Houssam HAJJ HASSAN

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Paris, France

AUTONOMOUS & AI-DRIVEN SYSTEMS ENGINEER

Engineer in autonomous systems with 5+ years of experience designing self-adaptive, ML-driven IoT systems that support QoS requirements under dynamic conditions. Proven track record in designing hybrid AI solutions (causal learning, RL, planning) and deployable infrastructures spanning Edge-Cloud environments.

EXPERIENCE

- **R&D Engineer** — November 2025 – Châtillon, France
  Orange Innovation
  - Deploying LLM-driven intelligent perception modules for robotic swarms.
  - Designing LLM-assisted optimization mechanisms for 6G wireless communication in industrial IoT environments.
  - Leading research for the CANCUN ANR project, enabling efficient and sustainable IIoT communication (in collaboration with National Taiwan University).

- **Postdoctoral Researcher** — January 2025 – October 2025
  Télécom SudParis — Évry, France
  - Technical lead and main contributor for the PANDORA EU project for developing scalable and trustworthy AIoT pipelines.
  - Designed causal-based approaches for synthetic IoT data generation supporting ML robustness.
  - Developed frameworks for adaptive ML model distribution across heterogeneous Edge-Cloud infrastructures.
  - Mentored junior researchers (PhD and MSc) in autonomous systems and experimental research.

- **PhD Researcher** — November 2021 – December 2024
  Télécom SudParis — Évry, France
  - Designed and implemented hybrid AI frameworks enabling proactive self-adaptation in dynamic IoT systems.
  - Designed and implemented a Causal Reinforcement Learning approach for proactive decision-making in autonomous IoT systems.
  - Designed and implemented an adaptive IoT data flow management framework leveraging AI Planning and Reinforcement Learning.
  - Mentored junior researchers (MSc) in autonomous systems and experimental research.

- **Research Intern** — April 2021 – October 2021
  Télécom SudParis — Évry, France
  - Developed a Java-based simulation tool for performance evaluation of IoT data exchange.
  - Optimized IoT data flow performance using AI planning methodologies.

- ***Telecommunications Engineering Intern*** — May 2019 – July 2019
  Dar Al-Handasah (Shair & partners) — Beirut, Lebanon
  - Conducted network analysis and optimization for telecom infrastructures.

EDUCATION

- **Institut Polytechnique de Paris (IP Paris)** — 2021 – 2024
  Ph.D. in Computer Science **(with honors)** — Paris, France
  - Thesis: Enabling Autonomous IoT Systems: A Middleware-based Hybrid AI Approach to Self-adaptation

- **Lebanese University** — 2020 – 2021
  M.S. in Information Systems and Data Intelligence **(ranked first)** — Beirut, Lebanon

- **American University of Beirut (AUB)** — 2016 – 2020
  B.E. in Computer and Communications Engineering **(with distinction)** — Beirut, Lebanon

SELECTED PROJECTS

- **SPARQ: A QoS-Aware Framework for Mitigating Cyber Risk in Self-Protecting IoT Systems**
  - SPARQ leverages Attack Graphs for analyzing the cyber exposure of IoT systems, and AI planning methodologies to optimize QoS performance in dynamic systems.
  - SPARQ significantly reduces the cyber risk while also **improving the QoS performance by 35%**.
  - SPARQ received the **Best Paper Award** at ACM/IEEE SEAMS 2025.
- **PlanEMQX: A Message Broker for Adaptive Data Exchange in the IoT**
  - PlanEMQX is an AI-enabled message broker for adaptive data exchange in dynamic distributed systems, deployed in a multi-node IoT environment using `Docker` and `Mininet`.
  - PlanEMQX **reduces latency by 20%** for time-sensitive data flows.
  - PlanEMQX received the **Distinguished Artifact Award** at IEEE ICSA 2024.
- **CRAFTER: Causal Reinforcement Learning for Autonomous IoT Systems**
  - CRAFTER enables causality-based adaptation for self-adaptive IoT systems.
  - CRAFTER leverages `causal-learn` and `PyTorch` to proactively adapt IoT systems to changes.
  - CRAFTER is deployed using `Docker` and `Mininet` across 5 nodes and 100 IoT devices.

TECHNICAL SKILLS

- **Programming:** Python, Java, C++
- **Machine Learning & AI:** Scikit-learn, PyTorch, Causal-learn, LLM fine-tuning & deployment
- **Network Simulators:** Mininet, Sionna
- **Reinforcement Learning & Planning:** PDDL, Gymnasium, Stable-Baselines
- **Systems:** Ubuntu, Kubernetes, Docker, Git, CI/CD

SELECTED SCIENTIFIC PUBLICATIONS

[1] **H. Hajj Hassan**, A. Kattepur, D. Conan, G. Bouloukakis. "CRAFTER: Causality-based Self-Adaptation for Autonomous IoT Systems". *The 21st International Conference on Software Engineering for Adaptive and Self-Managing Systems (SEAMS 2026, ranked A in CORE).*

[2] C. Badolato, N. Samson, **H. Hajj Hassan**, C. Huang, G. Bouloukakis, P. Pappachan, R. Yus. "PSMark: A Distributed IoT Benchmark for Publish/Subscribe Under Domain-Based Workloads". *The 24th International Conference on Pervasive Computing and Communications (PerCom 2026, ranked A* in CORE).*

[3] A. Palma, **H. Hajj Hassan**, G. Bouloukakis. "SPARQ: A QoS-Aware Framework for Mitigating Cyber Risk in Self-Protecting IoT System". *The 20th International Conference on Software Engineering for Adaptive and Self-Managing Systems (SEAMS 2025, ranked A in CORE).* **Best Paper Award.**

[4] **H. Hajj Hassan**, G. Bouloukakis, L. Scalzotto, N. Khaled, D. Conan, A. Kattepur, D. Belaïd. "A Message Broker Architecture for Adaptive Data Exchange in the IoT". *The 21th International Conference on Software Architecture (ICSA 2024, ranked A in CORE).* **Distinguished Artifact Award.**

[5] **H. Hajj Hassan**, G. Bouloukakis, A. Kattepur, D. Conan, D. Belaïd. "PlanIoT: A Framework for Adaptive Data Flow Management in IoT-enhanced Spaces". *The 18th International Symposium on Software Engineering for Adaptive and Self-Managing Systems (SEAMS 2023, ranked A in CORE).*

Full list available on Google Scholar.

LANGUAGES

French (fluent), English (fluent)

REFERENCES

References are available on request.