchange ideas and discuss emerging trends. We have hosted more than 30 events in the past three years and participated in dozens more, including an industry-academic roundtable, workshops and a debate series.

Working with industry partners, we have created opportunities for Ryerson students to gain real-world experience in data analytics

through workshop and boot-camp environments. We have also supported other Ryerson educational initiatives, developing programming for recent graduates and interns.

One of the highlights of the first three years was our call for research that was made possible by support from one of our key partners, TELUS. We have two projects currently underway funded by this research partnership, which will also support several student competitions and programs.

It has been an inspiring and productive initial phase for the institute, and we are all looking forward to the next stage of our growth. Together, we are contributing to Ryerson University's mission to advance applied knowledge and research in response to societal needs.

Dr. Ali Miri
Research Director
Privacy and Big Data Institute
Ryerson University

WWW

WE

EXXIST

Addressing the Challenges of Big Data

A Rapidly Growing Concern

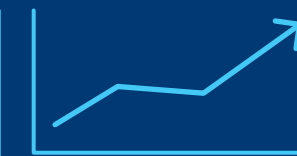
The complexities and difficulties created by the rapid expansion of big data have been evident for some time. Today, there are already trillions of sensors across the Internet of Things (IoT) that monitor, track and communicate with each other, populating the IoT with real-time data. If we consider the growth of mobile data alone, the scale and rate of change are staggering.

In February of 2017, Cisco released its Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2016-2021. In that report, Cisco predicted that by 2021:

11.6B Mobile devices will be in use

7x Aggregate smartphone traffic will be 7 times greater than it is today

1.5 There will be 1.5 mobile devices per capita



49EB

Mobile data traffic will exceed 49 exabytes per month (an exabyte is 1 billion gigabytes or the equivalent of 250 million DVDs; 5 exabytes are enough to contain a transcript of every word ever spoken)

As the centrality of data takes hold in all sectors and across a range of platforms, a host of issues emerge related to privacy, cybersecurity and big data. A deliberate approach is needed to provide solutions across a host of interconnected areas, including identity theft/fraud, data breaches and leaks, ransomware, legality of phone searches by law enforcement, commercial data sharing and/or usage, personal data protection in the era of WikiLeaks, government spying, IoT device hacking, Canadian privacy in the current American political climate, net neutrality, autonomous vehicles, and the collection, storage and use of biomedical data.

The complexity and widespread nature of these issues prompted Ryerson University to offer a multidisciplinary response.

Ryerson's Response

When the institute launched three years ago, it was Ryerson's acknowledgement of the need for a multidisciplinary hub of research, collaboration and education that would integrate the siloed areas of big data, privacy and cybersecurity.

Ryerson is uniquely qualified to lead the way through the uncertainties and fragmentation that underlie the societal and economic difficulties created by the acceleration of big data. Our network of relationships and integration into Toronto's downtown core create an ecosystem that facilitates innovation. Leveraging Ryerson's community, culture, connectedness and sense of place, the institute is bringing together leaders from industry, academia and government to create knowledge, build partnerships and find real-world solutions.



Our goal is to utilize our distinctive advantages to establish the institute at the forefront of data, cybersecurity and privacy innovation. Our goal is to facilitate this network of collaboration and thought leadership across disciplines.

A Pioneering Model

Multidisciplinary Collaboration

The Privacy and Big Data Institute was the first of its kind in Canada. It is also the only institute that focuses on the intersection of all three domains: cybersecurity, privacy and big data.

Historically, privacy and data analytics occupied opposing positions, while cybersecurity operated entirely separately from both. The institute integrates these three areas through a network of experts who form a think tank for relevant research. Together, we are laying a foundation for real-world applications and commercialization.

The challenges and opportunities presented by rapid expansion of big data, however, are cross-industry. By looking at all sides (policy, technical, legal, product, finance, design) we can proactively address and anticipate emerging issues. Our researchers are drawn from five faculties and schools at Ryerson: the Faculties of Science, Communication and Design, and Engineering and Architectural Science; as well as the Ted Rogers School of Management and the G. Raymond Chang School of Continuing Education.

The institute has also differentiated itself by providing a neutral space for researchers and experts from various disciplines to come together. The exchange and collaboration of ideas and approaches has powerful creative potential that produces ground-breaking results. This point is particularly significant to the institute's research mandate and strategic approach. Issues that cross industries and disciplines require solutions developed by teams that integrate multiple disciplines, industries, sectors and applications.



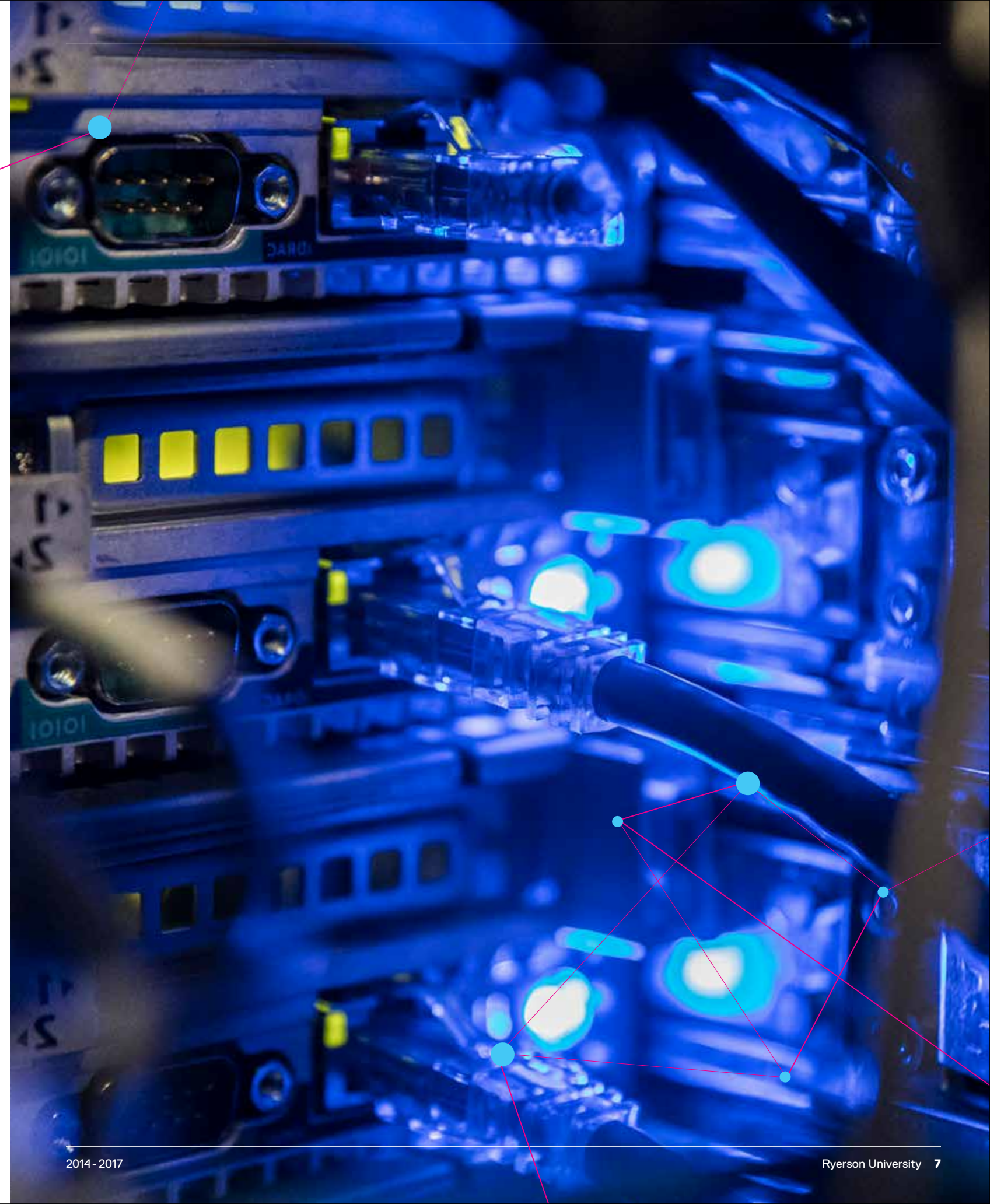
Industry-Academic Partnerships

Unique to the Privacy and Big Data Institute is the role it plays as a catalyst for industry-academic collaborations. Increasingly, industry groups are finding that the cybersecurity challenges they're facing are not sector-specific. The collaborations fostered by the institute allow industry leaders to address their existing and forecasted problems by enlisting thought leaders in cutting-edge research that focuses on particular problems.

These partnerships also provide researchers with funding, resources and opportunities to develop and test their ideas in real-world environments. Collaborations at the institute come in many different forms, including long and short-term consulting, project-based research, and student-centred experiential learning.

The institute has a range of industry partners, including TELUS, Deloitte, McGraw-Hill, HP, and World Vision. Working together, our teams can access funding provided by granting organizations such as the Natural Sciences and Engineering Research Council of Canada (NSERC), the Social Sciences and Humanities Research Council of Canada (SSHRC), Mitacs and Ontario Centres of Excellence (OCE).

Funding partners



WHAT

WE

DO

The institute brings together diverse audiences from industry, academia and government for presentations and discussions with leaders in big data, privacy and cybersecurity. In the 2016-17 academic year, PBDI hosted 10 keynote speakers.

Speaker Series Highlights



The Industry Need for Cloud Generation Security

Ajay Sood
Vice-President and General Manager,
Symantec Corporation

Speaking to a group of Ryerson students, Ajay demonstrated the importance and ability of industry to proactively build cybersecurity into an increasing range of cloud services. Reflecting on the unprecedented power of cloud applications and amazing possibilities they enable, he illustrated that cloud applications and services can be adopted rapidly and securely as design teams proactively build in security for users, devices and data.



Privacy and Records Management: A View from the Ontario Public Service

John Roberts
Chief Privacy Officer and Archivist
of Ontario

Demonstrating the importance of the public sector in the advancement of information management policies, John outlined the value of government partnerships with academia and industry in the process of proactively building positive data use policies and privacy practices.



Machine Learning & Big Data for eReading

Inmar Givoni
Vice President of Big Data, Kobo

Speaking to the power of machine learning and big data related to the fundamental human desire and capability to read and write, Inmar guided the audience toward a more robust understanding of the impact of technologies such as e-readers on publishing, education and communication.



The Poetry of Big Data

Bergur Ebbsi
Researcher, OCAD University

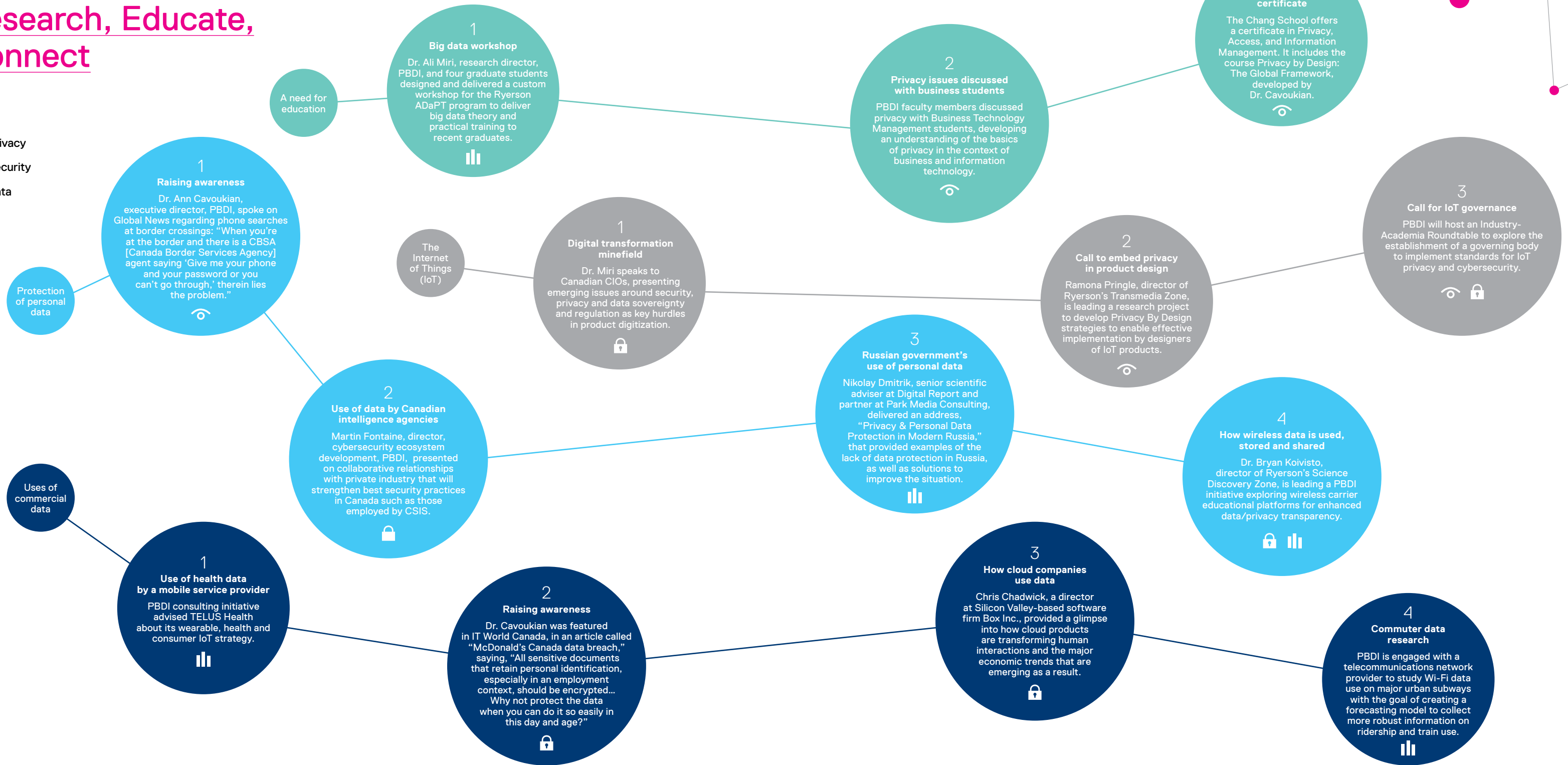
Exploring the nature of big data as a cultural phenomenon, Bergur enabled an alternative discussion about its impact from a societal and cultural viewpoint. Participating researchers were introduced to a contradictory view of big data that gave them a new framework for thinking about the issues that they would not otherwise have encountered.



PBDI is enabling change by fluidly integrating the three distinct areas of privacy, big data and cybersecurity and engaging in multidisciplinary collaboration and industry-academic partnerships. To illustrate our approach, consider examples in four different areas that link particular institute initiatives with their future impact.

Research, Educate, Connect

-  Privacy
-  Security
-  Data



Industry-Academia Roundtable

In May 2016, more than 50 industry leaders and Ryerson researchers came together for the PBDI's inaugural Industry-Academia Roundtable. Together, they explored a fundamental question: "How can we work together to become a catalyst for advanced solutions in privacy, big data and cybersecurity?" Participants explored potential collaborations, extended their understanding about funding options and learned about the institute's growing network of academic, industry and government partners.

Industry Entities:

Kobo, Wattpad, CIBC, Cossette, Box, Great-West Life Insurance, bankMe, Public Health Ontario, Shopify, ESET, Adastra and TELUS.

Ryerson Researchers:

Ted Rogers School of Management

- Dr. Anatoliy Gruzd: *Associate Professor, Global Management; Canada Research Chair, Director of Research, Social Media Lab*
- Dr. Aziz Guergachi: *Professor, Information Technology Management*
- Dr. Avner Levin: *Professor, Law & Business; Director, Ryerson University Law Centre*
- Dr. Joanne McNeish: *Associate Professor, Marketing Management*
- Dr. Farid Shirazi: *Associate Director and Associate Professor, Information Technology Management*

Faculty of Communication & Design

- Dr. Jeremy Shtern: *Associate Professor, School of Creative Industries*

Faculty of Engineering and Architectural Science

- Dr. Isaac Woungang: *Associate Professor, Department of Computer Science*
- Dr. Ayse Bener: *Professor, Mechanical and Industrial Engineering; Director, Data Science Laboratory; Academic Director of Big Data, Provost's Office*
- Dr. Cherie Ding: *Professor, Department of Computer Science*
- Dr. Eric Harley: *Associate Professor and Department Chair, Computer Science*
- Dr. Andriy Miranskyy: *Assistant Professor, Department of Computer Science*
- Dr. Abdolreza Abhari: *Professor, Department of Computer Science*

The institute is involved in a range of events to engage leaders in the big data, privacy and cybersecurity spaces.

Special Events



Privacy by Design Inaugural Seminar

Dr. Ann Cavoukian, January 2016

Toronto Region Board of Trade Smart Cities Summit

May 2016

Institute of Electrical and Electronics Engineers (IEEE) Toronto Speech

Dr. Shahryar Rahnamayan, June 2016

Toronto Region Board of Trade: Verizon 2016 Data Breach Investigations Report Presentation

Dr. Avner Levin, June 2016

Ryerson Advanced Digital and Professional Training (ADaPT) program Workshop

Dr. Ali Miri, June 2016

2016 CIO Innovation Summit

Invited Presentation
Dr. Ali Miri, September 2016

The Chang School Executive Seminar on Privacy and Big Data

October 2016

14th Annual Conference on Privacy, Security and Trust (New Zealand) Presentation

Dr. Ali Miri, December 2016

Education

The institute offers ongoing education and training opportunities for students, researchers and industry leaders. For example, it developed a partnership with Adastra Academy, an organization that provides for-profit data analytics training to organizations. Together, the institute and Adastra have co-hosted a two-day workshop (February 2016), a two-week boot camp (May 2016), and two four-day workshops (August and October 2016). Through these opportunities, Ryerson students received cutting-edge training in big data analytics.

The institute is also working with the Ryerson ADaPT program, a youth skills development and internship program aimed at bridging the employment gap for recent graduates. In June 2016, the institute contributed to the program and led a training session in data analytics and data visualization for program participants.

Launched in 2016, the TELUS Research Partnership is a notable initiative new to PBDI. TELUS has generously provided \$120,000 in funding for research projects at Ryerson; two projects funded by this initiative are summarized below.

TELUS Research Partnership

Major Objectives of the TELUS Research Partnership:

1. Improving transparency of Canadian wireless carriers in the use and collection of consumer data
2. Examining legal and policy frameworks regarding the use and collection of Canadian wireless consumer data
3. Addressing the needs of the Canadian consumer for wireless data

The institute launched a research call within Ryerson in October 2016 and two research projects are currently receiving funding.

Privacy by Design for the Internet of Things: A Design Manual

Ramona Pringle

Assistant Professor, Faculty of Communication & Design; Director, Transmedia Zone

December 1, 2016 to December 1, 2017
\$14,000

Pringle will work with designers and content creators to present the Privacy by Design (PbD) for IoT strategies in a clear and compelling fashion that will accelerate the adoption of PbD principles across the mobile network design industry.

The project also aims to determine which organizations in the Canadian landscape are developing IoT technologies in accordance with PbD principles. It will also explore methods for using incentives to encourage designers and content creators in applying the principles.

The output of the project will be to present the principles in a visually rich execution offering strategic and practical advice on implementing PbD principles into IoT devices conveyed in clear, accessible language.

Exploring Wireless Carrier Educational Platforms for Enhanced Data/Privacy Transparency

Dr. Bryan Koivisto

Assistant Professor, Faculty of Science; Director, Science Discovery Zone

April 1, 2017 to September 1, 2017
\$25,000

Dr. Koivisto is set to explore education platforms that can be leveraged to enhance data/privacy transparency from wireless carriers.

The project is a response to concerns expressed by wireless customers regarding how wireless carriers access, store and manipulate customer information. The objective of this project is to research and develop more effective methods for educating consumers about how wireless carriers collect and utilize user data.

The process will include a period of feedback collection followed by the development of an education module/video for consumers addressing some of their concerns. The research team will then develop a mockup of an app intended to enable better interactions for customers related to privacy and data transparency.



WORK

WITH

US

The institute's industry-academic integration enables a diverse service offering that brings together experts from multiple disciplines to collaborate and innovate.

Areas of Expertise

Our areas of expertise include:



Privacy, policy development and implementation



Encryption and authentication



Internet of Things



International privacy laws



Building data analytics infrastructure



Big data interpretation and utilization



Cyber-crime prevention and cybersecurity implementations



The institute builds capacity in 3 ways:

- 1 Research and facilitation of industry, academia and government collaborations
- 2 Education for students, industry partners and government representatives
- 3 Consulting and project-based expertise for industry organizations and government agencies

Consulting by PBDI

The institute works with industry partners of various sizes to address specific technical, legal or policy-based challenges. Once initial conversations determine the project scope, project leaders at the institute identify needed areas of expertise and onboard respective Ryerson researchers. The institute would also provide project management support throughout the consultation.

Past consulting clients include:





Message from Our Executive Director

A Look Forward

The past three years have been an exciting and productive period for the Privacy and Big Data Institute.

Some highlights include Privacy by Design being formally incorporated into the new General Data Protection Regulation by the European Union in 2016; Privacy by Design being translated into its 39th language, Afrikaans (a South African language), and recently being incorporated into the City of Toronto's privacy policy.

Over three years, I have given hundreds of interviews on Privacy by Design, big data, the Internet of Things, de-identification, and open data. I was also asked to take part in countless media interviews for radio, television, newspapers, blogs, and podcasts, on topics ranging from the General Data Protection Regulation (GDPR), the Canadian Security Intelligence Service (CSIS), the National Security Agency (NSA), numerous data breaches, the RCMP, Bill C-51, and IMSI catchers.

The future of the Privacy by Design certification is extremely bright. Over the last few months, two more Privacy by Design certifications were issued, with customers including TELUS.

The summer semester of 2017 will also see the second offering of the course on Privacy by Design (CZLW 327) which I offer as part of The Chang School Certification in Privacy, Access, and Information Management. This course and its future offerings will secure Privacy by Design as part of Ryerson's ongoing curriculum.

The institute's recent funding of research projects has started, with projects that support the improvement of industry transparency and consumer awareness on the use and collection of Canadian consumers' wireless data. I am already looking forward to seeing the work generated by Ryerson students.

In July 2017, I will be transitioning into a new role under the Office of the Provost and Vice-President, Academic as the Distinguished Expert in Residence for Privacy & Data Analytics. In my new position I will continue to spread the word about Privacy by Design on a national and international level. My new vehicle for this is the newly created International Council on Global Privacy and Security by Design. Look for the newest developments at gpsbydesign.org.

I am proud of all I have accomplished as executive director of the Privacy and Big Data Institute. I am confident that I have built a solid foundation at PBDI that will perpetuate the good work that I started as its inaugural executive director. It will certainly continue to be a global leader dedicated to being a centre of relevant research and education in privacy and big data.

It is important for Ryerson to continue to bridge the gap between big data and the inherent personal right to privacy; because that is how we can enable both scientific progress and scientific innovation. The Privacy and Big Data Institute is just the vehicle to bridge that gap, and I look forward to seeing the heights that it will reach.

Dr. Ann Cavoukian
Executive Director
Privacy and Big Data Institute

Collaboration and Research

Industry leaders work with the institute to engage, explore, and investigate opportunities to address existing and emerging challenges. We can connect you with multidisciplinary teams in a range of private and public sectors, such as not-for-profit, financial, retail, security, industrial and telecommunications. Your involvement in the institute will also give you first access to the top talent at Ryerson.

Roundtables

The institute can act as an impartial host, enabling your organization to meet and discuss common opportunities and challenges in either an open- or closed-door format. We can also arrange for Ryerson researchers and students to attend in order to amplify your discussions.

Researchers and Key Staff

The multidisciplinary team at the heart of the institute's success is drawn from across Ryerson.

Ted Rogers School of Management

Dr. Avner Levin
Dr. Joanne McNeish
Dr. Atefeh Mashatan
Dr. Murtaza Haider
Dr. Farid Shirazi

Faculty of Science

Dr. Cherie Ding
Dr. Andriy Miransky
Dr. Isaac Woungang
Dr. Ali Miri
Dr. Eric Harley

Faculty of Engineering and Architectural Science


Dr. Ebrahim Bagheri

Faculty of Communication & Design

Dr. Jeremy Shtern
Ramona Pringle

Institute Staff

Dr. Ali Miri, research director
Dr. Ann Cavoukian, executive director
Michael Keoshkerian, projects manager



To learn more or register for
an upcoming event, please visit
ryerson.ca/pbdi

Privacy and Big Data Institute

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Cybersecurity

Internet of Things

Data protection

Data breaches

Biomedical data

**Ryerson
University**