# Priscilla Kyei Danso

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## Biography

My research interests lie at the intersection of compliance automation and cybersecurity. I am currently developing ComplianceGPT, a system designed to automate regulatory compliance by integrating formal methods with Large Language Models (LLMs). ComplianceGPT is a hybrid system that combines specialized LLMs with a logic-based compliance checker, translating natural language regulations into First-Order Logic (FOL) formulas using a specialized regulatory vocabulary. Building on my master's research in IoT security, where I applied machine learning models for IoT device profiling, anomaly detection, and vulnerability assessment, I aim to further advance compliance automation and formal verification. I am committed to advancing the state-of-the-art in compliance automation, formal verification, and cybersecurity, contributing to a safer and more resilient digital world.

## Education

**Stony Brook University, New York, USA** *Sept 2023 – Present*
*Doctor of Philosophy in Computer Science (PhD)*

**University of New Brunswick, Fredericton, Canada** *May 2021 – May 2023*
*Master of Computer Science (MCS)*
Thesis: Transferability of Machine Learning Model for IoT device Identification and Vulnerability Assessment.

**Kwame Nkrumah University of Science and Technology, Kumasi, Ghana** *Sept 2012 – June 2016*
*Bachelor of Science in Computer Engineering*
Project Title: An Integrated Messaging Platform for an Enterprise Environment

## Publications

1. Liam McGevna, Jason Chow, Jeffery Luo, and **Priscilla Kyei Danso**. LLM-Based Anomaly Detection for Digital Substation Cybersecurity (**ACCEPTED**). *2024 IEEE 21st International Conference on Smart Communities: Improving Quality of Life Using ICT, IoT and AI (HONET)*, 2024.
2. **Priscilla Kyei Danso**, Sajjad Dadkhah, Euclides Carlos Pinto Neto, Alireza Zohourian, Heather Molyneaux, Rongxing Lu, and Ali A Ghorbani. Transferability of machine learning algorithm for IoT device profiling and identification. *IEEE Internet of Things Journal*, 2024.
3. **Priscilla Kyei Danso**, Euclides Carlos Pinto Neto, Sajjad Dadkhah, Alireza Zohourian, Heather Molyneaux, and Ali A Ghorbani. Ensemble-based intrusion detection for internet of things devices. In *2022 IEEE 19th International Conference on Smart Communities: Improving Quality of Life Using ICT, IoT and AI (HONET)*, 2022.
4. **Priscilla Kyei Danso**, Heather Molyneaux, Alireza Zohourian, Euclides Carlos Pinto Neto, Derrick Whalen, Sajjad Dadkhah, and Ali A Ghorbani. Human-Centric machine learning: The role of users in the development of IoT device identification and vulnerability assessment. In *HCI for Cybersecurity, Privacy and Trust: 5th International Conference, HCI-CPT 2023, Held as Part of the 25th HCI International Conference, HCII 2023, Copenhagen, Denmark, July 23–28, 2023, Proceedings*
5. Sajjad Dadkhah, Hassan Mahdikhani, **Priscilla Kyei Danso**, Alireza Zohourian, Kevin Anh Truong, and Ali A Ghorbani. Towards the development of a realistic multidimensional IoT profiling dataset. In *2022 19th Annual International Conference on Privacy, Security & Trust (PST)*, 2022.
6. Alireza Zohourian, Sajjad Dadkhah, Euclides Carlos Pinto Neto, Hassan Mahdikhani, **Priscilla Kyei Danso**, Heather Molyneaux, and Ali A Ghorbani. IoT zigbee device security: A comprehensive review. *Internet of Things*, 2023.

## Research Experience

**Graduate Research Assistant** *Aug 2023 – Present*
*Stony Brook University, New York, USA.*

- Conducting an in-depth analysis of LLM capabilities in translating free, unbounded assertive natural language into formal logic expressions.
- Designing experiments to test model effectiveness in identifying logical structures and mapping assertive statements to formal specifications.
- Evaluating and documenting outcomes to refine model capabilities in translating to specific logic forms for applications in compliance and legal reasoning.

**Graduate Research Assistant** *May 2021 – Dec 2022*

*The Canadian Institute for Cybersecurity, Fredericton, Canada*

- Engineered a system utilizing machine learning to profile IoT device types within a network while concurrently evaluating and visualizing the vulnerabilities associated with these devices.
- Collaborated with a team to publish an IoT dataset, aiming to facilitate the efforts of researchers specializing in the identification of IoT devices.
- Formulated and executed the implementation of an ensemble-based Intrusion Detection System (IDS), specifically designed for anomaly detection within an IoT infrastructure.
- Conducted extensive research on Internet of Things (IoT) devices, exploring potential vulnerabilities and implementing various efficient mitigation strategies. Executed experiments and thoroughly documented the results.

## Technical Skills

**Programming:** Python, OCaml; **Formal Verification:** NuSMV; **Cybersecurity:** Nmap, Snort; **Research and Technical Writing Skills:** LaTeX, Markdown; **Version Control:** Git, GitHub; **Databases:** MySQL, PostgreSQL

## Teaching Experience

**Teaching Assistant** *Jan 2024 – Apr 2024*

*ISE331 Fundamentals of Computer Security, Stony Brook University*

- Provided guidance and answered student questions during office hours.
- Proctored exams, ensuring a fair and secure testing environment.
- Graded student work, offered constructive feedback, and assigned final grades.

**Teaching Assistant** *Aug 2023 – Dec 2023*

*CSE331 Computer Security Fundamentals, Stony Brook University*

- Collaborated with faculty to develop assignments that met course objectives.
- Assisted students by holding office hours and addressing their questions.
- Ensured fair exam conditions by proctoring.
- Evaluated student submissions, provided feedback, and assigned grades.

## Conference Presentations

**Oral Presentations:**

- **Priscilla Kyei Danso**, Euclides Carlos Pinto Neto, Sajjad Dadkhah, Alireza Zohourian, Heather Molyneaux, and Ali A Ghorbani. *Ensemble-based intrusion detection for internet of things devices.* In 2022 IEEE 19th International Conference on Smart Communities: Improving Quality of Life Using ICT, IoT and AI (HONET), December 2022. Kennesaw State University, Marietta, Georgia.

**Poster Presentations:**

- **Priscilla Kyei Danso**, Euclides Carlos Pinto Neto, Sajjad Dadkhah, Alireza Zohourian, Heather Molyneaux, and Ali A Ghorbani. *Ensemble-based intrusion detection for internet of things devices.* 2022 19th Annual International Conference on Privacy, Security & Trust (PST), August 2022. Fredericton, New Brunswick, Canada.

## Awards and Scholarships

- Thirteenth Summer School on Formal Techniques + FMITF Bootcamp, sponsored by NSF, May 2024.
- CPS-IOT Week 2024 in Hong Kong, sponsored by NSF as a student travel award, April 2024.
- iMentor scholarship for ACM CCS conference in Copenhagen, Denmark, sponsored by NSF, November 2023.
- Academic Scholarship, University of New Brunswick, Faculty of Computer Science Funding, May 2021.
- Institute for Analytics and Data Science Summer School Scholarship, University of Essex, July 2020.
- Academic Scholarship, Newmont Ahafo Development Foundation (NADeF), September 2016.

## Peer Review and Artifact Review

**Peer Review for IEEE Internet of Things Journal**

- Conducted an in-depth review of a research paper on adversarial attacks and defenses in robotics.
- Provided constructive feedback on the paper's methodology, results, and its overall contribution to the field.
- Recommended revisions to enhance the clarity and impact of the paper.

**Artifact Review for the ACM Conference on Computer and Communications Security (CCS 2024)**

- Reviewed three artifacts focused on vision in autonomous vehicles, specification and verification of strong timing isolation, and OpenFlow package discovery forwarding.

- Assessed the technical merit, innovation, and potential impact of the artifacts.
- Evaluated and scored the artifacts based on their functional capabilities and usability.

## Work Experience

**United Nations World Food Programme, Data Analyst. Accra, Ghana** *Nov. 2020 - Apr. 2021*

- Created a Fleet Management System tailored to optimize operations for multiple pharmaceutical companies spanning all 16 West African countries, employing Microsoft Access.
- Conducted an in-depth assessment of the data integrity and accuracy within the Fleet Management System (FMS), additionally providing training sessions for staff on the effective utilization of the FMS system.

**Cobalt Partners, Web Developer Consultant. Accra, Ghana.** *Jul. 2020 - Mar. 2021*

- Contributed to the creation of an Enterprise portal that facilitates the growth and learning of more than 1599 children across 89 classrooms daily, while also supporting 217 jobs in the education sector. Technologies utilized include Laravel, VueJS, HTML, CSS and MySQL.
- Examined educational datasets using Google BigQuery and Microsoft PowerBI to extract valuable insights for informed business decision-making.

**Mesika Ghana, Data Scientist. Accra, Ghana.** *Aug. 2019 - Jun. 2020*

- Employed Pandas, Scikit-learn, and Plotly to analyze transaction data for over 1 million customers, implementing segmentation clustering algorithms and deriving valuable business insights.
- Implemented an ETL (Extract, Transform, Load) pipeline to optimize data storage and retrieval efficiency, leveraging Apache Flow, PostgreSQL, and conducting data analysis with MS Excel and PowerBI.
- Utilized Jenkins and Ansible to establish a continuous integration service, automating the entire development pipeline process.
- Collaborated with a team to create a visualization dashboard for customer transactions, employing HTML, Javascript, Python, and CSS.

**Ernst and Young Ghana, Intern. Accra, Ghana** *Apr. 2019 - Jul. 2019*

- Conducted analysis and visualization of ministerial data using Power BI and MS Excel, and concurrently drafted proposals and documentation.
- Performed comprehensive end-to-end testing of applications, evaluating fixes, features, and enhancements to identify and address aberrations.

**SuperTech Ghana, Software Developer. Accra, Ghana.** *Jan. 2018 - Mar. 2019*

- Created a document management system utilizing SharePoint, facilitating efficient organization and retrieval of documents.
- Designed custom reports within the Microsoft Dynamics ERP application to enhance the decision-making process for business operations.
- Addressed customer service problems promptly and accurately, adhering to company guidelines and fostering customer loyalty.

**IT Consortium, Assistant Programmer. Accra, Ghana** *Jun. 2016 - Dec. 2017*

- Coordinated and oversaw the completion of projects, while also offering technical support for the Ghana online passport application.
- Tracked tickets promptly and accurately through a project management system, employing triage and escalation processes as needed to the respective team leadership.
- Addressed customer service problems promptly and accurately, adhering to company guidelines and fostering customer loyalty.