AMIR ALI POUR | PhD

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Summary

Ph.D. in Nanoelectronics and Cybersecurity with 6+ years of research experience in machine learning, distributed systems, cyber-security, and cryptography. Proven track record of system design, academic publications, and teaching. Passionate about building privacy-preserving, scalable AI systems for real-world constrained environments.
Research Interests: Federated Learning, Edge Intelligence, Distributed Machine Learning, Mixture of Experts, Secure Inference, Secure and Privacy-Preserving AI.

Experience

- **École de Technologie Supérieure | Cloud-to-Edge laboratory [🌐]** *October 2025 - Present*
  Adjunct Professor Montreal (Remote), Quebec, Canada
  - Investigating Security Flaws and Solutions for Authentication and Authorization protocols in Agentic AI systems (**OAuth 2 in MCP & A2A**).
  - Continuing Research on Solutions to Optimize Performance of **Privacy Preserving Federated Learning**.
  - Investigating Distributed Computing models for Agentic AI Ecosystems through **Mixture of Experts**.

- **TandemLaunch [🌐]** *August 2025 – October 2025*
  Entrepreneur in Residence Montreal, Quebec, Canada
  - Researched and evaluated deep-tech IP for commercialization.
  - Worked on LLM inference optimization for constrained systems using **mixture-of-experts** and **operation fusion** for state-space models.
  - Designed venture concepts and business models from university technologies.

- **École de Technologie Supérieure | Cloud-to-Edge laboratory [🌐]** *Sept 2023 - Sept 2025*
  Lecturer & Postdoctoral Researcher Montreal, Quebec, Canada
  - Designed, developed, and collaboratively coordinated multiple research projects which resulted in peer-reviewed publications in notable conference and journals including IEEE IoTJ, IEEE IPDPSW, IEEE ICDCSW, IEEE CCGRID, and IEEE ACSOS.
  - Served as **Organizational Chair** of a colloquium at the **Acfas 92 Congress**, focusing on the synergy between Artificial Intelligence and Software Engineering.
  - Delivered a lecture titled *Federated Learning: Fundamentals, Challenges, and Opportunities*.
  - Designed and currently teach a **6-credit project-based course** on IoT solution development. The course centers on building a robust and secure facial recognition service for real-time user authentication and attendance tracking.

- **SGS-Brightsight [🌐]** *Feb 2023 – Sept 2023*
  Hardware Security Evaluator Delft, The Netherlands
  - Co-authored a journal paper for IACR's *CIC* on the performance of a **leakage-free deep learning-based side-channel attack** against AES.
  - Identified and reported vulnerabilities through EM and power side-channel analysis of cryptographic microchips.

- **Grenoble Alpes University | LCIS Laboratory [🌐]** *Oct 2019 – Dec 2022*
  Research and Teaching Assistant Valence, Rhône-Alpes, France
  - Performed machine learning-based modeling and evaluation of Physically Unclonable Functions (PUFs).
  - Simulated cryptographic systems using MATLAB and Python.
  - Programmed embedded systems using Embedded C.
  - Designed digital hardware systems using VHDL for FPGAs.
  - Published several IEEE journal and conference papers.

◦ Presented research at international conferences such as ISVLSI, ISQED, and ICCAD.

- **Clemson University | IS-WIN Lab [🌐]** *Nov 2021 – Mar 2022*
  Visiting PhD Student and Researcher Clemson, South Carolina, USA
  ◦ Conducted ML-based modeling and evaluation of Physically Unclonable Functions (PUFs).
  ◦ Designed a lightweight authentication and key-exchange protocol for PUF-enabled constrained systems.
  ◦ Simulated cryptographic systems using MATLAB and Python.
  ◦ Published a conference paper accepted at ISVLSI 2022.
  ◦ Organized the TEPN workshop for the DCOSS 2022 conference.

- **Grenoble INP | LCIS Laboratory [🌐]** *Feb 2019 – Jul 2019*
  Research Intern Valence, Rhône-Alpes, France
  ◦ Performed deep learning-based side-channel analysis of the AES algorithm.
  ◦ Studied differential power analysis using machine learning techniques.
  ◦ Published an IEEE conference paper accepted at DATE 2020.

- **Karina Mobile Solutions** *2016 – 2017*
  Video Game Developer (Part-time) Tehran, Iran
  ◦ Developed gameplay mechanics and tools using Unity3D.
  ◦ Ported and tested video games for the Android platform.

- ***Spooky Guys* Indie Game Development Team** *2011 – 2012 & 2013 – 2015*
  Founder and Technical Lead Tehran, Iran
  ◦ Designed and implemented gameplay features for 2D games.
  ◦ Developed custom level design tools (Spooky2D).

- **Medrick Game Studio** *2012 – 2013*
  Video Game Developer (Part-time) Tehran, Iran
  ◦ Developed mobile video games using Unity3D.

Recent Projects

- **FEDORA** *2025*
  C2E Lab, ÉTS, Montreal, Canada Collaborators: Sangrez Khan, Marios Avgeris, Aris Leivadeas, Julien Gascon-Samson
  ◦ A federated ensemble reinforcement learning framework for directed acyclic graph (DAG)-based task Offloading and resource allocation in MEC environments, that integrates twin delayed deep deterministic policy gradient (TD3) for continuous resource allocation and multi-head deep Q-networks (DQN) for discrete offloading decisions.

- **FlagSwap** *2025*
  C2E Lab, ÉTS, Montreal, Canada Collaborators: Sadra Bekrani, Laya Samizadeh, Julien Gascon-Samson
  ◦ A meta-heuristic optimizer for aggregation placement in SDFLMQ. FlagSwap employs particle swarm optimization (PSO) as a black-box method to optimize the assignment of aggregation tasks to client devices, with the objective of minimizing total processing time during each round of federated learning.

- **SDFLMQ** *2024 – 2025*
  C2E Lab, ÉTS, Montreal, Canada Collaborators: Julien Gascon-Samson
  ◦ A federated learning framework designed for resource-constrained user-end and edge devices. SDFLMQ implements a semi-decentralized hierarchical aggregation model and integrates dynamic task scheduling, clustering, and aggregation placement optimization to improve communication efficiency and scalability.

- **PECMQ** *2024*
  C2E Lab, ÉTS, Montreal, Canada | University of Toronto Collaborators: Julien Gascon-Samson, Cassie Li
  ◦ A secure communication methodology over MQTT that enables private, encrypted message exchange. PECMQ leverages Physically Unclonable Function (PUF)-based key generation and machine learning models of PUFs to reverse engineer challenge values, enabling symmetric key exchange via a trusted coordinator. Designed to support fast, MQTT-native secure communication for the SDFLMQ framework.

- **MQTTFC** *2023 – 2024*

  C2E Lab, ÉTS, Montreal, Canada Collaborators: Julien Gascon-Samson

  ◦ A lightweight Remote Procedure Call (RPC) layer built on top of MQTT's publish/subscribe model. MQTTFC facilitates real-time monitoring and execution of remote procedures between connected clients, providing a fast, MQTT-native communication backbone for both PECMQ and SDFLMQ.

- **MQTT2EdgePeer** *2023 – 2024*

  C2E Lab, ÉTS, Montreal, Canada Collaborators: Saeed Rahmani, Camille Coti, Julien Gascon-Samson

  ◦ A lightweight network overlay to support publish/subscribe communication via MQTT protocol in broker-less interconnected ecosystem based on P2P communication model. MQTT2EdgePeer supports MQTT-based communication via direct-dispatching and guided-dispatching of publisher and subscriber data to nodes that are elected to act as interim brokers in the P2P-based ecosystem of interconnected devices.

EDUCATION

- **Grenoble Alpes University** *Oct 2019 - Dec 2022*

  PhD in Nanoelectronics and Nanotechnology Valence, France

  ◦ Dissertation: PUF Utilization with Machine Learning for Resource Constrained Cyber-Physical Systems

  ◦ Advisors: Dr. David Hely, Prof. Vincent Beroulle, Dr. Giorgio Di Natale

- **Grenoble INP** *Sept 2018 - Sept 2019*

  Master in Embedded Systems Security and Trust Valence, France

  ◦ Internship: Side Channel Analysis of AES encryption using deep learning

  ◦ Advisor: Dr. David Hely

- **Azad University of Tehran (South branch)** *Sept 2011 - Sept 2016*

  Bachelor of Science in Computer Software Engineering Tehran, Iran

  ◦ Project: Procedural Content generation for 3D environment design using Unity3D

TEACHING AND SUPERVISION

- **Ecole de Technologie Superieure (ETS)[🌐]** *2025 - present*

  Montreal,Quebec, Canada

  ◦ Teaching a project-based course titled *realization of an internet of things solution* (Course No. IND520)

  ◦ Delivered a lecture titled *Federated Learning: Fundamentals, Challenges, and Opportunities*.

  ◦

  Grenoble INP Esisar [🌐] *2019 - 2022*

  Valence, Rhone Alpes, France

  ◦ Taught a class on theories of Physically Unclonable Function.

  ◦ Lab instructor of Realtime Operating Systems course.

  ◦ Lab instructor of System on Chip course.

  ◦ Lab instructor of Side Channel Analysis course.

  ◦ Lab instructor of Hardware design with VHDL course.

  ◦ Supervisor of a project for the innovative project campaign in 2019 comprising three graduate students.

  ◦ Supervisor of two undergraduate projects comprising a total of four undergraduate students.

  ◦ Developed teaching materials, quizzes, and projects for a class on theories of Physically Unclonable Functions. The materials were contributions also to a European project called EMNESS.

SKILLS

- **Programming Languages:** Python, C#.Net, C++, MATLAB, JavaScript
- **Data Science & Machine Learning:** Pytorch, Tensorflow, Hugging Face, Weights&Biases
- **Edge/Cloud Technologies:** MQTT, Docker, Kubernetes
- **DevOps & Version Control:** Github
- **Specialized Area:** Hardware design with VHDL
- **Mathematical & Statistical Tools:** MATLAB
- **Other Tools & Technologies:** Unity3D

Honors and Awards

- **Scholarship of Excellence** *Oct 2019*
  Grenoble Alpes University
  ◦ Awarded a scholarship of Excellence from IDEX to pursue my PhD studies at Grenoble Alpes University

- **Scholarship of Excellence** *Sept 2018*
  Grenoble INP
  ◦ Awarded 8000 € scholarship of Excellence from IDEX to pursue my master's program in Grenoble INP

Certifications

MITX : EDX verified Machine Learning with Python-From Linear Models to Deep Learning December 2020
Microsoft Azure: Azure AI Fundamentals May 2025

PROFESSIONAL SERVICE

- **Co-Organizer** *May 5 - 9 2025*
  Colloquium on the Synergy between software engineering and Artificial Intelligence, 92nd Acfas Congeres [🌐]
  ◦ Part of the committee in selecting and evaluating keynote presentations and posters for the colloquim.
  ◦ Handling the Logistics and organization of the colloquim.

- **TPC member** *January 6 - 10 2025*
  Workshop on Machine Intelligence in Networked Data and Systems (MINDS), COMSNETS conference [🌐]
  ◦ Part of the committee to review scientific papers.

- **TPC member** *July 20 - 23 2025*
  Workshop on Engineering Techniques for Distributed Computing Continuum Systems (EDCCS), ICDCS conference [🌐]
  ◦ Part of the committee to review scientific papers.

- **Web chair** *May 30 - June 02 2022*
  Workshop on Test and Evaluation of Programmable Networks, DCOSS conference [🌐]
  ◦ Developed and maintained a website for the workshop

- **Student co-lead Organizer** *November 9 - 11, 2021*
  Applied research Competition, Cybersecurity Awareness Weekend (CSAW) in Europe [🌐]
  ◦ Part of the committee in selecting and evaluating competition candidates
  ◦ Organized Poster and Technical presentations

- **Student lead Organizer** *November 9 - 11, 2020*
  Applied research Competition, Cybersecurity Awareness Weekend (CSAW) in Europe [🌐]
  ◦ Part of the committee in selecting and evaluating competition candidates
  ◦ Organized Poster and Technical presentations

- **Peer Reviewer** *2021 - present*

  ◦ Computer Networks
  ◦ Sustainable Computing: Informatic and Systems
  ◦ Journal of Cloud Computing
  ◦ IEEE Access
  ◦ COMSNETS MINDS workshop
  ◦ ICDCS EDCCS workshop
  ◦ INFOCOM
  ◦ IEEE WCNEE
  ◦ Ad-Hoc Networks
  ◦ IEEE COINS

Additional Information

Languages: Persian (Mother Language), English (Fluent), French (Intermediate)
Interests: Machine Learning, Distributed Computing, Data Privacy, Computer Security, Constrained Systems

PUBLICATIONS

C=CONFERENCE, J=JOURNAL, P=PATENT, S=IN SUBMISSION, W=WORKSHOP

[J.1] Lichao Wu, et al. (2024). **Breaking Free: Leakage Model-free Deep Learning-based Side-channel Analysis**. Archived in 2024

[J.2] Wu, L., Rezaeezade, A., Ali-pour, A., Perin, G. and Picek, S., 2024. **Leakage Model-flexible Deep Learning based Side-channel Analysis.** *IACR Communications in Cryptology, 1(3).* DOI: doi.org/10.62056/ay4c3txol7

[J.3] Amir Ali-Pour, et al. (2022). **Helper Data Masking for Physically Unclonable Function-Based Key Generation Algorithms**. In *IEEE Access*, vol. 10, pp. 40150-40164. IEEE. 2022. DOI: 10.1109/ACCESS.2022.3165284

[J.4] Amir Ali-Pour, et al. (2022). **Strong PUF Enrollment with Machine Learning: A Methodical Approach**. In *MDPI: Electronics*, 11(4), 653. MDPI. Feb 2022. DOI: 10.3390/electronics11040653

[J.5] Sangrez Khan, Amir Ali Pour, Marios Avgeris, Julien Gascon-Samson, Aris Leivadeas. (2025). **FEDORA: Federated Ensemble Reinforcement Learning for DAG-Based Task Offloading and Resource Allocation in MEC**. In *Internet of Things Journal (IoTJ)*, 11(4), 653. IEEE. July 2025. DOI: 10.1109/JIOT.2025.3596467

[W.1] Ali Pour, A., Hely, D., Beroulle, V. and Di Natale, G., 2020, March. **Power of prediction: Advantages of deep learning modeling as replacement for traditional PUF CRP enrollment.** In *TrueDevice2020.*

[W.2] Ali-Pour, A. and Gascon-Samson, J., 2024, July. **PECMQ: Private and Encrypted Communications in IoT Systems Using PUFs and MQTT.** In 2024 *IEEE 44th International Conference on Distributed Computing Systems Workshops (ICDCSW) (pp. 64-74). IEEE.* DOI: 10.1109/ICDCSW63686.2024.00017

[W.3] Amir Ali-Pour, Julien Gascon-Samson. (2025). **SDFLMQ: A Semi-Decentralized Federated Learning Framework over MQTT**. Accepted in *IPDPS: Workshop on on Parallel AI and Systems for the Edge (PAISE)*, IEEE

[C.1] Rahmani, S., Ali-Pour, A., Coti, C. and Gascon-Samson, J., 2024, May. **MQTT2EdgePeer: A robust and scalable brokerless peer-to-peer edge middleware for topic-based publish/subscribe.** In 2024 *IEEE 24th International Symposium on Cluster, Cloud and Internet Computing (CCGrid) (pp. 419-424). IEEE.* DOI: 10.1109/CCGrid59990.2024.00054

[C.2] Amir Ali-Pour, et al. (2022). **Secure PUF-based Authentication and Key Exchange Protocol using Machine Learning**. In *IEEE Computer Society Annual Symposium on VLSI (ISVLSI)*, pp. 386-389. IEEE. 2022, Nicosia, Cyprus. DOI: 10.1109/ISVLSI54635.2022.00086

[C.3] Amir Ali-Pour, et al. (2022). **An Efficient Approach to Model Strong PUF with Multi-Layer Perceptron using Transfer Learning**. In *23rd International Symposium on Quality Electronic Design (ISQED)*, Santa Clara, CA, USA, 2022, pp. 1-6. DOI: 10.1109/ISQED54688.2022.9806257

[C.4] Ali-Pour, A., Hely, D., Beroulle, V. and Di Natale, G., 2022, April. **Sub-space modeling: an enrollment solution for xor arbiter puf using machine learning.** In 2022 *23rd International Symposium on Quality Electronic Design (ISQED) (pp. 1-1). IEEE.* DOI: 10.1109/ISQED54688.2022.9806267

[C.5] Amir Ali-Pour, et al. (2022). **Elaborating on Sub-Space Modeling as an Enrollment Solution for Strong PUF**. In *18th International Conference on Distributed Computing in Sensor Systems (DCOSS)*, pp. 394-399. IEEE. 12 September 2022, Marina del Rey, Los Angeles, CA, USA. DOI: 10.1109/DCOSS54816.2022.00069

[C.6] Amir Ali-Pour, et al. (2020). **PUF Enrollment and Life Cycle Management: Solutions and Perspectives for the Test Community**. In *IEEE European Test Symposium (ETS)*, pp. 1-10. IEEE. 02 July 2020, Tallinn, Estonia. DOI: 10.1109/ETS48528.2020.9131578

[C.7] Francesco Ragazzoni, et al. (2020). **Machine learning and hardware security: challenges and opportunities**. In *ICCAD '20: Proceedings of the 39th International Conference on Computer-Aided Design*, vol. pp. 1-6. Association for Computing Machinery. 2 November 2020, Virtual Event, USA. DOI: 10.1145/3400302.3416260

[C.8] Amir Ali-Pour, et al. (2020). **On the Performance of Non-Profiled Differential Deep Learning Attacks against an AES Encryption Algorithm Protected using a Correlated Noise Generation based Hiding Countermeasure**. In *Design, Automation and Test in Europe (DATE)*, pp. 614-617. IEEE. 15 June 2020, Grenoble, France. DOI: 10.23919/DATE48585.2020.9116387

[C.9] Amir Ali-Pour, Sadra Bekrani, Laya Samizadeh, Julien Gascon-Samson. (2025). **FLAg-SwaP: Distributed Federated Learning Aggregation using Particle Swarm-based Placement**. Accepted in IEEE ACSOS 2025.

REFERENCES

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