

Hassan Fawaz — Curriculum Vitae

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Research Engineer at Télécom SudParis - IP Paris since 15/10/2020

Education and Research

Academic Qualifications.....

- **Lebanese University** **Beirut**
Diploma in Electrical and Communication Engineering, with distinction 2015
- **Saint Joseph University** **Beirut**
Masters in Telecom, Networks, and Security, with high distinction 2016
- **Saint Joseph University** **Beirut**
Ph.D., Topic: Scheduling and Power Allocation in Full-Duplex Wireless Networks 2019
- **Université Paris-Saclay, UVSQ** **Versailles**
PostDoc at Li-Parad, Topic: LoRa, LoRaWAN, Spreading Factor and Channel Assignment 2019-2020
- **Télécom SudParis - IMT** **Palaiseau**
Research Engineer, Topics: MA Machine Learning, Software-Defined Networks, 5G 2020-Current

Notable Projects.....

- **Final Year Project** '*Direction of Arrival Estimation for Smart Antennas in a Multi-path Environment*'
This was the final year project for my diploma in Electrical and Communication Engineering. The task was to study and simulate different proposals for DoA estimation in smart antennas.
- **Master Thesis:** '*Scheduling in Full-Duplex Wireless Networks*'
Made feasible by the development of self-interference cancellation techniques post-2010, full-duplex communications have gained a lot of traction in the past few years. In my masters' thesis, I studied different propositions of full-duplex network implementations, and proposed multiple algorithms for scheduling in FD-OFDMA wireless networks.
- **PhD Thesis:** '*Scheduling and Power Allocation in Full-Duplex Wireless Networks*'
Going further into the details of full-duplex wireless networks, my thesis tackled several important issues such as user fairness, power control, spectral efficiency, CSI availability, multi-cell scenarios, and many others. Throughout my work on my thesis, we enlisted multiple research tools such as machine learning, game theory, and optimization. Published articles related to my PhD work are listed below. I successfully defended my thesis on November 13, 2019.
- **PostDoc:** '*Improving the Reliability and Scalability of LoRaWANs*'
The work of my PostDoc revolved around LoRa and LoRaWANs. We started with proposing spreading factor assignment algorithms for LoRaWAN in a multi-operator environment. We used recurrent neural networks, LSTMs specifically, to help model the packet delivery rate as a time series. This helped reduce the amount of cooperation required among different network operators. We utilized game theory, and both Nash and correlated equilibriums, to allocate the available channels in a LoRaWAN among competing operators.

- **Projects at TSP:** *'Deep Reinforcement Learning for Smart Load Balancing and Queue Management'*
From October 2020 till October 2022, I worked within a small team at Télécom SudParis - Institut Mines-Télécom on a collaborative project that focuses on developing deep reinforcement learning solutions for network problems. The project tackles two main tasks: load balancing and queue management. My work focuses on the latter. We used deep Q-networks and multi-agent cooperation approaches, like graph convolutional reinforcement learning, to determine how to best dequeue packets in a manner that helps maintain the service level agreements (SLAs) for a set of classified network flows.
Starting 2023, I've been working on the simulation of 5G networks. More specifically, my current project aims to add more functionalities to the current non-stand alone ns3-NR simulator by connecting it to a 5G core implementation like open5gs. The objective is to be able to emulate a 5G stand-alone network.

Technical skills and General Information

- **Programming Languages:** Proficient in: Matlab, Python, C, C++. Familiar with: Java, SQL.
- **CISCO Certificates:** CISCO CCNA 1 V4.1, Network Fundamentals, CISCO CCNA 2 V5.0 Routing and Switching, CISCO CCNA 3 V5.0 Routing and Switching: Scaling networks.
- **Doctoral Fellowship Program 2016:** Awarded a research grant from the Lebanese National Council for Scientific Research (CNRS-L).
- **Languages:** Fluent in Arabic and English, (B1-B2) level in French.

References

- **Kinda Khawam:** PostDoc Supervisor, Associate Professor at UVSQ, Versailles, at kinda.khawam@uvsq.fr
- **Samer Lahoud:** Thesis Supervisor, Associate Professor at Dalhousie University at sml@dal.ca
- **Steven Martin:** Collaborator, Professeur des universités, Université Paris-Saclay at steven.martin@lri.fr

Previous Employment

- **Saint Joseph University** **Beirut**
C++ Lab Assistant *September - December 2016 to 2019*
I was responsible for preparing, and presiding over, C++ lab sessions for engineering students.
- **Saint Joseph University** **Beirut**
Electronics Lab Assistant *April - May 2017,2018*
I supervised and aided students during their lab work, and preparations, for mini-projects in basic analog electronics.
- **Saint Joseph University** **Beirut**
General Course Assistant *March - December 2019*
Assisted in lab sessions pertaining to different courses including Routing and Switching, Unified Modeling Language (UML) exercises and business administration labs (Microsoft Biztalk).
- **UVSQ - Paris Saclay** **Versailles**
PostDoc Researcher *December 2019 - October 2020*
Worked on proposing game theory and machine learning based approaches for spreading factor and channel assignment in IoT LoRaWAN networks.

Teaching Experience

During my years as a PhD. student, I taught at the faculty of engineering (ESIB) at Université Saint-Joseph de Beyrouth from 2016 to 2019. In the table below, I list all the course I taught, their nature, and the total volume in hours. All of them were for engineering students, except the object oriented programming course (C++) which was for both engineering and computer science students. A brief overview of what each course included is also mentioned below:

- Object Oriented Programming: Mainly C++, included practical work on arrays, vectors, functions, classes, inheritance, and polymorphism.
- Routing and Switching: Introduction to network layers, TCP/IP, functionalities of layer 2 and 3 switches, and routing protocols.
- Linux OS: Introduction to Linux fundamentals, CLI commands, bash scripts, and others.
- Analog electronics: Design and implementation of analog circuits with basic functionalities. I worked on proposing and supervising the ideas. This includes applying knowledge on basic electronic components: relays, switches, capacitors, and others.
- "Miscellaneous" lab classes included exercises on Microsoft Biztalk and Unified Modeling Language (UML). Additionally, I have been instructing a part of the course "Virtual Networks" for FIPA 2nd year students at Telecom SudParis and Master students at Telecom Paris. This section of the course introduces students to SD-WAN networks, Docker, Kubernetes and incorporates lab work.

Publications

1. PhD Thesis: Scheduling and Power Allocation in Full-Duplex Wireless Networks. 2019 Nov 13. Available online: <https://hal-usj.archives-ouvertes.fr/tel-03133975v1> .
2. Khawam, K., Martin, S., Lahoud, S., Taleb, H., Fawaz, H., & Qadri, D. (2024). Non-Cooperative Edge Server Selection Game for Federated Learning in IoT. IEEE/IFIP Network Operations and Management Symposium (NOMS) 2024.
3. Fawaz, H., Lesca, J., Quang, P. T. A., Leguay, J., Zeghlache, D., & Medagliani, P. (2023). Graph Convolutional Reinforcement Learning for Collaborative Queuing Agents. IEEE Transactions on Network and Service Management (IEEE TNSM), 20(2), 1363–1377.
4. Fawaz, H., Houidi, O., Zeghlache, D., Lesca, J., Quang, P. T. A., Leguay, J., & Medagliani, P. (2023). Graph Convolutional Reinforcement Learning for Load Balancing and Smart Queuing. 2023 IFIP Networking Conference, IFIP Networking 2023.
5. Fawaz, H., Lahoud, S., El Helou, M., & Khawam, K. (2023). Queue-Aware Resource Allocation in Full-Duplex Multi-Cellular Wireless Networks. IEEE Journal on Selected Areas in Communications (JSAC), 41(9), 2852–2863.
6. Khawam, K., Fawaz, H., Lahoud, S., Maillard, O.-A., & Martin, S. (2022). A channel selection game for multi-operator LoRaWAN deployments. Computer Networks, 216, 109185.
7. Fawaz, H., El Helou, M., Lahoud, S., & Khawam, K. (2021). A reinforcement learning approach to queue-aware scheduling in full-duplex wireless networks. Computer Networks, 189, 107893.
8. Fawaz, H., Zeghlache, D., Quang, P. T. A., Leguay, J., & Medagliani, P. (2021). Deep Reinforcement Learning for Smart Queue Management. NetSys 2021, MaLeNe Workshop.
9. Fawaz, H., Khawam, K., Lahoud, S., Martin, S., & El Helou, M. (2020). Cooperation for Spreading Factor Assignment in a Multi-Operator LoRaWAN Deployment. IEEE Internet of Things Journal, 1-1.
10. Fawaz, H., Lahoud, S., & El Helou, M. (2020). Queue-aware scheduling in full-duplex wireless networks. Wireless Networks, 26(6), 3967-3983.
11. Fawaz, H., Khawam, K., Lahoud, S., & El Helou, M. (2019). A Game Theoretic Approach for Power Allocation in Full Duplex Wireless Networks. IEEE International Symposium on Personal, Indoor and Mobile Radio Communications, PIMRC.
12. Fawaz, H., Khawam, K., Lahoud, S., & El Helou, M. (2019). A Game Theoretic Framework for Power Allocation in Full-Duplex Wireless Networks. IEEE Access, 7, 174013-174027.
13. Fawaz, H., Lahoud, S., & Helou, M. E. (2018). A Queue-Aware Discrete Scheduling Simulator for Full-Duplex OFDMA Wireless Networks. 2018 International Conference on Computer and Applications,

ICCA 2018, 60-65.

14. Fawaz, H., Lahoud, S., Helou, M. E., & Ibrahim, M. (2018). Optimal Max-SINR scheduling in full-duplex OFDMA cellular networks with dynamic arrivals. IFIP Wireless Days, 196-201.
15. Fawaz, H., Lahoud, S., Helou, M. E., & Saad, J. (2018). Queue-Aware Priority Based Scheduling and Power Allocation in Full-Duplex OFDMA Cellular Networks. 2018 25th International Conference on Telecommunications, ICT 2018, 15-20.
16. Fawaz, H., Lahoud, S., El Helou, M., & Ibrahim, M. (2018). Queue-aware scheduling in full duplex OFDMA wireless networks with imperfect channel state information. 24th European Wireless 2018 "Wireless Futures in the Era of Network Programmability", EW 2018, 13-19.
17. Fawaz, H., Lahoud, S., El Helou, M., & Ibrahim, M. (2017). Max-SINR scheduling in Full-Duplex OFDMA cellular networks with dynamic arrivals. Proceedings - IEEE Symposium on Computers and Communications, 493-498.