

Aristide Tanyi-Jong Akem

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ABOUT ME

I am an early-stage researcher with skills in P4 programming, machine learning and mobile networks. My research contributes to the vision of next-generation self-driving networks by leveraging the opportunities provided by network programming and machine learning to enable in-network intelligence in the user plane. During my PhD, I have developed solutions for deploying machine learning models into P4-programmable hardware for line-rate inference in the user plane, with some outputs presented at top conferences like IEEE INFOCOM. I am currently looking for opportunities to expand the scope of my research by exploring other user-plane targets such as SmartNICs and FPGAs, and new technologies like eBPF.

EDUCATION

PhD - Telematics Engineering Mar 2021 - Sep 2024 (Expected)

Universidad Carlos III de Madrid (UC3M), Madrid, Spain

Masters - Electrical and Computer Engineering Aug 2019 - May 2020

Carnegie Mellon University Africa (CMU-Africa), Kigali, Rwanda

Masters - Telecommunications Engineering Sep 2013 - July 2018

University of Yaounde I (UYI), Yaounde, Cameroon

RESEARCH EXPERIENCE

IMDEA Networks Institute (Madrid, Spain) | PhD Student / Research Assistant Mar 2021 - Present

I am carrying out my PhD as a MSCA ITN Fellow within the Networks Data Science Group led by Prof. Marco Fiore. My research is on in-band network intelligence, with a focus on user-plane inference, within the EU H2020 project BANYAN. Our work has been presented at conferences like IEEE INFOCOM, IEEE MetaCom, and IEEE NetSoft.

Ranplan Wireless (Cambridge, UK) | Visiting Researcher Sep 2023 - Apr 2024

I visited Ranplan Wireless during the same period I was at the University of Cambridge, as part of the secondments of the BANYAN project. I also had a previous visit to Ranplan between October 2022 and February 2023.

University of Cambridge (Cambridge, UK) | Visiting PhD Student Sep 2023 - Feb 2023

I visited the Department of Computer Science and Technology under the supervision of Dr. Ian Wassell, as part of the secondments of my PhD program. During the visit, I researched more in-switch inference use cases. I also served as lab assistant for the the Digital Electronics undergraduate class. I also had a previous visit to the same institution between October 2022 and February 2023.

Orange Innovation Networks (Paris, France) | Visiting PhD Researcher Mar 2023 - Aug 2023

I visited the SMART team at Orange Innovation under Dr. Guillaume Fraysse, where we worked on encrypted traffic classification at line rate in programmable switches. The output of this work will be presented at the 2024 IEEE/IFIP Network Operations and Management Symposium (NOMS).

TEACHING EXPERIENCE

University of Cambridge (Cambridge, UK) | Laboratory Assistant Oct 2023 - Feb 2024

I assisted Dr. Ian Wassell in the Digital Electronics course. I supervised lab sessions, debugged issues with students' circuit implementations, and guided them on how to go about their labs.

Carnegie Mellon University Africa (Kigali, Rwanda) | Graduate Teaching Assistant Aug 2020 - Mar 2021

I assisted Prof. McSharry in 3 courses over 2 semesters. They include Data Inference and Applied Machine Learning, Data Analytics and Big Data Science. My job description included preparing and running recitation sessions, grading homework assignments, and holding office hours to answer the students' questions and help them with exercises.

OMEGA Learning Centre (Yaounde, Cameroon) | Mathematics Instructor Sep 2018 - May 2019

As a high school teacher, I prepared and delivered Mathematics lessons to students, producing excellent results. Full-time from September 2018 to January 2019 and then part time from January to May 2019.

INDUSTRY EXPERIENCE

Ministry of ICT and Innovation (Kigali, Rwanda) | *Data Science Intern*

May 2020 - Aug 2020

I performed data extraction, cleansing, wrangling, visualization, and analysis, using Python, to generate insights that facilitated the decision-making process.

Huawei Technologies Co. Ltd. (Yaounde, Cameroon) | *Intelligent Video Surveillance Engineer*

Jan 2019 - Jul 2019

I was part of the team that installed, configured and commissioned 351 street video surveillance camera sites in the city of Yaounde, under the Safe City Project of the National Police.

Cameroon Telecommunications, (Yaounde, Cameroon) | *Radio Access Network Engineer Intern*

Feb 2018 - Jun 2018

I designed a mobile video surveillance value-added service, dubbed CAMTEL4GSURV, over the 4G LTE access network of CAMTEL with two web applications to provide CCTV services to clients.

Orange Cameroon S.A., Cameroon | *Transmission Engineer Intern*

Jul 2017 - Sep 2017

I updated the microwave link database of the backhaul transport network of the telecom operator, comprising 1731 links, and redesigned the architecture of the backhaul transport network.

PUBLICATIONS

1. Aristide Tanyi-Jong Akem, Michele Gucciardo and Marco Fiore, "Ultra-Low Latency User-Plane Cyberattack Detection in SDN-based Smart Grids," *In ACM EnergySP'24*, June 2024. **(Accepted)** [PDF]
2. Aristide Tanyi-Jong Akem and Marco Fiore, "Towards Data-Driven Management of Mobile Networks through User Plane Inference," *In IEEE/IFIP NOMS*, May 2024. **(Accepted)** [PDF]
3. Aristide Tanyi-Jong Akem, Guillaume Fraysse and Marco Fiore, "Encrypted Traffic Classification at Line Rate in Programmable Switches with Machine Learning," *In IEEE/IFIP NOMS*, May 2024. **(Accepted)** [PDF]
4. Aristide Tanyi-Jong Akem, Beyza Bütün, Michele Gucciardo and Marco Fiore, "Jewel: Resource-Efficient Joint Packet and Flow Level Inference in Programmable Switches," *In IEEE INFOCOM*, May 2024. **(Accepted)** [PDF]
5. Aristide Tanyi-Jong Akem, Beyza Bütün, Michele Gucciardo and Marco Fiore, "Showcasing In-Switch Machine Learning Inference," (Demo) *In IEEE NetSoft*, June 2023. [PDF] **(Best Demo)**
6. Beyza Bütün, Aristide Tanyi-Jong Akem, Michele Gucciardo and Marco Fiore, "Fast Detection of Cyberattacks on the Metaverse through User-plane Inference," *In IEEE MetaCom*, June 2023. [PDF]
7. Michele Gucciardo, Aristide Tanyi-Jong Akem, Beyza Bütün and Marco Fiore, "Demonstrating Flow-Level In-Switch Inference," (Demo) *In IEEE INFOCOM*, May 2023. [PDF]
8. Aristide Tanyi-Jong Akem, Michele Gucciardo and Marco Fiore, "Flowrest: Practical Flow-Level Inference in Programmable Switches with Random Forests," *In IEEE INFOCOM*, May 2023. [PDF]
9. Aristide Tanyi-Jong Akem, Beyza Bütün, Michele Gucciardo, and Marco Fiore, "Henna: Hierarchical Machine Learning Inference in Programmable Switches," *In NativeNI*, December 2022. [PDF]
10. Aristide Tanyi-Jong Akem and Edwin Mugume, "A Machine Learning Approach to Temporal Traffic-Aware Energy-Efficient Cellular Networks," *In IEEE UEMCON*, October 2020. [PDF]

TALKS

- Machine Learning Inference in Programmable Switches with Random Forests - *BANYAN project summer school*, 26/05/2023.
- Practical Flow-Level Inference in Programmable Switches with Random Forests - *IMDEA Networks seminar series*, 03/05/2023.
- In-Network Machine Learning for Automatic Network Management - *UC3M Thesis Talk 2022*, 04/07/2022.
- An Introduction to In-Band Network Intelligence - *IMDEA Networks seminar series*, 03/11/2021.

COMMUNITY SERVICE

- Shadow program committee member: EuroSys 2024 conference
- Program committee member: ACM S3 2023 Workshop, co-located with ACM MobiCom 2023
- Publication chair: Passive and Active Measurement - PAM 2023 conference
- Reviewer: IEEE/ACM Transactions on Networking

- Reviewer: IEEE GLOBECOM 2024
- Reviewer: IFIP Networking 2024
- Reviewer: IEEE INFOCOM 2024
- Reviewer: IEEE SECON 2023
- Reviewer: IFIP Networking 2023
- Reviewer: IEEE VNC 2023
- Reviewer: WoWMoM 2022.

AWARDS

- ACM SIGENERGY Student Travel Grant, *ACM e-Energy 2024*, April 2024
- IEEE ComSoC Student Travel Grant, *IEEE/IFIP NOMS 2024*, April 2024
- Best Demo Award, *IEEE NetSoft 2023*, June 2023
- Marie Skłodowska-Curie Grant for PhD Studies, *European Commission*, March 2021
- Dean's Fellowship for Master's Studies, *Carnegie Institute of Technology*, July 2019

LANGUAGES

- English: Fluent
- French: Fluent
- Spanish: Beginner

TECHNICAL SKILLS

Network Programming	Over 3 years experience writing P4 code for targets like BMv2 & Intel Tofino ASICs.
Data Analytics	Proficient in several Python data science packages like Pandas, Numpy, Sklearn, and Keras.
Computer languages/ systems	Regular use of Windows and Linux operating systems and intermediate C programming.
Web application tools	Proficient in HTML5, CSS3, and WordPress
Database management	1 year experience with SQL databases interacting with web applications.
Signal Processing & Simulations	Proficient in running wireless network simulations in MATLAB.

REFERENCES

Marco Fiore,

Research Professor, IMDEA Networks Institute, Spain,
marco.fiore@imdea.org

Ian J. Wassell,

Senior Lecturer, University of Cambridge, United Kingdom,
ijw24@cam.ac.uk

Guillaume Fraysse,

Researcher, Orange Innovation Networks, France,
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