



Centre for Information
Integrity and Information
Systems Assurance

ANNUAL REPORT

2018

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MISSION

The mission of the University of Waterloo Centre for Information Integrity and Information Systems Assurance (UW CISA) falls under three headings:

RESEARCH

Identify, create and deliver research addressing the expanding boundaries of information integrity and assurance;



EDUCATION AND KNOWLEDGE TRANSFER

Support and promote the marketing and delivery of innovative educational activities and materials related to information integrity and assurance issues;

Identify, communicate and promote information integrity and assurance issues that are important to professionals working in these areas;



INTERACTION

Support and promote interaction on information integrity and assurance issues among practitioners, educators and students.





BACKGROUND

The University of Waterloo is a leading university in Canada and is well known for its information technology related research, teaching and entrepreneurship. The School of Accounting and Finance (SAF) is one of Canada's leading academic units in the accounting and finance fields and has both a Canada-wide and international reputation.

The SAF is a strong supporter of the information integrity and information systems assurance fields, as demonstrated by its leading courses and programs in these areas and related research they have spawned. For information please visit: uwaterloo.ca/school-of-accounting-and-finance/our-programs.

UW CISA was founded in 1998 by the School of Accounting and Finance at the University of Waterloo. The founding sponsors were the Chartered Professional Accountants of Canada (CPA Canada) and the Information Systems Audit and Control Association (ISACA).¹ IIA Canada joined the sponsor group on July 1, 2018. The sponsors' objectives were to improve the quality of education and research in information integrity and information systems assurance, and to foster a close and continuing working relationship between the SAF, the sponsors and other partners with an interest in information integrity and information systems assurance. UW CISA was renamed from the Centre for Information Systems Assurance to the Centre for Information Integrity and Information Systems Assurance in 2008 (retaining the acronym UW CISA) in recognition of the need to broaden UW CISA's mandate and activities beyond systems assurance to information integrity. UW CISA is an administrative sub-unit within the Centre of Accounting Research and Education (CARE).

¹The following name changes have taken place since the founding of UW CISA. ISACA replaced Information Systems Audit and Control Association on January 1, 2006. The School of Accounting and Finance replaced The School of Accountancy on November 19, 2007. Chartered Professional Accountants of Canada (CPA Canada) replaced Canadian Institute of Chartered Accountants (CICA) on April 1, 2013.

A NOTE FROM THE DIRECTOR



To the Board of Directors:

I am pleased to present this report on the operations and activities of the University of Waterloo Centre for Information Integrity and Information Systems Assurance during 2018, our twenty-first year of operation.

This year marks the third year in the three-year funding commitment by UW CISA's sponsors for the period 2016–2018, inclusive. We are pleased to announce that a new three-year commitment was agreed to after the date of this report.

During the year, we continued our thought leadership role through service on CPA Canada's Assurance Innovation Committee (AIC) and the AICPA's Trust Services Information Integrity, Cybersecurity, and Data Analytics Task Forces. We also continued our research activities related to information integrity, IT governance, risk and internal control, business model and business process documentation, XBRL, blockchain, and data analytics and presented our research at a number of conferences as detailed in the report. During the year, we saw a number of publications result from these efforts as detailed in this report. Our work in progress includes projects addressing IT governance, risk and internal control, cybersecurity, information integrity, business model presentation for Integrated Reporting <IR>, machine learning, AI and robotics, and data analytics and visualization.

I am delighted to report that our research productivity in the field of accounting information systems has been recognized by our third place ranking in the global rankings of universities produced by Brigham

Young University. These rankings are based on classifications of peer reviewed articles in 12 key accounting journals since 1990.

During the year we held very successful PD sessions on Text Analytics and Machine Learning and Cybersecurity Reporting and Assurance. We are planning to expand our PD offerings in the areas of data/text analytics and machine learning, cybersecurity reporting and assurance, data integrity criteria and assurance, and blockchain and cryptoassets during the coming year.

We continue to work with other Centres with similar purposes, strengthening an international network for mutual support of our respective missions. We have recently joined the University of Waterloo's Cybersecurity and Privacy Institute (CPI) and Waterloo.AI. We also have expanded our relationship with the Institute of Internal Auditors (IIA) by providing assistance with the 2019 CCITAGS conference and other initiatives. We are co-sponsoring the 2019 Symposium on The Impact of Technology on Ethics, Professionalism and Judgement in Accounting to be held in April 2019 and we have started planning for our 11th Biennial Research Symposium on Information Integrity and Information Systems Assurance to be held in October 2019.

We welcome IIA Canada and Richter LLP. to our roster of sponsors and continue to invite new partners to share in our mission. I thank UW CISA's Board members and sponsors for their continued support and look forward to another productive year.

DR. J.E. BORITZ, FCPA, FCA, CISA
EXECUTIVE DIRECTOR

RESEARCH

THOUGHT LEADERSHIP

UW CISA provided thought leadership in several areas during 2018.

Our research productivity in the field of accounting information systems continues to be recognized by our third place ranking in the global rankings of universities produced by Brigham Young University. These rankings are based on classifications of peer reviewed articles in 12 accounting journals since 1990. For more information about the rankings visit byuaccounting.net/rankings/univrank/rankings_per_univ.php?univid=586&univname=University%20of%20Waterloo.

BIG DATA/DATA ANALYTICS

Guide to Audit Data Analytics. Work on this guide was co-funded by the AICPA and CPA Canada. The guide updates the AICPA guide on Analytical Procedures with information on Audit Data Analytics. Author Greg Shields was supported by an AICPA Task Force of which the Executive Director is a member. CPA Canada's Audit Data Analytics Committee of which Theo Stratopoulos is a member has adapted the guide for Canadian standards. The US guide was published in mid-2017 and the Canadian guide was published in May 2018.



BLOCKCHAIN

Blockchain Technology Adoption. Research by Theo Stratopoulos. The objective of this study is to provide a framework for predicting the expected duration of competitive advantage due to emerging technology adoption, and suggest a process for generating technology-specific predictions. This paper was presented at the Blockchain Technology Symposium,

The Fields Institute, Toronto, ON, September 17-21; the Mediterranean Conference on Information Systems, Corfu, GR, September 29-30, 2018; and has been accepted for presentation at the AAA AIS midyear meeting in San Antonio, TX, January 2019.



THEO STRATOPOULOS



BRUCE DEHNING



VICTOR WANG

Blockchain Technology Adoption. Research Team is Theo Stratopoulos, Bruce Dehning, and Victor Wang. The objective is to leverage textual information from firm disclosures to predict blockchain technology adoption. The paper is being prepared for journal submission.

CYBERSECURITY

Are External Auditors Concerned about Cyber Incidents? Evidence from Audit Fees. Research team is He (Stanley) Li, Southwestern University of Finance and Economics, China and Won Gyun No, Rutgers University, and Efrim Boritz. The objective is to explore issues related to cybersecurity with relevance to risk management, internal control, and assurance. This paper was presented at the American Accounting Association (AAA) midyear meeting of the Auditing Section; the AAA midyear meeting of the AIS/SET section; January 2017, in Orlando, FL; Monash University in Melbourne, AU, March 2017; and at the International Symposium on Accounting Information Systems (ISAIS) held in Valencia, ES, May 2017. It is under review at *Auditing: A Journal of Practice & Theory* (AJPT).



HE (STANLEY) LI



WON GYUN NO

How Reliable are the Hurr Professional Skepticism Scale and Rotter Interpersonal Trust Scale for Audit Experimental Research? Reserach team is Efrim Boritz, →

Katharine Elizabeth Patterson, Kristian Rotaru, Monash University, and Carla Wilkin, Monash University. The objective is to compare the results obtained from two well accepted scales that have been designed to measure stable personality traits – the Hurtt Professional Skepticism Scale (HPSS) and the Rotter Interpersonal Trust Scale (RITS). This paper was presented at the AAA Auditing Section midyear meeting, Portland, OR, January 12-13; the Annual Congress of the EAA Conference, Milan, IT, May 31-June 1; the Canadian Academic Accounting Association (CAAA) Annual Conference, Calgary, AB, June 14-17; and the AAA Annual Conference, Washington, DC, August 5-8, 2018.



KRISTIAN ROTARU



CARLA WILKIN



KATHARINE PATTERSON

Neuro-Cognitive Measures of Professional Skepticism. Research team is Efrim Boritz, Katharine Elizabeth Patterson, Kristian Rotaru, Monash University, and Carla Wilkin, Monash University. The objective is to examine the moderating role of neurocognitive measures such as risk taking propensity, cognitive (inhibitory) control and social cognition during the decision-making process to reveal the impact of these neurocognitive traits on professional skepticism during individual decision-making processes associated with audit risk judgments. This paper has been accepted for presentation at the Annual Congress of the EAA Conference in Paphos, CY, 2019.

Neuro-Physiological Measures of Professional Skepticism. Research team is Efrim Boritz, Katharine Elizabeth Patterson, Kristian Rotaru, Monash University, and Carla Wilkin, Monash University. The objective is to examine the mediating role of neurophysiological measures commonly associated with the degree of cognitive and/or emotional arousal experienced during

the decision-making process to reveal the mechanism through which professional skepticism affects individual decision-making processes associated with audit risk judgments. This paper has been accepted for presentation at the AAA Annual Conference, San Francisco, CA, 2019.

Factors Affecting Individuals' and Susceptibility to Cyber Attacks. Research team is Efrim Boritz, Katharine Elizabeth Patterson and Jessie Ge. The objective is to identify personality and other factors that affect professional judgment and susceptibility to "hostile acts" such as cyberattacks. This paper is being prepared for conference submission.

BUSINESS RISK ASSESSMENT

Business Models and Business Model Descriptions: A Research Synthesis. Research team is Efrim Boritz, Louise Hayes and Giselle White. This paper addresses a series of research questions aimed at exploring the nature of business models and business model descriptions to better understand how they are and can be used in accounting and auditing. It was presented at the AAA annual meeting in New York, NY, August 2016. The paper is being revised for submission to a journal.

INFORMATION INTEGRITY

Information Integrity Control Guidelines. Project team is Efrim Boritz and Malik Datardina, Avenir. The objectives are to: 1) define information integrity and to identify information integrity risks and controls for mitigating those risks; 2) define assurance practices for information integrity services; 3) interview or survey audit team members about their views on information integrity risks, controls and assurance practices. Funding is being provided by CPA Canada. *The Framework for Information Integrity Controls* published by CPA Canada is forthcoming in 2019. In addition, the Executive Director assisted the AICPA to develop a guideline on data integrity assurance that will be published in 2019.

IT GOVERNANCE, RISK AND INTERNAL CONTROL

Understandability of Auditors' Internal Control Reports. Research Team is Efrim Boritz, Louise Hayes, University of Guelph, and Lev Timoshenko, University of Calgary. The objective is to evaluate information content of SOX 404 internal control reports. This paper was presented at the AAA annual meeting in Atlanta, GA, August 2014; the AAA annual meeting in Chicago, IL, August 2015; the World Banking and Finance Conference in Hanoi, VN, December 2015; the AAA annual meeting in New York, NY, August 2016; and as an invited presentation at Monash University, AU, April 13, 2018. This paper is being prepared for journal resubmission.



LOUISE HAYES



LEV TIMSHENKO

Does Information Technology Reputation Affect Bank Loan Terms? Research team is Jeong-Bon Kim, Byron Y. Song and Theo Stratopoulos. The objective is to investigate whether Information Technology (IT) reputation, captured by the accumulation of consistent IT capability signals, influences bank loan contracting even though banks have access to inside information. This paper was published in *The Accounting Review*, May 2018.



DUANE KENNEDY

Mapping IT Spending Across Industry Classifications: An Open Source Dataset. Research team is Duane B. Kennedy and Theo Stratopoulos. The objective of this study is to compile a data set of industry level IT spending based on publicly available information and make it available as an open source data set. This paper was presented at the AAA AIS midyear meeting in Orlando, FL, January 2017 and in Newport Beach, CA, January 18-20, 2018.

IT Capability Reputation: Antecedents and Implications. Research team is Jee-Hae Lim, University of Hawai'i at Ma-noa, Theo Stratopoulos and Tony S. Wirjanto. The objective of this study is to determine which firms are more likely to project IT capability signals to external stakeholders and whether IT capability reputation matters. This paper is being prepared for journal submission.



TONY WIRJANTO

INTEGRATED REPORTING AND CSR

Business Models in Integrated Reporting. Research team is Efrim Boritz, Louise Hayes and Giselle White. The objective is to review and evaluate the presentation of business models in integrated reports. This paper was presented at the AAA annual meeting in New York, NY, August 2016 and the International Symposium on Accounting Information Systems (ISAIS) in Valencia, ES, May 2017. This paper is under review at the *International Journal of Accounting Information Systems (IJAIS)*.

Communicating Value Creation in Integrated Reporting. Research team is Efrim Boritz and Giselle White. The objective is to review and evaluate the presentation of value creation information in integrated reports. This project is in pilot testing.

A dollar for a tree or a tree for a dollar? The behavioral effects of measurement basis on managers' CSR investment decision. Research team is Bryan Church, Wei Jiang, Jason Kuang, and Adam Vitalis. This paper is forthcoming in *The Accounting Review*.



ADAM VITALIS

MACHINE LEARNING, AI AND ROBOTICS

Classifying Restatements: An Application of Machine Learning and Textual Analysis. Research team is Louise Hayes, University of Guelph and Efrim Boritz. The objective is to explore uses of machine learning technologies with applications to accounting and →

auditing. This paper was presented at the AAA annual conference in New York, NY, August 2016; the AAA midyear meeting in Orlando, FL, January 2017; the EAA Conference in Valencia, ES, May 2017; and World Banking and Finance Conference in Sardinia, IT, July 2017. This paper is under review at the *Journal of Information Systems* (JIS).

Do Differences in CFO Background Matter to Financial Statement Quality? An Application of Machine Learning and Textual Analytics. Research team is Louise Hayes, University of Guelph and Efrim Boritz. The objective is to explore uses of machine learning technologies with applications to accounting and auditing. This paper was presented at the CAAA annual conference in Montréal, QC, June 2017; the AAA annual meeting in San Diego, CA, August 2017; and the EAA Annual Conference in Milan, IT, May 30–June 1, 2018. This paper is being revised.

Robotics, Controls and Assurance. Research team is Robert Parker and Efrim Boritz. The objective is to consider the impact of the developing uses of robots and robotic process automation on risk, control and assurance issues.

USE OF SPECIALISTS IN AUDITING

Auditors' and Specialists' Views about the Use of Specialists during an Audit. Research team is Efrim Boritz, Natalia Kochetova, St. Mary's University, Linda Robinson and Chris Wong, Wilfrid Laurier University. The objective is to describe current practices in using specialists in the audit. This paper was presented at the CAAA annual conference in Edmonton, May 2014; the AAA auditing section midyear meeting in Miami, January 2015; the EAA Annual Conference in Glasgow, UK, April 2015; the Public Company Accounting Oversight Board (PCAOB) Standards Advisory Group Meeting in Washington, DC, June 2015; and the International Symposium on Audit Research (ISAR) in Boston, MA, June 2015. This paper is under review at *Auditing: A Journal of Practice & Theory* (AJPT).

XBRL

The Quality of Interactive Data: XBRL versus Compustat, Yahoo Finance, and Google Finance. Research team is Efrim Boritz and Won Gyun No. This paper was presented at the 25th XBRL International Conference in Yokohama, JP, November 2012; the AAA IS section midyear meeting in Ft. Lauderdale, FL, January 2013; the 26th XBRL International Conference in Dublin, IE, April 2013; and the AAA annual meeting in Anaheim, CA, August 2013. It was on SSRN's top download list for several months in the spring and summer of 2013. This paper is under review at the *Journal of Information Systems* (JIS).

The Impact of Senior Management Competencies on the Voluntary Adoption of an Innovative Technology. Research Team is Efrim Boritz, Jap Efendi, University of Sydney, AU, and Jee-Hae Lim, University of Hawai'i at Mānoa. The objective is to determine which management competencies (IT or Financial) were most strongly associated with voluntary adoption of XBRL during the SEC's XBRL voluntary filing program. This paper was presented at the XBRL 25th International Conference in Yokohama, JP, November 2012; the AAA IS section midyear meeting in Ft. Lauderdale FL, January 2013; the International Conference on Information Systems (ICIS) in Auckland, NZ, December 2014; and at Queensland University of Technology in Brisbane, AU, November 2015. This paper was published in the *Journal of Information Systems* (JIS), Vol. 32, No. 2 (Summer) 2018.

SOCIAL MEDIA



JONATHAN YE

Commercialized Content on Social Media Platforms: Exploring the Drivers of the Viewership of Paid Q&A. Research team is Xueping Yang and Jonathan Ye. The objective of this study is to enlighten content providers and platform organizations on how to facilitate individual users to commercialize content for profits. This paper has been accepted for presentation at the AAA AIS midyear meeting in San Antonio, TX, January 2019.

MOBILE

Trust User Service Innovation on Mobile Phone Platforms: Investigating Impacts of Lead Users, Toolkit Support, and Design Autonomy. Research team is Jonathan Ye and Atreyi Kankanhalli. The objective is to propose a model that builds on user innovation theory and the work design literature to explain the influences of lead users, design autonomy, toolkit support, and their interactions on users' innovation



ATREYI KANKANHALLI

outcomes (innovation quantity) on these platforms. This paper was published in *Management Information Systems Quarterly* (MIS), 42(1), 2018.

Encouraging Innovations of Quality from User Innovators: An Empirical Study of Mobile Data Services. Research by Jonathan Ye. This study develops a model to explain effects of platform features (i.e., toolkit support and design autonomy) on the quality of user service innovation. This paper was published in *Service Science*, 10(4), 2018.

TRUST SERVICES

Trust Services Information Integrity Task Force. The Executive Director is serving on the AICPA task force to update Trust Services Principles and Criteria. The task force published the updated Guide on Reporting on Controls at a Service Organization (SOC 2®) in January 2018.



FUNDING SPECIFIC RESEARCH AND EDUCATION PROJECTS

UW CISA's funding comes from donations provided by our generous sponsors, research grants from various agencies, professional development offerings and publication revenues. UW CISA is exploring new fundraising options to help establish a full-time staff to conduct its research, education and professional development offerings and activities on a long-term, sustainable basis.

We welcome new partners to help us achieve UW CISA's mission.

FELLOWSHIPS AND SCHOLARSHIPS

UW CISA makes funds available for Visiting Fellows and doctoral students. Our next fellow, Dr. Kristian Rotaru of Monash University, Australia, will be visiting in 2019.



KRISTIAN ROTARU

SPONSORING RESEARCH SYMPOSIUM

Information Integrity and Information Systems Assurance Symposium

The 10th Biennial Research Symposium was held October 19–21, 2017 at the Toronto Marriott City Centre (Renaissance) Hotel, One Blue Jays Way, Toronto, Canada. The symposium was sponsored by the University of Waterloo, CPA Canada, Avenir, ISACA Toronto Chapter, CaseWare Analytics, the Canadian Academic Accounting Association, the Strategic and Emerging Technologies Section of the American Accounting Association and the *International Journal of Accounting Information Systems*.

A special issue of the *International Journal of Accounting Information Systems* was published in September 2018, containing selected papers from UW CISA's 2017 Symposium, available at [sciencedirect.com/journal/international-journal-of-accounting-information-systems/vol/30/suppl/C](https://www.sciencedirect.com/journal/international-journal-of-accounting-information-systems/vol/30/suppl/C).

EDUCATION AND KNOWLEDGE TRANSFER

DEVELOPING COURSES, WORKSHOPS, CASES AND OTHER TEACHING MATERIAL

COURSES

IT COMPETENCIES

The Executive Director is involved in consultations aimed at revising the IT Competency section of CPA Canada's Competency Map. During 2018, an updated CPA map incorporating Data Analytics and Information System (DAIS) competencies was published. The Executive Director has been invited to speak on this topic at the Accounting Educators and Academics Symposium presented by the Chartered Professional Accountants' Education Foundation of BC (CPAEF) in May 2019.

IT LAW

Under the leadership of Darren Charters UW CISA sponsored the development and implementation of a course in IT Law.

IT CONTROLS AND ASSURANCE

Under the leadership of Malik Datardina of Avenir, UW CISA sponsored the development and implementation of a course on technology, assurance and innovation. The course covers core concepts of IT control and assurance and also explores exponential technologies such as the Internet of Things (IoT), blockchain and AI.

DATA ANALYTICS AND VISUALIZATION

Under Theo Stratopoulos' leadership and with the assistance of Kieng Iv of Real Matters and May Leung of Deloitte, UW CISA sponsored the development and implementation of a Business Analytics stream within the accounting program at the University of Waterloo. In addition to pre-requisite foundation courses in Statistics, Business Systems and Accounting Information Systems, the program includes the following courses: Introduction to Data Analytics and Visualization; Intermediate Data Analytics and Visualization; Data Analytics for Assurance and Fraud Detection. As well, the University of Waterloo data analytics team, Cindy Hum, Jennifer Lo and Jasper Lam, mentored by Kieng Iv, won the fourth annual Business Analytics Competition & Conference held at Manhattan College, New York City, NY in May 2018 and Ana Cezara Rusu, Justin Wong and Md Ahnaf Labibur Rahman were invited finalists at the Teradata University Network Data Challenge, Las Vegas, NV in June 2018.

Business Value of Information Technology – A Data Analytics Approach by Theo Stratopoulos. The objective of this paper is to suggest a series of topics for teaching the introduction to information systems to an accounting and finance audience. (SSRN Scholarly Paper No. ID 3186759). Rochester, NY: Social Science Research Network (2018). papers.ssrn.com/abstract=3186759

Accounting and Finance Applications for Introduction to Statistics with R. Research team is Duane Kennedy and Theo Stratopoulos. These materials were developed to help instructors teach data analytics in their classes. (SSRN Scholarly Paper No. ID 3184054). Rochester, NY: Social Science Research Network (2018). papers.ssrn.com/abstract=3184054 →



Our data analytics teams, mentored by Kieng Iv, are winners!



GREGORY SHIELDS

Basic Audit Data Analytics with R. The research team is Gregory Shields and Theo Stratopoulos. The primary learning objective is to provide trainees with capabilities required to perform

entry level audit data analytics. The training uses the software R because it is open-source (free) and it provides virtually endless possibilities to those who learn it. The cases, including practice problems, use comprehensive large data sets for an entire company accessed from the HUB of Analytics Education. Millions of data points are updated regularly. (SSRN Scholarly Paper No. ID 3142207). Rochester, NY: Social Science Research Network (2018). papers.ssrn.com/abstract=3142207

At the AAA Annual Meeting Theo Stratopoulos presented a workshop titled Hands on Audit Data Analytics Training & Open Source Teaching Material and presented the SAF model data analytics curriculum at a panel session August 5-7, 2018.

He was also invited to discuss emerging technologies and the way data analytics and technology are incorporated into Waterloo's accounting and finance curriculum at the following meetings:

- › University of Tomas Bata, Czech Republic, July 9-14, 2018.
- › Audit Data Analytics with R. CAAA annual meeting, Calgary, AB, June 16, 2018.
- › AAA Intensive Data Analytics Workshop, Orlando, FL, June 4-7, 2018.
- › CPA Ontario's Faculty Symposium on the Impact of Blockchain Technology panel, Toronto, ON, June 1, 2018.
- › CFA Society, panel on Blockchain and Its Disruption to Financial Services, Toronto, ON, May 25, 2018.
- › Data Analytics for AIS. AAA AIS Bootcamp, Minneapolis, MN, May 23, 2018.
- › Audit Data Analytics with R and HUB of Analytics Data. AAA AIS midyear meeting, New Port Beach, CA, January 18, 2018.

CYBERSECURITY

The Executive Director assisted by Malik Datardina and Rutgers University are developing an online course that will cover Cybersecurity risk management and controls.

The Executive Director presented Cybersecurity Risk Management Program Examination Reporting and Assurance at The Canadian Conference on IT Audit, Governance and Security (CCITAGS) on March 27-28, 2018.

BLOCKCHAIN



JESÚS CALDERÓN

Introduction to Blockchain. The research team is Jesús Calderón and Theo Stratopoulos. The primary objective of this paper is to develop a hands-on tutorial for helping accounting and finance students understand blockchain technology and how it works. (SSRN Scholarly Paper No. ID 3189518). Rochester, NY: Social Science Research Network, 2018. papers.ssrn.com/abstract=3189518

WORKSHOPS

A PD workshop developed by UW CISA on Cybersecurity Reporting and Assurance was presented by the Executive Director on November 30, 2018 at CPA Canada in Toronto.



ANDREW BAUER



RAJENDRA P. SRIVASTAVA

A PD workshop developed by UW CISA on Text Analytics and Machine Learning was presented by Andrew Bauer (Topic Modelling), Louise Hayes (Text Analytics Introduction and Machine Learning), Rajendra P. Srivastava (Text Extraction, Textual Analysis, and Model Building) and Theo Stratopoulos (Text Mining and Analytics) at CPA Canada in Toronto on October 26, 2018.

Andrew Bauer presented a workshop Accounting Skills: An Introduction to Data Analytics and Topic Modeling at the AAA Financial Accounting and Reporting Section (FARS) midyear meeting on January 26, 2018.

SHARING MATERIAL WITH OTHER EDUCATORS

A variety of materials is available for use by academics and practitioners. For information, please contact the Executive Director.



INTERACTION



ALLIANCES AND RELATIONSHIPS

As part of its mission to interact with academe and practice, UW CISA seeks to create and sustain relationships with academic units with similar objectives and professional associations with an interest in information integrity and information systems assurance.

We have recently joined the University of Waterloo's Cybersecurity and Privacy Institute (CPI) and Waterloo.AI.

During the year, UW CISA supported the following activities:

- › Adam Vitalis is our liaison with IIA and is leading the Centre initiative in assisting the School of Accounting and Finance to maintain its accredited program under the IIA's IAEP (Internal Audit Education Program). Adam and Tim Bauer are updating course offerings to continue this initiative.
- › Louise Hayes is a member of CPA Canada's Audit and Assurance Technology Committee.
- › Theo Stratopoulos, Kieng Iv and May Leung are members of CPA Canada's Audit Data Analytics Task Force.
- › Malik Datardina is a member of CPA Canada's Audit Data Analytics Committee, Technology Advisory Committee, Audit and Assurance Technology Committee and Foresight Workshop and Roundtable, Live Sessions. He is also assisting on CPA Canada's Crypto-Asset Discussion Group.



- › The Executive Director is a member of CPA Canada's Assurance Innovation Committee, IT Competency Map Revision Task Force, Study Group on Information Integrity and the AICPA's Trust Services Information Integrity Task Force, Cybersecurity Assurance Task Force and Audit Data Analytics Task Force.
- › The Executive Director and PhD students Katharine Patterson and Jessie Ge are developing a cybersecurity research program with the financial support of Richter, LLP.

RICHTER

DISSEMINATING BEST PRACTICES

CONFERENCES

Centre personnel made presentations at a number of conferences during 2018:

- › American Accounting Association (AAA) Annual Meeting
- › AAA Accounting Information Systems Section Midyear Meeting
- › AAA Auditing Section Midyear Meeting
- › AAA Financial Accounting and Reporting Section (FARS) Midyear Meeting
- › AAA *Journal of Information Systems* (JIS) Conference
- › AAA Strategic and Emerging Technologies (SET) Section Midyear Meeting
- › Blockchain Technology Symposium – Fields Institute
- › Canadian Academic Accounting Association (CAAA) Annual Conference
- › Canadian Conference on IT Audit Governance and Security (CCITAGS)
- › Conference on the Convergence of Financial and Managerial Accounting Research
- › European Accounting Association (EAA) Annual Conference

- › International Conference on Information Systems (ICIS)
- › International Symposium on Accounting Information Systems (ISAIS)
- › Mediterranean Conference on Information Systems
- › World Continuous Auditing and Reporting Symposium (WCARS)

COMMUNICATION

WEBSITE AND SOCIAL MEDIA OUTREACH

UW CISA's website, uwaterloo.ca/uwaterloo-centre-for-information-system-assurance, serves as UW CISA's portal. It includes calls for papers and research proposals, a resources section, a number of links and downloadables, and the IS Assurance blog.

UW CISA's most current Annual Report is posted to the website and summarizes the current year's activities. The reports are disseminated both electronically and in hardcopy formats. Past reports can be requested online at: uwaterloo.ca/uwaterloo-centre-for-information-system-assurance/annual-reports/request-annual-report.

Our website is linked to key social networks such as Facebook, LinkedIn, YouTube and Twitter. These social networks give us an opportunity to share information (like the flyer for the Symposium) with people who would not normally be closely tied to our Centre.

IS ASSURANCE WEBLOG

Malik Datardina maintains our blog at: UWCISA-assurance.blogspot.com.

FUTURE PLANS

In the next twelve months, UW CISA will maintain its current research, education and knowledge transfer, and interaction activities, and will undertake new initiatives as well. Plans for each key category are outlined below.

RESEARCH

THOUGHT LEADERSHIP

UW CISA will continue working on the following projects during 2018:

- › **Big Data/Data Analytics** – One paper on this topic will be completed and submitted for presentation at various conferences and publication.
- › **Blockchain Technology** – Through a workshop and publications we will contribute to the development of understanding of this technology among accounting, finance and assurance practitioners and academics.
- › **Business Model Descriptions and Business Risk Assessment** – One paper on this topic will be completed and submitted for presentation at various conferences and publication.
- › **Cybersecurity** – Through membership on the AICPA Trust Services Task Force we will contribute to the development of criteria for reporting on an entity's cybersecurity risk management program. One paper on this topic will be presented at various conferences and submitted for publication.



- › **Data/Information Integrity** – Through membership on the AICPA Trust Services Task Force we will contribute to the development of criteria for reporting on data integrity. One monograph on this topic is being prepared for publication, and a new project will be started.
- › **IT Governance, Risk and Internal Control** – Two papers on this topic will be completed and submitted for presentation at various conferences and publication.
- › **Integrated Reporting and CSR** – Two papers on this topic will be completed and submitted for presentation at various conferences and publication.
- › **Machine Learning, AI and Robotics** – Two papers on this topic will be completed and submitted for presentation at various conferences and publication.
- › **Use of Specialists** – One paper on this topic is being revised for presentation and publication, and a new project will be started.
- › **XBRL** – One paper on this topic will be completed and submitted for publication.
- › **Social Media** – Two papers on this topic will be completed and submitted for presentation at various conferences and publication.

FUNDING SPECIFIC RESEARCH AND EDUCATION PROJECTS

UW CISA's fundraising committee will continue seeking ways to expand the funding base for UW CISA. We invite partners to join us in our mission to improve the quality and reliability of information systems and the processes used to produce data/information with integrity (i.e., representational faithfulness).

RESEARCH PROPOSALS

For Research Proposal Guidelines, visit: uwaterloo.ca/uwaterloo-centre-for-information-system-assurance/call-proposals.

FELLOWSHIPS AND SCHOLARSHIPS

UW CISA will make funds available for Visiting Fellows and doctoral students. For details, contact the Executive Director.

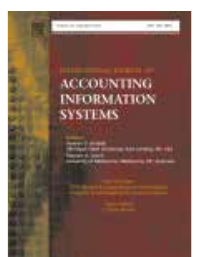
During the summer of 2019 UW CISA will host a visit by Dr. Kristian Rotaru of Monash University, Australia,

SPONSORING RESEARCH SYMPOSIUM

UW CISA is pleased to be partnering with the University of Waterloo Centre for Accounting Ethics, CPA Canada and the *Journal for Business Ethics* to offer a Symposium on the Impact of Technology on Ethics, Professionalism and Judgement in Accounting to be held in April 2019. More information is available on our website at: uwaterloo.ca/uwaterloo-centre-for-information-system-assurance/news/uwcisa-partners-uwcae-and-cpa-canada-impact-technology.

The 11th Biennial Research Symposium to be held in October 24-26, 2019 at the Marriott Downtown at CF Toronto Eaton Centre Hotel, 525 Bay St, Toronto, Ontario, Canada. The symposium is sponsored by the University of Waterloo, CPA Canada, ISACA Toronto Chapter, IIA Canada and the *International Journal of Accounting Information Systems*.

A special issue of the *International Journal of Accounting Information Systems* will be published in 2020 containing selected papers from UW CISA's 2019 Symposium. →



EDUCATION AND KNOWLEDGE TRANSFER



DEVELOPING COURSES, WORKSHOPS, CASES AND OTHER TEACHING MATERIAL

COURSES

Under Theo Stratopoulos' leadership and with the assistance of Kieng Iv UW CISA has sponsored the development of a Business Analytics stream at the University of Waterloo. The program will be expanded in 2019.

WORKSHOPS

PD Workshops developed by UW CISA on The Evolution of Data/Text Analytics and Machine Learning, Cybersecurity Reporting and Assurance, Data Integrity Criteria and Assurance, and Blockchain and Cryptoassets are being planned for 2019.

SHARING MATERIAL WITH OTHER EDUCATORS

UW CISA will continue to share its material with educators around the world. For information, please visit our website or contact the Executive Director.

INTERACTION

ALLIANCES AND RELATIONSHIPS

As part of its mission to interact with academe and practice, UW CISA seeks to create and sustain relationships with academic units with similar objectives, professional associations



and industry partners with an interest in information integrity and information systems assurance. In the coming year we will continue our outreach to units with similar goals and objectives to develop an international network for mutual support.

DISSEMINATING BEST PRACTICES

CONFERENCES

Centre personnel will make presentations at a number of conferences during 2019, including: the American Accounting Association (AAA) Auditing, AIS and SET section Midyear Meetings, the AAA Annual Meeting, the Canadian Academic Accounting Association (CAAA) Annual Conference, the Canadian Conference on IT Assurance, Governance and Security (CCITAGS), the Chartered Professional Accountants' Education Foundation (CPAEF) Accounting Educators and Academics Symposium, the European Accounting Association (EAA) Annual Conference, the International Symposium on Accounting Information Systems (ISAIS) and the World Continuous Auditing & Reporting Symposium (WCARS).

COMMUNICATION

WEBSITE AND SOCIAL MEDIA OUTREACH

- › An environmental scan for 2019 will be posted on the UW CISA website in summer of 2019.
- › Various social media networks will continue to be used (Facebook, Twitter, YouTube and LinkedIn).

Your comments are welcome.

IS ASSURANCE WEBLOG

- › Malik Datardina will continue to manage the IS Assurance blog on behalf of UW CISA.

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THANK YOU

The University of Waterloo Centre for Information Integrity and Information Systems Assurance gratefully acknowledges the generous support of our founding partners and sponsors



RICHTER



We welcome inquiries, suggestions and comments.

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