AYMAN KHALIL

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QUALIFICATIONS

PhD in Computer and Communication Engineering
Master's in Networking and Communications
Bachelor of Engineering in Computer and Communication Engineering

I completed my PhD before becoming a Research Engineer at the National Institute of Applied Sciences, Rennes, France, where I contributed to the development of next-generation systems. For three years, I worked on the European project OMEGA, playing a key role in designing protocols and solutions for future home networks. My expertise spans cross-layer resource allocation and AI-driven optimization schemes. Today, as an active researcher in AI and the latest technologies, I continue to push the boundaries of innovation while also mentoring PhD students in Lebanon and France and providing training in AI and digital transformation.

RESEARCH INTERESTS

AI and Emerging Technologies: Business Intelligence and Big Data**,** cloud computing, IoT, 5G and beyond.

Next Generation Wireless Networks: orthogonal frequency division multiplexing (OFDM) systems, quality of service (QoS) support, optimization schemes.

Heterogeneous Networks: scheduling and multiple access schemes, mesh networking, network coding and routing protocols.

Cross-layer Design: resource allocation and time-frequency spectrum sharing solutions under heterogeneous constraints.

Cognitive Radio and interference mitigation: ultra-wideband (UWB) systems, power allocation and interference reduction solutions for unlicensed systems.

EDUCATIONAL BACKGROUND

2007-2010

PhD Thesis: Cross-layer resource allocation optimization for future high-rate UWB systems. The goal of the thesis is to develop innovative schemes and mechanisms for optimizing the coexistence of unlicensed UWB users. These schemes are designed to meet the diverse Quality of Service (QoS) requirements of users while adapting to varying physical channel conditions. A novel multiuser spectrum sharing approach is explored, utilizing a cross-layer methodology that integrates information from both the MAC and PHY layers. The research focuses on formulating and solving an optimization problem that accounts for cross-layer constraints, resulting in optimal sub-band and power allocations. Additionally, sub-optimal solutions are proposed to reduce computational complexity, making the solution more suitable for the distributed architecture typical of UWB systems.

Laboratory: Institute of Electronics and Telecommunications of Rennes
University: National Institute of Applied Sciences - Rennes France

2006-2007	**Title:** **Masters in Networking and Telecommunications – Scheduling and QoS in WiMaX systems**
	Laboratory: Institute of Research in Informatics and Random Systems – Rennes France
	University: Lebanese University/ Saint-Joseph University
2000-2006	**Title: Bachelor in Computer and Communication Engineering**
	University: Holy Spirit University of Kaslik

ACADEMIC and PROFESSIONAL EXPERIENCE

Academic Experience

Fall 2025 - Present: Assistant Professor of Practice
       AKSOB – ITOM department
       Lebanese American University (LAU)

2022 – 2025: Adjunct Professor
       AKSOB – ITOM department
       Lebanese American University (LAU)

- Teaching courses in:
    - **Artificial Intelligence and Machine Learning**
    - **Data Analytics**
    - **Computer Architecture & Organization**
    - **Computer Networks & Network Programming**
    - **Database Management Systems**
    - **Operating Systems & Digital Systems**
- Supervising research projects in **AI, Smart Cities, IoT, and Emerging Technologies**
- Contributing to curriculum development in AI and Digital Transformation

2010 – 2022: Part-time Instructor

- Teaching a variety of courses, including:
    - **AI & Machine Learning**
    - **Computer and Network Security**
    - **Digital Systems & Digital Signal Processing**
    - **Computer Networks & Network Programming**

2011 – 2018: Research Engineer - IETR, Rennes, France

- Contributed to **national and European research projects**
- Supervised **PhD students** in AI, Networking, and Digital Systems

2007 – 2010: Instructor - INSA, Rennes, France

- Taught undergraduate and graduate courses in:
    - **Electronics & Electric Circuits**
    - **Computer Architecture & C++ Programming**
    - **Digital Communications & Digital Signal Processing**

Professional Experience – Digital Transformation & AI Training

2020 – Present: Trainer & Consultant

- **Expertise in:**
  - Digital Transformation & Emerging Technologies
  - AI & its Applications
  - Smart Cities
  - Cybersecurity
  - Internet Of Things and Connected Devices
  - Generative AI & Business Intelligence
- **Notable Clients & Institutions:**
  - Manchester Innovation and Technology Academy – UAE
  - Academy of Continuing Education (ACE-LAU) / Banque Libano-Française
  - BMB Smart / SNA Insurance
  - Duke Global - Qatar

2005 – 2006: Network Administrator - RHUH, Beirut, Lebanon

- Managed **system monitoring, database administration, and device configuration**

SPECIAL COURSES AND TRAININGS

2022	Be Your Own Boss (BYOB) training of trainers	HECD
2021	Online/Blended Course Design	Stewart Ross
2020	Foundations of Learning Experience Design	NovoED
2010	Emotional aspects of the life of a PhD student	INSA – France
2009	The voice and the body, privileged instruments of the teacher in situation	INSA– France
2009	To speak in public: managing stress and stage fright	INSA – France

RESEARCH ACTIVITIES

Green IoT and Artificial Intelligence:
- Co-advisor of a PhD thesis: New green and AI-based solutions to reduce the energy consumption in 5G
- Institution: Université Paris Nanterre

Next Generation Home Networks:
- Development and study for new solution for next generation high data rate WPANs
- Institution: INSA – IETR

Resource allocation in OFDM systems:
- New resource allocation and spectrum sharing schemes for next generation systems
- Contribution to a European project OMEGA
- Institution: INSA-IETR

Uplink scheduling in WiMAX systems:
- New scheduling and queuing solutions for next generation WiMAX systems
- Institution: IRISA

Future Mesh High Data Rate WPAN:
- Co-advisor of a PHD thesis: Cross-layer optimization for Mesh networks
- Defense: September 2014

Network Coding:
- Co-advisor of a PHD thesis: Optimization and application of Network Coding
- Collaboration: INSA – Rennes France

Heterogeneous Networks:
- Co-advisor of a PHD thesis: Optimization of future heterogeneous networks
- Collaboration: INSA – Rennes France

Non-coherent MIMO Systems:
- Co-advisor of a PHD thesis: Design and performance evaluation of new non coherent MIMO schemes
- Collaboration: INSA – Rennes France

AFFILIATIONS

- Order of Engineers, Beirut, Lebanon. Affiliation 2006
- Served as Student body representative in the scientific council of INSA de Rennes
- Served as a session chair at several conferences
- Severed as a Technical Program Committee (TPC) member at several conferences
- Served as a reviewer for several conferences and journals

SOFTWARE

- UNIX, WINDOWS
- MATLAB, NS-2, GNS3, FEMLAB, OMNET++, C, C++, C#, JAVA, PYTHON, ASP (VB SCRIPT), HTML, XML, VS.NET

LANGUAGES

- Arabic : Mother tongue
- English : Excellent
- French :Excellent
- German : Good

REFERENCES

Manal Yunis: Chairman of the department of Information Technology Management (IToM), LAU, Lebanon

Email: myunis@lau.edu.lb   Phone: 03 – 83 28 87

Pascal Damien: Dean of the Faculty of Science, USEK, Lebanon

Email: pascaldamien@usek.edu.lb   Phone: 03 - 55 99 25

Jean-Francois Helard: Director of Research at INSA, Rennes, France

Email: jean-francois.helard@insa-rennes.fr

PUBLICATIONS

Journal Papers:

1- H. Zeng, M. Yunis, **A. Khalil** and N. Mirza, "Towards a conceptual framework for AI-driven anomaly detection in smart city IoT networks for enhanced cybersecurity", in *Journal of Innovation & Knowledge*, 2024.

2- Z. Ezzedine, **A. Khalil**, B. Zeddini and H. Ouslimani, "A Survey on Green Enablers: Challenging Study for AI-based 5G Energy Efficiency Network", in *Sensors*, 2024.

3- **A Khalil** and B. Zeddini, "Cross-Layer Optimization for Enhanced IoT connectivity: A Novel Routing Protocol for Opportunistic Networks", in *Future Internet*, 2024**.**

4- Z. Al-mekhlafi, H. Al-janabi, **A. Khalil**, M. Al-shareeda, B. Mohammed, A. Alsadhan, A. Alayba, A. Shamsan, H. Al-Reshidi, K. Almekhlafi, "Lattice-Based Cryptography and Fog Computing Based Efficient Anonymous Authentication Scheme for 5G-Assisted Vehicular Communications," in *IEEE access*, 2024.

5- H. Al-Janabi, S. Lashari, **A. Khalil,** M. Al-Shareeda, A. Alsadhan, M. Almaiah and T. Alkhdour, "D-BlockAuth: An Authentication Scheme-Based Dual Blockchain for 5G-Assisted Vehicular Fog Computing," in *IEEE access*, 2024.

6- **A. Khalil** and B. Zeddini, "Secure Opportunistic Network with Efficient Routing for Enhanced Efficiency and Sustainability", in *Future Internet*, 2024.

7- M. Saare, S. Lashari, **A. Khalil**, M.Al- Shareeda, S. Manickam, "Review of Routing Protocol for Low Power and Lossy Network in the Internet of things", in *Indonesian Journal of Electrical Engineering and Computer Science*, 2023.

8- M. A. Al-Shareeda, M. Anbar, S. Manickam, **A. Khalil** and I. H. Hasbullah, "Security and Privacy Schemes in Vehicular Ad- Hoc Network With Identity-Based Cryptography Approach: A Survey," in *IEEE Access*, 2021.

9- **A. Khalil** and J.-F. Hélard, "Energy-Efficient Cross-layer Resource Allocation Scheme for OFDMA Systems," in *Annals of Telecommunications*, Springer 2020.

10- **A. Khalil**, N. Abou Haidar, G. Bassil and R. Chbeir, "Adaptive Resource Management Solution for Ad-Hoc Opportunistic Networks," in *Wireless Personal Communications (WPC)*, Springer 2020.

11- M. Shareeda, **A. Khalil** and W. Fahs, "Realistic Heterogeneous Genetic-based RSU Placement Solution for V2I Networks," in *The International Arab Journal of Information Technology*," 2019.

12- M. Zalghout,, **A. Khalil**, S. AbdulNabi, M. Crussière and J.-F. Hélard, "Context-Aware and Priority-Based User Association and Resource Allocation in Heterogeneous Wireless Networks," in *Compuetr Networks, Elsevier*, 2018.

13- S. AbdulNabi, **A. Khalil,** P. Mary and J.-F. Hélard, "Efficient Network Coding Solutions for Limiting the Effect of Packet Loss", in *EURASIP journal on wireless communications and networking,* 2017.

14- S. AbdulNabi, **A. Khalil,** P. Mary and J.-F. Hélard, "Aging in Network Coding," in *IEEE Wireless Communication Letter*, 2014.

15- S. Sindian, M. Crussière, J.-F. Helard , A. Samhat and **A. Khalil**, "Admission control and resource allocation strategies for
IEEE 802.15.5," in *EURASIP journal on wireless communications and networking*, 2014.

16- S. Sindian, J.-F. Helard, **A. Khalil,** A. Samhat and M. Crussière, "Resource Allocation Mechanisms in IEEE 802.15.3 Parent/Child Model," in *Wireless Networks*, 2014.

17-   S. Sindian**, A. Khalil,** M. Crussiere, A. Samhat and J.-F. Helard, **"**Resource Allocation in High Data Rate Mesh WPAN: A Survey Paper," in *Wireless Personal Communications (WPC),* Volume 74, Issue 2, pp 909-932, Springer 2013.

18-   **A. Khalil,** H. Hajj Hassan, M. Hérlard, J.-F. Hélard, "New QoS-based Decision Making Approach for Heterogeneous Networks", in *International Journal of Computer and Technology (IJCT),* Volume 10, Council for Innovative Research 2013.

19-   **A. Khalil**, M. Crussière and J.-F. Hélard, "Cross-layer Multiple Access Optimization Scheme for Linear-Precoded OFDM UWB Systems," in *Annals of Telecommunications*, Volume 68, Issue 5-6, pp 287-298, 2012, Springer 2012.

20-   W. Itani and **A. Khalil**, "A novel frequency hopping scheme for secure and reliable communication systems", in *American Academic & Scholarly Research Journal* (AASRC), Volume 4, No. 5, 2012.

21-   **A. Khalil,** M. Crussière and J.-F. Hélard, "Adaptive Self-learning Resource Allocation Scheme for Unlicensed Users in High-Rate UWB Systems," in *Wireless Personal Communications (WPC),* Volume 56, No. 3 , pp 611-623, Springer 2011.

22-   **A. Khalil,** M. Crussière and J.-F. Hélard, "Time-frequency Spectrum Sharing Scheme for Next Generation OFDM Systems*,"* in *EURASIP Journal on Wireless Communications and Networking,* Article ID 598707, 11 pages, Springer 2010.

23-   **A. Khalil**, M. Crussière and J.-F. Hélard, "Cross-layer Resource Allocation Scheme under Heterogeneous constraints for Future Unlicensed High-Rate UWB Systems," in *International Journal of Computer & Communications,* 152-168, 2010.

Conference Papers:

1-   I. Dawi, G. Zaharia, J.-F. Hélard, **A. Khalil** and Y. Nasser, "Performance of DSTM MIMO Systems Using a Double Extension of the Weyl Group in Time-Varying Rayleigh Channel," *IEEE International Symposium on Signals, Circuits and Systems (ISSCS'19)*, July 2019.

2-   I. Dawi, G. Zaharia, Y. Nasser, **A. Khalil** and J.-F. Hélard, "Increase of DSTM Spectral Efficiency by the Extension of the Mathematical Weyl Group with Application to Differential MIMO Systems," *IEEE International Conference on Telecommunications (ICT'19)*, April 2019.

3-   M. Araji, **A. Khalil** and W. Fahs, "Towards the Optimization of Road Side Unit Placement Using Genetic Algorithm," *International Arab Conference on Information Technology (ACIT'18),* November 2018.

4-   F. Chbib, **A. Khalil**, W. Fahs and R. Chbib, "Improvement of OLSR Protocol by Using Back Up MPR and Routing Table Mechanisms*," International Arab Conference on Information Technology (ACIT'18),* November 2018.

5-   S. sindian, A. Samhat, M. Crussiere, J.F. Helard and **A. Khalil**, "An optimization framework for resource allocation in IEEE 802.15.5 hop1," *International Arab Conference on Information Technology (ACIT'18),* November 2018.

6-   R. Kazzi, **A. Khalil**, "Energy-Saving Solution for Future Cellular Systems," *International Conference on Renewable Energies for Developing countries (REDEC'18)*, November 2018.

7-   A. Fadel, B. Cousin and **A. Khalil**, "User Selection in 5G Heterogeneous Networks Based on Millimeter-Wave and Beamforming," *IEEE International conference on High Performance in Computing and Communication (HPCC'18)*, June 2018.

8-   M. Zalghout, **A. Khalil,** M. Crussiere, S. Abdul-Nabi and J.-F. Hélard, "Context-Aware Network Selection Algorithm for Heterogeneous Wireless Networks", *IEEE Sensors Networks Smart and Emerging Technologies (SENSET'17),* Sept 2017.

9-   M. Zalghout, **A. Khalil,** M. Crussiere, S. Abdul-Nabi and J.-F. Hélard, "A Greedy Heuristic Algorithm for Context-Aware User Association and Resource Allocation in Heterogeneous Wireless Networks", *IEEE Vehicular Technology Conference (VTC'17),* Septembre 2017.

10-   M. Zalghout, **A. Khalil,** M. Crussiere, S. Abdul-Nabi and J.-F. Hélard, 'Load-Aware Power Efficiency Maximization in Heterogeneous Wireless Networks*", IEEE International Conference on Telecommunications (ICT'17)*, April 2017.

11-   M. Zalghout, **A. Khalil**, M. Crussiere, S. Abdul-Nabi and M. Hélard, "Optimizing Context-Aware Resource and Network Assignment in Heterogeneous Wireless Networks", *IEEE Wireless Communications and Networking Conference (WCNC'17)*, March 2017.

12-   M. Zalghout, **A. Khalil**, M. Crussiere, S. Abdul-Nabi and M. Hélard, "SDRAN-based user association and resource allocation in heterogeneous wireless networks*," IEEE Wireless Communications and Networking Conference (WCNC'16),* April 2016.

13-   S. AbdulNabi, P. Mary, J.-F. Hélard and **A. Khalil, "** Fault-tolerant minimal retransmission mechanism with network coding," *IEEE International Conference on Software, Telecommunications and Computer Networks (SoftCOM 2015)*, September 2015.

14-   S. AbdulNabi, P. Mary, **A. Khalil** and J.-F. Hélard, "Novel Distributed Decoding Scheme for Efficient Resource Utilization in Network Coding," *IEEE Wireless Communications and Networking (WCNC'15),* April 2015.

15-   S. Sindian, **A. Khalil,** M. Crussière and J.-F. Hélard, "Admission Control and Resource Allocation for HDR IEEE 802.15.5 WPAN*", IEEE International Conference on Network of the Future (NoF'14),* December 2014.

16-   S. Sindian, **A. Khalil,** M. Crussière and J.-F. Hélard, "Resource Allocation with Differentiation between RT and NRT Traffic in IEEE 802.15.5," *IEEE Mediterranean Electrotechnical Conference (MELECON'14)*, April 2014.

17-   Z. Fawaz, S. El Assad, M. Farajallah, **A. Khalil**, R. Lozi and Olivier Deforges, "Lightweight Chaos-Based Cryptosystem for Secure Images," *IEEE International Conference on Internet Technology and Secured Transactions 2013 (ICITST'13)*, December 2013.

18-   Z. Fawaz, Z. Zbib, **A. Khalil** and S. Abdulnabi, "Chaos-Based Video Encryption for Network Coded Wireless Systems", *IEEE International Conference on Microelectronics (ICM'13)*, December 2013.

19-   S. AbdulNabi, **A. Khalil** and J.-F. Hélard, "Routing coded messages in wireless networks", *IEEE International Conference on Communications and Information Technology (ICCIT'13),* June 2013.

20-   S. Sindian, **A. Khalil,** M. Crussière and J.-F. Hélard, "Dynamic Superframe Size-based Admission Control in Parent/Child HR WPANs", *IEEE International Conference on Communications and Information Technology (ICCIT'1*3), June 2013.

21-   I. Jamil, S. Sindian, **A. Khalil,** M. Crussière and J.-F. Hélard, "A New Distributed Decision Making Scheme for the IEEE
 802.15.3   Parent/Child Model", *IEEE International Conference on Communications and Information Technology (ICCIT'13),* June 2013.

22-   S. AbdulNabi, **A. Khalil** and J.-F. Hélard, "Efficient Network Coding packet selection model for QoS-based applications", *IEEE International Wireless Communications and Mobile Computing Conference (IWCMC'13),* June 2013.

23-   **A. Khalil**, M. Crussière and J.-F. Hélard, "Spectrum Sharing Optimization Model for OFDMA Systems under Joint Time and Frequency Constraints", *IEEE International Conference on Telecommunications (ICT'12),* April 2012.

24-   **A. Khalil**, M. Crussière and J.-F. Hélard, "Spectrum Sharing Optimization Model for Multiuser Linear-Precoded OFDM UWB Systems", *IEEE Wireless Communications and Networking Conference (WCNC'12)*, April 2012.

25-   **A. Khalil,** R. Diab, M. Crussière and J.-F. Hélard, "Time-frequency Resource Allocation Optimization Model for OFDMA systems," *IEEE International Workshop on Cross-Layer Design (IWCLD'11),* November 2011.

26-   **A. Khalil**, M. Crussière and J.-F. Hélard, "Distributed Coexistence-aware Channel Allocation for Future Unlicensed High- Rate WPAN", *IEEE International Conference on Signal Processing and Communication Systems (ICSPCS'10)*, December 2010.

27-   H. Ali Ahmad, **A. Khalil,** M. Crussière and J.-F. Hélard, "A Joint Distributed Resource Management and Scheduling Scheme for Future UWB-based High-Rate WPAN", *IEEE International Conference on Signal Processing and Communication Systems (ICSPCS'10*), 1-8, December 2010.

28-   **A. Khalil,** M. Crussière and J.-F. Hélard, "Interference-Aware Prioritized Spectrum Scheduling for MB-OFDM Systems," *IEEE International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC'10),* 1242-1247, Turkey, September 2010.

29-   **A. Khalil,** M. Crussière and J.-F. Hélard, "Multiuser Service Differentiated Spectrum Allocation Scheme for High Rate UWB systems," *IEEE Wireless Communications and Networking Conference (WCNC'10),* 1-6, Australia, April 2010.

30-   **A. Khalil,** M. Crussière and J.-F. Hélard, "Spectrum Allocation Optimization Scheme for Heterogeneous Multiuser UWB systems," *IEEE International Workshop on Cross-Layer Design (IWCLD'09),* Spain, June 2009.

31-   **A. Khalil,** M. Crussière and J.-F. Hélard, "Differentiated Multiuser Resource Allocation Scheme for Multi-band UWB systems," *IEEE International Workshop on Signal Processing Advances in Wireless Communications (SPAWC'09),* 1-6, Italy, June 2009.

32-   **A. Khalil,** M. Crussière and J.-F. Hélard, "Cross-layer Resource Allocation Scheme for Multi-band High Rate UWB Systems," *International Wireless Communications and Mobile Computing Conference (IWCMC'09),* Germany, June 2009.

33-   E. Najjar, **A. Khalil**, M. Crussière and J.-F. Hélard, "Allocation Dynamique de Ressource dans les Systèmes ULB sous Contrainte de Qualité de Service," *Manifestation des JEunes Chercheurs en Sciences et Technologies de l'Information et de la Communication (MajecSTIC'09),* France, November 2009.

34-   **A. Khalil,** M. Crussière and J.-F. Hélard, "Dynamic Cross-layer Spectrum Allocation for Multi-band high-rate UWB systems," *Multi-Carrier Spread-Spectrum (MC-SS'09),* 355-364, Germany, May 2009.
35-   **A. Khalil,** A. Stephan, M. Crussière and J.-F. Hélard, "Multi-user Cross-layer Allocation Design for LP-OFDM high-rate UWB," *IEEE International Symposium for Wireless communication Systems (ISWCS'08)*, 6-10, Iceland, September 2008.

36-   **A. Khalil** and A. Ksentini, "Classification of the Uplink Scheduling Algorithms in IEEE 802.16," *International Workshop on Dynamic Networking (IWDYN'07)*, France, September 2007.

Book Chapters:

A. Khalil, M. Crussière and J.-F. Hélard, "Cross-layer resource allocation for MB-OFDM UWB system," Ultra-Wideband Communications: Novel Trends / Book 3, ISBN 978-953-307-461-0, 2011.