EECS4486 – Fall 2023
Technological Countermeasures to Financial Crimes

Course Description

Financial technology is an emerging industry that aims to replace or enhance traditional financial services with technological solutions. While financial technology aims to make financial services more accessible to the general public, it is also a crucial component in the fight against financial crimes. The rapid advancement of technology and digital transformation has contributed to the growth and complexity of financial crimes. This course provides an overview of financial crimes and examines key technologies used to combat them.

- Students gain a broad view of financial crimes including history, definitions, methodologies, financial intelligence units, regulations, and financial crime investigation. Various concepts such as Know Your Customer (KYC), Customer Due Diligence (CDD), Anti-Money Laundering (AML), Combating the Financing of Terrorism (CFT), regulatory reporting, and risk assessment will be covered.
- Students study current and emerging key technologies employed to identify and combat financial crimes such as artificial intelligence, machine learning, natural language processing, big data analytics, distributed ledgers, virtual currency, and privacy enhancing technologies.
- Students apply the technologies to solve real-world problems via case studies and projects.
- Students benefit from many experiential education opportunities via guest lecturers from industry, and case studies and projects suggested and mentored by volunteer professionals currently working in the field.

This course is suitable for students who intend to pursue a career in banking, accounting, finance, financial technology, anti-money laundering, fraud management, corporate security, law enforcement, compliance, policy making, and cyber-security.

Pre-requisites: Cumulative grade point average of 4.5 or higher over all major EECS courses; LE/EECS 2011 3.0

Lecture Schedule

Time: Tuesday, 16:00 – 19:00

Location: SC-222 (Stong College)

Teaching Team

Course Director: Uyen T. Nguyen

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Guest Lecturers

The course will feature guest lecturers who are professionals currently working or doing research in financial technology.

Dr. Faisel Saeed

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Mr. Reza Soltani

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Mr. Lwin Moe

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Mr. Shahram Ghahremani

Researcher and PhD candidate

Learning Objectives

In this course, students will

- study different types of financial crimes, and major regulators and their regulations, standards, and policies, as well as public-private partnerships for combatting financial crimes.
- gain an understanding of the financial crime investigation process.
- apply AI, machine learning, and big data analytics techniques to CDD, KYC, Suspicious Activity Report (SAR) and Suspicious Transaction Report (STR) processes, and money laundering/terrorism financing (ML/TF) transaction monitoring.
- gain an understanding of privacy enhancing technologies, blockchain technology and virtual currencies.

Learning Outcomes

By the end of the course, a student should be able to

- identify and describe different types of financial crimes;
- carry out a comparative analysis of regulations and policies set by governments and regulators in different jurisdictions (e.g., Canada, USA, Australia, UK, EU);
- apply knowledge about the financial crime investigation process to a case study;
- apply a technology (e.g., machine learning, big data analytics, blockchain and privacy enhancing technologies) to the implementation of a reporting/monitoring process (e.g., CDD, KYC, SAR, STR processes, and ML/TF transaction monitoring);
- identify and analyze a financial crime risk; propose technological solutions to mitigate the risk.

Assessment

Grading Scheme (tentative, subject to change)

- *Assignments* 40%
- *Tests* 20%
- *Project* 40%

Conversion from numeric to letter grade is applied to *the overall mark only*, in accordance with the following departmental standard:

F	E	D	D+	C	C+	B	B+	A	A+
<40	>=40	>=50	>=55	>=60	>=65	>=70	>=75	>=80	>=90

Assessment Policy

- *Assignments*: 3 to 4 assignments; individual work.
- *Tests*: 2 tests (45 to 60 minutes each); in class; individual work.
- *Project*: Students are encouraged to work in teams of 2 but have the option to work alone. All projects will be graded using the same rubric regardless of the number of participants. The projects will be graded based on the significance of the topic, significance of results, written presentations (reports), and oral presentations and Q&A with the audience.

Academic Honesty Guidelines

Department of Electrical Engineering and Computer Science Academic Honesty Guidelines

York University Senate Policy on Academic Honesty

York University Academic Integrity Guidelines

Academic Integrity at York University

Resources

Because financial technology, financial crimes and regulations evolve at a fast pace, there is no single textbook that can cover all the topics in this course. Students will use several books and online resources throughout the term. Students are not required to buy the books or references. They will be available online, on York Library website or in York libraries.

Primary Resources

The Hundred-Page Machine Learning Book, Andriy Burkov, ISBN 978-1999579500, January 2019.

Machine Learning Engineering, Andriy Burkov, ISBN 978-1999579579, True Positive Inc. Publisher, September 2020.

Fighting Financial Crimes with Artificial Intelligence, Alice LaPlante, Atif Kureishy, Chad Meley, ISBN 978-1492052661, O'Reilly Media Inc., May 2019.

The Basics of Bitcoins and Blockchains, Antony Lewis, ISBN 978-1642506730, Mango Publisher, April 2021.

Introduction to Privacy Enhancing Technologies, Carlisle Adams, ISBN 978-3030810429, Springer, October 2021.

Investigation and Prevention of Financial Crime: Knowledge Management, Intelligence Strategy and Executive Leadership, 2nd edition, Peter Gottschalk, ISBN 978-1317113089, CRC Press, May 2016.

Regulatory documents, e.g., FinCEN, FINTRAC, AUSTRAC (online resources).

Other References

FinTech, Artificial Intelligence and the Law: Regulation and Crime Prevention, Alison Lui and Nicholas Ryder, ISBN 9780367897659, Routledge, July 2021.

A Guide to Canadian Money Laundering Legislation, 5th Edition, Suhuyini Abudulai, LexisNexis, ISBN 9780433503347, 2018.

Money Laundering - An Endless Cycle? A Comparative Analysis of the Anti-Money Laundering Policies in the United States of America, the United Kingdom, Australia and Canada, Nicholas Ryder, ISBN 9780415730525, Routledge, October 2013.

Financial Crime in the 21st Century: Law and Policy, Nicholas Ryder, ISBN 1848443242, Edward Elgar Publisher, March 2011.

White-Collar and Financial Crimes: A Casebook of Fraudsters, Scam Artists, and Corporate Thieves, Jennifer C. Noble, ISBN 052-0302893, University of California Press, January 2021.

Following the Money: Compendium of Resources and Step-by-step Guide to Financial Investigations into Trafficking in Human Beings, Organization for Security and Co-operation in Europe, November 2019 (online resource).

News and research articles , e.g., ACAMS Today (online resources).

Useful Suggestions

- When sending emails to the course director or TAs, please indicate "EECS4486" in the subject line (e.g., "EECS4486 - Lecture notes unreadable"), or they may be deleted by mistake as spam. Include your name and student ID in the email.
- For questions related to course materials, it is best to ask during lectures or office hours. Email is not an effective or time-efficient way to explain course materials.

Important Dates

September 6	Classes start
September 20	Last date to announce components of final grades
October 7-13	Fall Reading Week

December 5	Fall classes end
December 7-20	Fall examinations

Last updated: September 5, 2023

LE/EECS 4486 - Technological Countermeasures to Financial Crimes

Why This Course?

Financial technology is an emerging industry that aims to replace or enhance traditional financial services with technological solutions. The four key areas of financial technology are artificial intelligence (AI), blockchain, big data and cloud computing. While financial technology aims to make financial services more accessible to the general public, it is also a crucial component in the fight against financial crimes.

Financial crimes are multi-national, multi-faceted and often under-detected activities, making them hard to understand, identify, measure and counter. Between 2019 and 2020 there were 2,057 unique disclosures of financial intelligence by FINTRAC to law enforcements in Canada alone, which is up 25% over the previous five years [1]. According to the Cullen Commission Report published in June 2022, billions of dollars are laundered every year in the province of British Columbia through real estate, casinos, and the purchase of luxury goods [2]. Regulatory pressures faced by organizations require adequate understanding and countermeasures against this rapidly evolving form of crime.

The rapid advancement of technology and digital transformation has contributed to the growth and complexity of financial crimes. Yet, there is a significant shortage of domain experts and specialists in financial frauds and financial crimes. The proposed course will

- bring an opportunity to York University to offer a relevant and important course to students
- fill a gap in current offerings by providing students a thorough understanding of the financial crimes, their implications, and technology solutions/countermeasures.
- fill a labour gap in the finance sector by training future domain experts and specialists in financial crimes and allowing current professionals to upgrade their skills and knowledge.

Students who intend to pursue a career in banking, accounting, finance, financial technology, anti-money laundering, fraud management, corporate security, law enforcement, compliance, policy making, and cyber-security will particularly benefit from this course.

The course will provide an excellent environment for experiential education:

- guest lecturers and guest speakers from industry. This will bridge the gaps between academic research and technological trends/advances, motivate students and connect them to potential employers.
- case studies and projects suggested and mentored by volunteer professionals currently working in the field. This is the model currently used in ENG4000 and the university wide C4 Capstone Projects. Ideally this model should be applied to projects in regular courses as well to allow students to apply their learned knowledge to real-world problems and be mentored by current practitioners in the field.
- an interdisciplinary course which is co-taught by EECS faculty and guest lecturers from industry.

This teaching and learning model can potentially be applied to other EECS courses at Markham, currently a technology hub of Canada with many high-tech professionals who are eager to teach and mentor.

The government of Ontario is revamping the science and technology curriculum to teach students coding starting in Grade 1 and artificial intelligence and its impact on society starting in Grade 3 to 8 [3]. Students will "learn about the impact of things like facial recognition, self-driving cars and drones" [3]. Following the same trend, the proposed course aims to "popularize" AI and blockchain technologies in the context of university education. Students will learn the technologies from users' point of view rather than from programmers/developers' point of view. The knowledge and skills acquired in this course will enable York students to be more competitive in the job market.

Being the financial hub of Canada and North America's second largest financial center, Toronto is positioned as a key center of financial activities and technology [4]. This course will fill a labour gap in the finance sector to meet the high demand for financial crime experts [5].

References

[1] *FINTRAC Annual Report 2019–20*, Government of Canada, https://www.fintraccanafe.gc.ca/publications/ar/2020/1-eng

[2] *The Cullen Commission Report*, the Commission of Inquiry into Money Laundering in British Columbia, June 15, 2022, https://cullencommission.ca/files/reports/CullenCommissionFinalReport-Full.pdf

[3] *Ontario revamps science, technology curriculum for elementary students*, Toronto Star, March 8, 2022, https://www.thestar.com/politics/provincial/2022/03/08/ontario-revampsscience-technology-curriculum-for-elementary-students.html

[4] *The Impact of Toronto's Financial Sector*, The Conference Board of Canada, March 2020, https://www.conferenceboard.ca/research/the-impact-of-torontos-financial-sector

[5] *5 key trends in the financial crime market*, https://www.robertwalters.co.uk/hiring/hiringadvice/five-key-trends-in-the-financial-crime-market.html