AMINE BARRAK

Ph.D. in Computer Science, University of Quebec

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EDUCATION

PhD student in Computer Science September 2021- July 2024
University of Québec, Québec, Canada.

- *Thesis: "Optimized Training and Enhanced Resilience in Distributed ML: A Serverless Peer-to-Peer Architectural Approach".*
- *Research area: Distributed ML on Serverless Computing*
- *Current GPA: 3.65/4.0*
- *Awards: Tuition Fee Exemption Scholarship*

MSc in software engineering September 2016- January 2019
Polytechnique Montréal, Montréal, Québec, Canada.

- *Thesis: "Just-in-time detection of protection-impacting changes on WordPress and MediaWiki"*
- Research area: Security Vulnerabilities of Privilege Protection Changes
- GPA: 3.80/4.0
- *Awards: Tunisia National Excellence Scholarship*

TEACHING EXPERIENCE

Lecturing Professor Summer 2022 / Summer 2024
University of Québec, Department of Computer Science and Mathematics

- Cryptography (8INF854) - Graduate Students - Summer 2024 (54 students), Summer 2022 (17 students)
  - Explored cryptographic protocols and practical applications. Topics included advanced concepts such as quantum cryptography and elliptic curve cryptosystems.

- Cloud Computing (8CLD202) - Undergraduate Students (Bachelor Degree) - Fall 2023 (22 students)
  - Taught cloud infrastructure, technologies such as Kubernetes and Docker, CI/CD processes, IaaS, PaaS, SaaS, and Infrastructure as Code (IaC), including cloud-based machine learning applications.

- Cloud System Design/Architecture (8INF876) - Graduate Students - Fall 2023, Fall 2022 (60 students)
  - Delivered lectures on distributed system design and architecture, covering system models, communication protocols, and Web Services (REST, GraphQL, SOAP).

- Recognized by the Department for teaching excellence, leading to an extended teaching engagement after a successful evaluation over two academic sessions.
- Completed a certified training on "Teaching Pedagogy"

Teaching Assistant Winter 2023 / Summer 2023
University of Québec, Department of Computer Science and Mathematics

- Computer Science and Industry 4.0 (8INF406) - Summer 2023
  - Assisted in a course that explored the impact of Industry 4.0 on manufacturing, focusing on digital transformation, data security, IoT, AI, and the critical role of computer science in operational efficiencies and service delivery innovations.

- Advanced Web Technologies (8INF345) - Winter 2022
  - Supported teaching advanced web technologies, including client and server-side programming, web security, and the integration of commercial web services

PROFESSIONAL EXPERIENCE

IoT Data Analysis / ML & Cloud Internship December 2022 – July 2024
Mitacs Internship, IdeoConcept Inc
Project: IoT Devices and Data Analysis for Machine Learning Purposes
- Analyzed IoT data for ML applications.
- Proposed cloud architecture solutions.
- Explored multi-cloud strategies to ensure data redundancy, resilience, and availability.

AI for fair and diverse Hiring Initiative Juin 2022 – December 2022
CTO, DIVRSE inc.
Projet: AI-Driven Engine for Fair and Diverse Recruitment Processes
- Developed an AI-powered tool to optimize diverse hiring practices.
- Contacted and negotiated with companies to use their APIs, integrating these with our strategic approach.
- Recruited and led a dynamic team to work on the platform development.

NLP on Archaeological Data Internship September 2021 – January 2022
Research & Development, ÉTS Montréal.
Project: Textual Analysis of PDFs and Unsupervised Grouping of Textual Documents
- Extracted and cleaned data from PDFs.
- Applied unsupervised clustering algorithms.
- Developed a website for automating clustering steps.

ML on Time Series dataset Internship April 2021 – September 2021
Research & Development, CRIM Inc.
Project: Analysis of Energy Consumption and Network Traffic of Compromised IoT Devices
- Analyzed energy and network traffic datasets.
- Classified compromised IoT devices.
- Identified impactful metrics.

NLP & BERT Fine-tuning Internship July 2020- March 2021
Research & Development, Airudi Inc.
Project: Matching Resumes with Job Descriptions
- Extracted and cleaned data from PDFs.
- Applied unsupervised clustering algorithms.
- Developed a website for automating clustering steps.

ML Pipeline Evolution Internship February 2020- September 2020
Research Assistant, Polytechnique Montréal
Project: ML Tracking and Co-evolution with Source Code Artifacts
- Explored DVC tools in ML pipelines.
- Classified open-source files.
- Tracked ML pipeline complexity evolution.

ML Build Failure Internship January 2019- September 2020
Research Assistant, Polytechnique Montréal
Project: Study and Analysis of Build Failures
- Handled imbalanced data.
- Analyzed code/test smells in open-source software.
- Developed models for predictions.
- Ranked metrics in ML models.

ACADEMIC AWARDS AND GRANTS

- Tuition Fee Exemption Scholarship (University of Québec) 2021- 2024
- Best research paper award (Cascon x Evoke conference) November 2018

- Tunisia National Excellence Scholarship (Govt. of Tunisia) 2016- 2019

PROFESSIONAL AFFILIATIONS MEMBER

- *Institute of Electrical and Electronics Engineers (IEEE)* *2018 - Present*
- *Association for Computing Machinery (ACM)* *2018 - Present*
- *AÉCSP Polytechnique Graduate Student Association* *2017 - 2019*
- *MAGE-UQAC Student member* *2022 - Present*

TECHNICAL SKILLS

- **Data Processing and Machine Learning :** Pandas, Numpy, Seaborn, Scikit-learn
- **Deep Learning Frameworks:** Pytorch, Tensorflow, Keras
- **Programming languages:** Python, Java, Go, C++ , C#, Javascript
- **Database Development:** PL/SQL, NoSQL
- **Big Data Framework :** Hadoop , spark, kafka
- **Full Stack Development Frameworks:** Django, Angular, .NET, Jhipster, ReactJs and SpringBoot
- **Testing:** JUnit, Mockito, Selenium
- **Methodologies & Practices:** Agile (Scrum), SOLID principles
- **Cloud, DevOps & CI/CD:** AWS, Docker, Git, Jenkins, Kubernetes, Terraform, Ansible

COMMUNITY ENGAGEMENT AND SERVICE ACTIVITIES

Program Committee Member

- Conference: IEEE International Conference on Software Security and Reliability (QRS) 2024

External Reviewer

- Conference: IEEE International Conference on Software Security and Reliability (QRS), 2021-2023
- Conference: International Conference on Software Engineering (ICSE), 2020

Conferences Volunteering and Organizational Experience

- Journée Cyberdéfense Desjardins at the University of Quebec, 2024
- International Conference on Software Engineering (ICSE), 2019, 2022
- Software Engineering for Machine Learning Applications (SEMLA), 2018-2020

PUBLICATIONS

Journal Papers

1. **A. Barrak,** R. Trabelssi, F Petrillo, F Jaafar. "Advancing Serverless ML Training Architectures via Comparative Approach." IEEE Transactions on Parallel and Distributed Systems **(TPDS 2024)**. (Under Review)
2. **A. Barrak**, F Petrillo, F Jaafar. "Serverless on Machine Learning: A systematic mapping study." **(IEEE Access 2022)**.
3. **A. Barrak**, Amine, Ellis E. Eghan, and Bram Adams. "Why do builds fail?—A conceptual replication study." 2021 Journal of Systems and Software **(JSS 2021)**.

Conferences

1. **A. Barrak**, G. FOFE, E. KOUAM, L. MACKOWIAK and Fehmi JAAFAR"Securing AWS Lambda: Advanced Strategies and Best Practices". **(CSCLOUD 2024)** (Under Review)
2. **A. Barrak**, M Jaziri, R Trabelsi, F Jaafar, F Petrillo. "SPIRT: A Fault-Tolerant and Reliable Peer-to-Peer Serverless ML Training Architecture." 2023 IEEE 23rd International Conference on Software Quality, Reliability and Security. **(QRS 2023)**.
3. **A. Barrak**, R Trabelsi, F Jaafar, F Petrillo. "Exploring the Impact of Serverless Computing on Peer To Peer Training Machine Learning." IC2E 2023 11th IEEE International Conference on Cloud Engineering. **(IC2E 2023)**.

4. **A. Barrak**, Amine, Ellis E. Eghan, and Bram Adams. "On the Co-evolution of ML Pipelines and Source Code-Empirical Study of DVC Projects." 2021 IEEE International Conference on Software Analysis, Evolution and Reengineering **(SANER 2021)**.
5. F. Jaafer, D. Amayed, **A. Barrak** and M. Cheriet, "Identification of Compromised IoT Devices: A Combined Approach Based on Energy Consumption and Network Traffic Analysis" 2021 IEEE International Conference on Software Quality, Reliability and Security **(QRS 2021)**.
6. **A. Barrak**, Amine, et al. "Just-in-time detection of protection-impacting changes on WordPress and MediaWiki." Proceedings of the 28th Annual International Conference on Computer Science and Software Engineering. **CASCON 2018** - *Best student paper award*.
7. N. Ghrairi, S. Kpodjedo, **A. Barrak**, F. Petrillo and F. Khomh, "The State of Practice on Virtual Reality (VR) Applications: An Exploratory Study on Github and Stack Overflow," 2018 IEEE International Conference on Software Quality, Reliability and Security **(QRS 2018)**.

Posters and Short Papers

1. **A. Barrak.** "Best Practices for Scalable and Efficient Distributed Machine Learning with Serverless Architectures" The 38th IEEE International Parallel & Distributed Processing Symposium (**IPDPS 2024**)
2. **A. Barrak.** "Incorporating Serverless Computing into P2P Networks for ML Training: In-Database Tasks and Their Scalability Implications (Student Abstract)." The 38th Annual AAAI Conference on Artificial Intelligence. **(AAAI 2024)**.
3. **A. Barrak**. "The Promise of Serverless Computing within Peer-to-Peer Architectures for Distributed ML Training." The 38th Annual AAAI Conference on Artificial Intelligence - DOCTORAL CONSORTIUM**. (AAAI 2024)**.
4. H. Bourreau, E Guichet, **A. Barrak**, B Simon, F Jaafar. "On Securing the Communication in IoT Infrastructure using Elliptic Curve Cryptography." 2022 IEEE 22nd International Conference on Software Quality, Reliability and Security. **(QRS 2022)**.