THUWAL, MECCA, SAUDI ARABIA •
PHONE 00966558423139 • E-MAIL ASMAA.ABDALLAH@KAUST.EDU.SA

# ASMAA WALID ABDALLAH

## Employment History

2021– present **King Abdullah University for Science and Technology (KAUST)** Thuwal, Saudi Arabia

Postdoctoral Research Fellow

- Communications and Computing Systems Lab (CCSL) of **Prof. Ahmed El Tawil**
- Concentration: Machine Learning Solutions for Future Wireless Communications

2020– 2021 **King Abdullah University for Science and Technology (KAUST)** Remote

Remote Research Consultant

- Communications and Computing Systems Lab (CCSL) of **Prof. Ahmed El Tawil**
- Concentration: Deep Learning based Channel Estimation for Millimeter Wave Wireless Communications

## Education

2015-2020 **American University of Beirut (AUB)** Beirut, Lebanon

*Ph.D. in Electrical & Computer Engineering*

GPA: 4.00/4.00 ( 93/100)
Ph.D supervisor:: **Prof. Mohammad Mansour**
Emphasis on Communications and Applied Electromagnetics and RF Systems.
Minor in Networking and Security
Dissertation Title: "*Interference Mitigation in 5G Network Densification Technologies: Algorithms and Performance Limits*".
Graduation: June 2020

2013-2015 **Rafik Hariri University** Mechref, Lebanon

*Master of Science in Computer & Communication Engineering*

GPA: 96.90/100
Thesis Option: "*Relaying Techniques for 4G Technology*"

2010-2013 **Rafik Hariri University** Mechref, Lebanon

*Bachelor of Science in Computer & Communication Engineering*

GPA: 94/100
Honors: Distinguished Dean's List (2010/2011/2012/2013)
Senior Project: "*Line Follower and Obstacle Avoider Robot controlled by Arduino*".

## Certifications

| | | |
|---|---|---|
| 2022 | **HARVARD University**<br>Derek Bok Center for Teaching and Learning<br>Higher Education Teaching Certificate | Online |
| 2012-2013 | **Cisco Networking Academy**<br>Completed four levels of CCNA Program | Saida, Lebanon |

## Prizes, awards, and fellowships

- **MIT Technology Review Innovators Under 35 MENA 2022 award:** Dec. 2022

*King Abdullah University of Science and Technology (KAUST)*

- **3rd place for outstanding achievement** Mar. 2022

*KAUST Research Conference on Extreme Bandwidth Communication: From mmWave, THz to Optical Bands*

- **Ericsson research grant** Sep. 2021

*KAUST*

- **The CNRS-L/AUB Doctoral Scholarship Award** Sep. 2018

*A prestigious award provided by The National Council for Scientific Research*

- **Academic Excellence Award** June. 2013

*Rafik Hariri University (Valedictorian of the class of 2013)*

- **Undergraduate Scholarship Award** Sep. 2010

*Rafik Hariri University*

- **Dean's Honor List** Sep. 2010 – June. 2015

*Rafik Hariri University (All Semesters)*

## Experience

**Postdoctoral Research**
August 2020 – present

**King Abdullah University for Science and Technology (KAUST)**

- Mentoring interns and supervising graduate students in their research.
- Currently working on reinforcement learning approaches for beamforming/combining and power control problems for RIS assisted cell-free massive MIMO systems.
- Proposed deep learning-based cascaded channel estimation techniques for frequency selective reconfigurable intelligent surface (RIS) assisted wireless systems
- Proposed cascaded channel estimation techniques for frequency selective reconfigurable intelligent surface (RIS) assisted wireless systems
- Proposed deep learning-based channel estimation techniques for frequency selective mmWave MIMO channels with hybrid architectures

**Research Assistant**
Feb. 2015 – July 2020

**American University of Beirut (AUB)**

- Proposed deep-learning approaches for channel estimation and power control problems for FDD-based cell-free massive MIMO systems.
- Proposed angle-domain processing techniques along with power control schemes that work on suppressing interference for frequency-division duplexing (FDD) based cell-free massive MIMO system and enhance spectral efficiency and energy efficiency of this system.
- Proposed and analyzed channel allocation schemes together with power control schemes to mitigate interference in a D2D underlaid cellular system using stochastic geometry.
- Studied and analyzed the hardware limitations of massive MIMO such as the power consumption and hardware complexity of the massive MIMO system by lowering the resolution of the analog-to-digital converters.
- Proposed low complexity detection for low resolution massive MIMO systems.
- Derived analytical bounds on the performance of the proposed techniques.

**Research Intern**
Jun. 2019 – Dec. 2019

**Nokia Bell Labs (Nozay, France)**

- Proposed hybrid automatic request (HARQ) mechanisms for long-delay channels in non-terrestrial networks (NTN) such as Satellite communications.
- Studied blind retransmission approaches for long delay channel to improve the link robustness when the system may not rely on the HARQ feedback.
- Applied link adaptation approaches where in appropriate modulation and coding schemes (MCS) are selected for each condition of the satellite's time-varying channel under 3GPP specifications and standards.
- Modeled using MATLAB and applied performance analysis.

**Instructor**
2015 – 2017

**American University of Beirut**

- Lab instructor ("Electric Circuits")
- Teaching assistant ("Electric Circuits")

**Reviewer**
2015 – Present

**Freelance**

- Evaluating research papers and providing written critique as a constructive feedback to the authors in several journals and conferences including:
- IEEE Transactions on Communications
- IEEE Communications Letters
- IEEE Transactions on Wireless Communications
- IEEE Wireless Communications Letters
- Elsevier: Digital Signal Processing
- Elsevier: Physical Communication
- IEEE ICC conference
- IEEE GLOBECOM conference
- IEEE VTC conference

**Research Assistant**
2013 – 2015

**Rafik Hariri University**

- Proposed and analyzed relaying techniques for 4G technology

## Supervision of Junior Researchers

- **Ahmed Hussain**, Ph.D. Student at KAUST — June. 2023 – present
  *Channel Estimation for Near-field Communications*
- **Mattia Fabiani**, Research Intern at KAUST — Feb. 2023 – present
  *Unsupervised Learning-Based Downlink Power Allocation in Cell-Free MIMO Systems*
- **Nasser Khan,** Research Intern at KAUST — Jan 2023– present
  *Explainable Artificial Intelligence for Resource Management in 6G Networks*
- **Amira Bendami,** Research Intern at KAUST — May. 2023 – present
  *Physical Layer Authentication in RIS-assisted Systems*
- **Recep Tasci**, Research Intern at KAUST — Jan. 2022 – Jan. 2023
  *RIS-Assisted Grant-Free NOMA: Over the Air Power Control*
- **Fatih Kilinc**, Research Intern at KAUST — Jan. 2022 – Jan. 2023
  *RIS-Assisted Grant-Free NOMA: Over the Air Power Control*
- **Balsam Al Harthi**, Research Intern at KAUST — Jun. 2022 – Aug. 2022
  *Deep Learning-based Power Control for Physical Layer Security in RIS-assisted Systems*

## Research Grants

- Ericsson Research Grant A two-year 481 K USD research grant: " **Machine Learning of Frequency Selective Wireless Channels**" – Senior personnel (major contributions to the proposal) – Sep. 2021
- The National Council for Scientific Research (CNRS)-L/AUB Doctoral Scholarship Award – A three-year 18000 USD research grant for the project: "Interference Mitigation 5G Network Densification Technologies" – Sep. 2018

## Publications

**International Peer-reviewed Scientific Journals:**

1. M. Fabiani, **A. Abdallah,** A. Celik, and A. M. Eltawil**,** "Unsupervised Learning for Distributed Downlink Power Allocation in Cell-Free mMIMO Networks", to be submitted to IEEE Transactions on Wireless Communications.
2. **A. Abdallah,** A. Celik, M. M. Mansour, and A. M. Eltawil, "Multi-Agent Deep Reinforcement Learning for Beam Training in Cell-Free RIS-aided Systems", submitted to IEEE Transactions on Wireless Communications.
3. AM Elbir, **A Abdallah**, A Celik, AM Eltawil, "Antenna Selection With Beam Squint Compensation for Integrated Sensing and Communications" submitted to IEEE Transactions on Wireless Communications.

4. A. Nasser, **A. Abdallah,** A. Celik, and A. M. Eltawil, "Rendezvous of ISAC and NOMA: Progress and Prospects of Next-Generation Multiple Access", submitted to IEEE Communications Standards Magazine, 2023.
5. AM Elbir, KV Mishra, **A Abdallah**, A Celik, AM Eltawil, "Spatial path index modulation in mmWave/THz-band integrated sensing and communications", submitted to IEEE Transactions on Wireless Communications.
6. N. Khan, S. Coleri, **A. Abdallah**, A. Celik, and A. M. Eltawil, "Explainable and Robust Artificial Intelligence for Trustworthy Resource Management in 6G Networks", Submitted to IEEE Communications Magazine.
7. **A. Abdallah,** A. Celik, M. M. Mansour, and A. M. Eltawil, "Multi-Agent Deep Reinforcement Learning for Beam Codebook Design in RIS-aided Systems", Under revision in IEEE Transactions on Wireless Communications.
8. R. Tasci, F. Kilinc, A. Celik, **A. Abdallah**, A. M. Eltawil, and E Basar, "RIS-Assisted Grant-Free NOMA: Over the Air Power Control," Under revision in IEEE Transactions on Cognitive Communications and Networking.
9. **A. Abdallah**, A. Celik, M. M. Mansour and A. M. Eltawil, "RIS-Aided mmWave MIMO Channel Estimation using Deep Learning and Compressive Sensing," in *IEEE Transactions on Wireless Communications*, 2022.
10. **A. Abdallah**, A. Celik, M. M. Mansour and A. M. Eltawil, "Deep Learning Based Frequency-Selective Channel Estimation for Hybrid mmWave MIMO Systems," in *IEEE Transactions on Wireless Communications* 2022.
11. H. Sarieddeen, **A. Abdallah**, M. M. Mansour, M. -S. Alouini and T. Y. Al-Naffouri, "Terahertz-Band MIMO-NOMA: Adaptive Superposition Coding and Subspace Detection," in *IEEE Open Journal of the Communications Society,* vol. 2, pp. 2628-2644, 2021.
12. **A. Abdallah** and M. M. Mansour, "Efficient Angle-Domain Processing for FDD-based Cell-free Massive MIMO Systems," in *IEEE Transactions on Communications*, vol. 68, no. 4, pp. 2188-2203, April 2020.
13. **A. Abdallah**, M. M. Mansour, L. M. A. Jalloul and A. Chehab, "When Quantized Massive MIMO Meets Large MIMO With Higher Order Modulation," in *IEEE Communications Letters*, vol. 22, no. 12, pp. 2599-2602, Dec. 2018.
14. **A. Abdallah,** M. Mansour, and A. Chehab, "Power Control and Channel Allocation for D2D Underlaid Cellular Networks," in *IEEE Transactions on Communications*, vol. 66, no. 7, pp. 3217-3234, July 2018.

**Peer-reviewed conference proceedings:**

1. AM Elbir, **A Abdallah,** A Celik, AM Eltawil, " Spatial Path Index Modulation To Combat Beam-Squint Effect in THz-ISAC Systems," submitted to IEEE Global Communications Conference Workshops (GLOBECOM 2023).
2. **A. Abdallah,** A. Celik, M. M. Mansour and A. M. Eltawil**,** "Deep Beamforming Codebook Design for Distributed RIS Networks Using Deep Reinforcement Learning," submitted to IEEE Global Communications Conference Workshops (GLOBECOM 2023).
3. M. Fabiani, **A. Abdallah,** A. Celik, and A. M. Eltawil**,** "Unsupervised Learning-Based Downlink Power Allocation in Cell-Free Massive MIMO Systems," accepted to appear in IEEE Global Communications Conference (GLOBECOM 2023).
4. R. Tasci, F. Kilinc, A. Celik, **A. Abdallah**, A. M. Eltawil, and E Basar, "RIS-Assisted Grant-Free NOMA," accepted to appear in *IEEE International Conference on Communications* (ICC 2023).
5. **A. Abdallah,** A. Celik, M. M. Mansour and A. M. Eltawil**, "**Deep Reinforcement Learning Based Beamforming Codebook Design for RIS-aided mmWave Systems," accepted to appear in IEEE Consumer Communications & Networking Conference (CCNC 2023)**.**
6. **A. Abdallah,** A. Celik, M. M. Mansour and A. M. Eltawil, **"**Deep-Learning Based Channel Estimation for RIS-Aided mmWave Systems with Beam Squint, " in *Proc. IEEE International Conference on Communications (ICC 2022)*, Seoul, Korea, Republic of, 2022, pp. 1269-1275.

7. **A. Abdallah** and M. M. Mansour, "Angle-Based Multipath Estimation and Beamforming for FDD Cell-free Massive MIMO," in *Proc. IEEE Int. Sig. Process. Advances in Wireless Communication. Workshop (SPAWC)}*, Cannes, France, July. 2019.
8. **A. Abdallah**, M. Mansour, A. Chehab and L. Jalloul, "MMSE Detection for 1-bit Quantized Massive MIMO with Imperfect Channel Estimation," in *Proc. IEEE Int. Sig. Process. Advances in Wireless Communication. Workshop (SPAWC),* Kalamata, Greece, March. 2018.
9. **A. Abdallah**, M. Mansour, and A. Chehab, "Joint channel allocation and power control for D2D communications using stochastic geometry," in *IEEE Wireless Communications and Networking Conference (WCNC)*, Barcelona, 2018, pp. 1-6.
10. **A. Abdallah**, M. M. Mansour and A. Chehab, "A Distance-Based Power Control Scheme for D2D Communications Using Stochastic Geometry," in *Proc. IEEE Vehicular Technology Conference (VTC-Fall),* Toronto, ON, Canada, 2017, pp. 1-6.
11. **A. Abdallah** and S. Doumiati, "Hybrid Precoding for Device-to-Device Communication at MmWave Frequencies," in *Proc. European Wireless Conference (EW),* Oulu, Finland, 2016, pp. 1-6.
12. **A. Abdallah**, D. Serhal and K. Fakih, "Relaying Techniques for LTE-Advanced," in *Proc. European Wireless Conference (EW)*, Budapest, Hungary, 2015, pp. 1-6.

## Patents

1. **A. Abdallah,** A. Celik, M. M. Mansour, and A. M. Eltawil, "Channel Estimation for RIS-aided Multi-User mmWave MIMO Systems", **Non-Provisional** U.S. Patent Application filed on May 12 2022, with the U.S. Patent and Trademark Office, U.S. Provisional Application No. 63/341,218
2. **A. Abdallah,** A. Celik, M. M. Mansour, and A. M. Eltawil, "Channel Estimation for Frequency Selective mmWave MIMO Systems," **Non-provisional** U.S. Patent Application filed on February 17, 2022, with the U.S. Patent and Trademark Office, U.S. Provisional Application No. 63/311,247
3. **A. Abdallah**, A. Celik, M. M. Mansour, and A. M. Eltawil, "Deep Reinforcement Learning Based Beamforming Codebook Design for Reconfigurable Intelligent Surfaces Assisted Massive MIMO Networks," Provisional U.S. Patent Application filed on Aug 12 2022, with the U.S. Patent and Trademark Office, U.S. Provisional Application No. P105713US01

## Oral contributions to conferences (talk or poster)

In addition to presenting my work (talks and posters) in my contributions to conferences with proceedings, I exhibited my work in other workshops, including:

**Presentations:**

- Talk Title: "Deep Learning Empowered Solutions for mmWave RIS-aided Systems" at University of California Irvine (UCI) – Jan. 2023.

**Posters:**

- **A. Abdallah,** A. Celik, M. M. Mansour and A. M. Eltawil, **"**Deep-Learning Based Channel Estimation for RIS-Aided mmWave Systems with Beam Squint, *" in 6G Summit Abu Dhabi 2023*, Abu Dhabi, UAE, Nov. 2022.
- **A. Abdallah**, A. Celik, M. M. Mansour and A. M. Eltawil, "Deep Learning Based Frequency-Selective Channel Estimation for Hybrid mmWave MIMO Systems," in *KAUST Research Conference on Extreme*

*Bandwidth Communications: from mmWave, THz to Optical Bands,* KAUST, Thuwal, Saudi Arabia, Mar. 2022.

## Research Interest

Communication theory – Information theory – Signal processing for wireless communication systems – Energy-efficient interference mitigation – Massive MIMO – D2D – 5G network densification technologies – NOMA – RIS-aided systems – Power control – Channel allocation – Beamforming – Detection – Estimation – Deep Learning – Machine Learning.

## Organization of Conferences

- Track co-chair at IEEE VTC 2023 – Spring (Florence, Italy) - Transmission and reception techniques.

## Summary Skills

**Technical skills:**

- Languages: MATLAB, Python, PyTorch, C++, C#, PIC assembly, PL/SQL
- Web development: HTML, CSS, XML, ASP.net, and C#
- Tools: MATLAB, Visual Studio, Arduino (Robotics), TEMS Cell Planner Tool, Mentum Planet, Arena Simulation Software, Antenna Magus, Latex, Packet Tracer, Advanced Design System (ADS) momentum, LabView.

**Interpersonal skills:** Leadership, Communication, Team-Building, Organizational, and Innovative.

**Languages:** English, Arabic, and French (technical knowledge).

## Nationality

*Canadian, Lebanese.*

## Membership

- Current member in many societies: Institute of Electrical and Electronics Engineers (IEEE), IEEE ComSoc, IEEE Signal Processing Society, IEEE Young Professionals, and IEEE Women in Engineering.
- Current member of the Order of Engineers and Architects (OEA) in Lebanon.

## Volunteering work

- Treasurer of IEEE Young Professionals Affinity Group in Lebanon (2019-2020)

- Organized Students and Young Professional Lebanon Congress (SYPLC) in 2019 for IEEE Young Professionals.
- Activity Coordinator of the AUB's Electrical and Computer Engineering Graduate Committee (2018-2020)
- Secretary of IEEE Young Professionals Affinity Group in Lebanon (2017-2018)
- Advertiser of the AUB's Electrical and Computer Engineering Graduate Committee (2017)
- Organized a shadowing day at Ericsson Lebanon for young female engineers (Summer 2018)
- Organized the first and second editions of ALFA & Ericsson IoT Award in 2017 and 2018 (Lebanon)
- Organized SYPLC 2018 for IEEE Young Professionals

## References

Will be provided upon request.