AMINE BARRAK

Ph.D. in Computer Science, University of Quebec

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CURRENT POSITION

Oakland University, Rochester, Michigan
Assistant Professor, School of Engineering and Computer Science   September 2024 - Present

EDUCATION

PhD student in Computer Science   September 2021- July 2024
University of Québec, Québec, Canada.
- *Thesis: "Serverless Architectures for Scalable Peer-to-Peer Machine Learning Training".*
- *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

Assistant Professor
Oakland University, Department of Computer Science and Engineering   January 2025 – April 2025

- Integrated Computing Systems (CSI 4160) – Graduate & Undergraduate Students (50 students)
    - Covered APIs, REST & Web Services, Cloud Computing, Containers & Orchestration, and Infrastructure as Code (IaC).
- Parallel and Distributed Computing (CSI 4650) - Undergraduate Students (12 students)
    - Covered parallel and distributed system architecture, instruction-level parallelism, shared/distributed -memory architectures, distributed storage, parallel algorithms, and programming interfaces.

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.

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, Canada.
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., Canada.
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., Canada.
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, Canada.
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, Canada.
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

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, Redis
- **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
- Journal: IEEE Transactions on Network and Service Management 2025.
- Journal: Empirical Software Engineering (EMSE 2025)
- Journal: PeerJ Computer Science 2025.
- Conference: IEEEInternational Conference on Mining Software Repositories (MSR) 2025
- Conference: IEEE International Conference on Software Security and Reliability (QRS) 2024

External Reviewer
- Conference: International Conference on Knowledge-Based and Intelligent Information & Engineering Systems (KES), 2024
- 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

Press
- Serverless Computing and Machine Learning, interview with Lucy Smith from Aihub, 26 March, 2024.

PUBLICATIONS

Journal Papers

1. **A. Barrak,** F Petrillo, F Jaafar. "Advancing Serverless ML Training Architectures via Comparative Approach." Journal of Cloud Computing, Advances, Systems and Applications **(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. Abid, **A. Barrak,** I. Bakayoko**,** F. Jaafar, D. Rankourt, "Software-Driven Adaptive Energy Management for IoT-Enabled Smart Buildings", 7th International Workshop on. Software Engineering Research & Practices for the Internet of Things **(SERP4IoT 2025).**
2. **A. Barrak**, K. Emna, "Scalable and Cost-Efficient ML Inference: Parallel Batch Processing with Serverless Functions", 22nd International Conference on Service-Oriented Computing **(ICSOC 2024).**
3. **A. Barrak**, G. Fofe, E. Kouam, L. Mackwiak, F. Jaafar, "Securing AWS Lambda: Advanced Strategies and Best Practices". The 11th IEEE International Conference on Cyber Security and Cloud Computing. **(CSCLOUD 2024)**

4. **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)**.
5. **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)**.
6. **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)**.
7. 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)**.
8. **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*.
9. 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)**.