MOHAMMED FAROUK NAKMOUCHE

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SUMMARY

With over 8 years of experience in research and engineering, I specialize in the design and integration of passive components and antennas for microwave and millimeter-wave applications. My expertise includes advancing the modeling and design of these components through machine learning techniques, with a focus on Substrate Integrated Waveguide (SIW), Ridge Gap Waveguide (RGW), and Additive Manufacturing (AM). I also optimize miniature, low-cost system-in-package solutions, particularly for Internet of Space (IoS) applications. Having worked on international projects across France, Turkey, Egypt, Taiwan, and Canada, I bring a global perspective and strong collaboration skills.

EDUCATION

- PhD, Electrical Engineering, École de technologie supérieure (ETS) Montreal, Canada, January 2022 - September 2025 (Expected)
- Msc, Telecommunication System and Network, University of Laghouat, Algeria, September 2013 - July 2015
- Bsc, Telecommunication System and Network, University of Laghouat, Algeria, September 2010 - July 2013

TECHNICAL SKILLS

- **Programming Skills:** Proficient in Python and MATLAB for algorithm development and computational tasks.
- **Deep Learning Frameworks:** Hands-on experience with TensorFlow, Keras, and PyTorch for developing and training machine learning models.
- **3D Electromagnetic Analysis Software:** Expertise in Ansys HFSS and CST Microwave Studio for electromagnetic simulations, analysis, and validation.
- **Circuit Design Tools:** Skilled in using Keysight Advanced Design System (ADS) for RF and microwave circuit design, optimization, and performance analysis.
- **Design Expertise:** Extensive experience in designing and validating:
  - **Antennas:** Complete lifecycle from conceptual design to experimental validation, including single-element, array, and MIMO configurations.
  - **Waveguides:** Substrate Integrated Waveguides (SIW) and Ridge Gap Waveguides (RGW) for interconnections, transitions, and SIW/RGW-based components.
  - **RF/Microwave Filters:** Conceptual design, simulation, and performance optimization.
- **Measurement and Analysis:** Proficient in conducting RF and microwave measurements using vector network analyzers (VNAs), spectrum analyzers, and anechoic chambers. Experienced in analyzing measured data for design validation and performance enhancement.
- **Fabrication Expertise:** Extensive experience in fabricating RF/microwave components using advanced manufacturing techniques, including conventional PCB fabrication, 3D printing, and screen printing. Skilled in material selection and process optimization for efficient prototyping and production.

PROFESSIONAL AND ACADEMIC EXPERIENCE

Research experience

ETS Montreal, Quebec University

Research assistant - PhD student *January 2022 - August 2025 (Expected)*

- Worked on the development of scalable machine learning-aided synthesis approaches for fully metallic 3D printed ridge gap waveguides.
- Proposed a new modeling and design approach for printed ridge gap waveguides.
- Proposed a foldable printed ridge gap waveguide MIMO antenna based on thick materials.
- Proposed a novel vertical transition from substrate-integrated waveguides (SIW) to printed ridge gap waveguides (PRGW), providing significant advantages in system-on-substrate (SoS) design.
- Currently investigating machine learning-aided synthesis approaches for 3D-printed nonuniform lens antenna designs, which yield promising results.

National Research Council Canada (NRC)

Research intern *May 2023 - August 2024*

- Worked on the design of a multiple input multiple output (MIMO) antenna for a radar system dedicated to elderly monitoring applications.
- Worked on the design of 3D-printed origami antennas for reconfigurable pattern applications.
- Develop and investigate substrate-integrated waveguides (SIWs), printed ridge gap (PRGW) waveguides, and multimode waveguides based on flexible materials.
- Showed that it is possible to 3D print SIW, PRWG, and multimode waveguide using screen printing.

Izmir University of Economics (Turkey)

Research Assistant *Septmber 2020 - December 2021*

- Development of an innovative antenna design approach using machine learning (ML) and genetic algorithms (GA).
- Antenna and Filter Design Based on Ridge Gap Waveguide Technology for Satcom applications
- Design and development of metamaterial-based absorbers based on textile materials

National Taiwan University of Science and Technology (Taiwan)
Guest Research intern *January 2020 - March 2020*
- Proposed low-cost antenna in the packaging (AiP) design approach using machine learning techniques for mm-wave applications.
- Worked in collaboration on the design of an end-fire antenna in the packaging (AiP) with wide operating bandwidth and stable radiation patterns supported by the "Qualcomm Taiwan Research Program, 2020 (NCTU/NYCU).

Ege University (Turkey)
Research Assistant *September 2016 - October 2018*
- Worked on the design and experimental validation of a miniature wideband bandpass filter operating from 8 GHz to 19 GHz.
- Worked on the design and development of a miniature substrate integrated waveguide (SIW) antenna for IoT and sub-6 GHz and satellite downlink application

Industrial experience

LATYS Intelligence (Canada)
RF System Engineer Intern *June 2022 - September 2022*
- Develop and simulate reconfigurable metasurfaces and full-duplex antennas using HFSS and CST.
- Fabrication and performance verification using instruments like VNAs and spectrum analyzers.
- Performance verification of the LATYS non-reciprocal wireless relay system and conduct rigorous testing to validate against specifications.

Fizari Lab Startup (France)
Founder and R&D Engineer *March 2020 - September 2020*
I started building a deep-tech start-up to commercialize innovative research services to accelerate the antenna design process using machine learning techniques for 5G and IoT applications. Nonetheless, it was a promising idea, but COVID-19 prevented us from moving forward.

TransferFi (Singapore)
Research And Development Engineer (Contract) *October 2018 - March 2019*
- Development of new rectifier circuits for ambient energy harvesting terminals:
- Design and development of a rectifier circuit using Keysight ADS.
- Writing technical documentation and rapport.

Mobilis Laghouat Company HSC/BSC Communication Center (Algeria)
Antenna Engineer Junior *May 2015 - October 2015*
- Maintenance and optimization of base station antennas.
- Worked on antenna performance monitoring to ensure effective communication.

VOLUNTEERING EXPERIENCE

Treasurer of the IEEE Student Branch, ÉTS Montreal **January 2022- December 2023**
- Managed the branch's budget and supported the planning and execution of student-led technical, professional, and outreach events.

IEEE Microwave Theory and Techniques Society (MTT-S)
- Lead the MTT-S Student Ambassador Program, coordinating outreach, mentoring, and professional development events globally.
- Member of the MTT-S Member and Geographic Activities (MGA) Committee and Standing Committees [September 2024-Present]

CERTIFICATES AND ONLINE COURSES

- Multi-Functional RF Integrated Passive Components for 6G, Radar Systems, and Beyond (IMS 2025), June 2024
- RF Bootcamp from Keysight Technologies, Modelithics, USF, Air Force Research Laboratory Information Directorate, and Northeastern University, June 2024
- Intro to Python for Data Science Course (DataCamp), Nov 2018
- Product Lifecycle Management (Ege University Product Lifecycle Management Research & Application Excellence Centre)
- Turkish Language Preparatory Course Certificate (Ege University), Jun 2016
- Inclusive Leadership Training: Becoming a Successful Leader (edX), Aug 2015
- Programming for Everybody with Python (Coursera), May 2015

AWARDS

- Graduate Research Fellowship, École de technologie supérieure (2022)
- Graduate Research Fellowship, National Taiwan University of Science and Technology (January 2020 - March 2020)
- Türkiye Scholarships Graduate Research Fellowship (2015 - 2018)
- Valedictorian Award, Amar Telidji University of Laghouat (2015)
- Second Place Award, Amar Telidji University of Laghouat (2013)

PUBLICATIONS LIST

Submitted Publications

Mohammed Farouk Nakmouche, Dominic Deslandes, Ghyslain Gagnon, "Machine Learning-Aided Synthesis Approach for 3D Printed Ridge Gap Waveguides," under review in IEEE Transactions on Components, Packaging and Manufacturing Technology.

Mohammed Farouk Nakmouche, Dominic Deslandes, Ghyslain Gagnon, "3D-Printed Metallic 90° Bent Ridge Gap Waveguide Structures: Enabling Compact Antenna and Passive Component Integration in CubeSats," under review in IEEE Antennas and Wireless Propagation Letters.

Mohammed Farouk Nakmouche, Dominic Deslandes, and Ghyslain Gagnon, "Printed Ridge Gap Waveguide Synthesis Approach Based on Genetic Programming," under review in IEEE Journal on Multiscale and Multiphysics Computational Techniques.

Mohammed Farouk Nakmouche, Dominic Deslandes, and Ghyslain Gagnon, Low-Cost Origami Printed RGW Wideband MIMO Antenna With Additively Manufactured Dielectric Resonator," under review in IEEE Transactions on Antennas and Propagation.

Published work

Articles in peer-reviewed journals

Mohammed Farouk Nakmouche, Dominic Deslandes, Mourad Nedil, Ghyslain Gagnon, "Machine Learning-Aided Design of Defected Ground Structures for PRGW-Based MIMO Antennas," Accepted in IEEE Transactions on Antennas and Propagation, doi: 10.1109/TAP.2025.3587540.

Eddine Lamri, Isam, Ahmad, Sarosh, **Mohammed Farouk Nakmouche**, Ghaffar, Adnan, Fawzy, Diaa E., Allam, A.M.M.A., Ali, Esraa Mousa, Dalarsson, Mariana, and Alibakhshikenari, Mohammad. "Design and development of a graphene-based reconfigurable patch antenna array for THz applications." Frequenz, 2022.

M. F. Nakmouche, Abdemegeed Mahmoud Allam, Diaa E. Fawzy, and Mahmoud Abdalla, "Design and Measurement of Triple h -Slotted DGS Printed Antenna with Machine Learning," Progress In Electromagnetics Research Letters, Vol. 101, 117-125, 2021.

M. F. Nakmouche, Muhammad Idrees Magray, Abdemegeed Mahmoud Allam, Diaa E. Fawzy, Ding-Bing Lin, and Jenn-Hwen Tarng, "A Novel Dual-Band Printed SIW Antenna Design Based on Fishnet & CCRR DGS Using Machine Learning for Ku-Band Applications," Progress In Electromagnetics Research C, Vol. 116, 207-219, 2021.

M. F. Nakmouche, Abdemegeed Mahmoud Allam, Diaa E. Fawzy, and Ding-Bing Lin, "Development of a High Gain FSS Reflector Backed Monopole Antenna Using Machine Learning for 5G Applications," Progress In Electromagnetics Research M, Vol. 105, 183-194, 2021.

Articles in conferences

Mohammed Farouk Nakmouche, Dominic Deslandes, Ghyslain Gagnon, George Xiao, and Jianping Lu, " Fabry Perot Array Antenna Design Using Machine Learning," 2024 IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting (AP-S/URSI), Florence, Italy, July 2024.

Mohammed Farouk Nakmouche, Dominic Deslandes, Ghyslain Gagnon, George Xiao, and Jianping Lu, "Design of a Beam Reconfigurable Flexible SIW Slot Array Antenna Using ANN-Based Technique," 2024 IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting (AP-S/URSI), Florence, Italy, July 2023.

Mohammed Farouk Nakmouche, Dominic Deslandes, Ghyslain Gagnon, " Machine Learning Design Approach of 3D Printed Pixelated Lens MIMO Antenna for CubeSat," 2023 IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting (AP-S/URSI), Portland, USA, July 2023.

Mohammed Farouk Nakmouche, Dominic Deslandes, Ghyslain Gagnon, " Machine Learning Aided Design of Sub-Array MIMO Antennas for CubeSats Based on 3D Printed Metallic Ridge Gap Waveguides," 2022 IEEE Future Networks World Forum, October 2022.

Mohammed Farouk Nakmouche, Dominic Deslandes, Ghyslain Gagnon, "Dual-Band 4-Port H-DGS Based Textile MIMO Antenna Design Using Genetics Algorithms for Wearable Application," 2022 IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting (AP-S/URSI), Denver, CO, USA, 2022.

Mohammed Farouk Nakmouche, D. Deslandes and G. Gagnon, "Dual-Band 4-Port H-DGS Based Textile MIMO Antenna Design Using Genetics Algorithms for Wearable Application," 2022 IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting (AP-S/URSI), 2022.

Gökberk Akarsu, Hany Taher, E. Buse Zengin, **Mohammed Farouk Nakmouche**, Diaa E. Fawzy, A.M.M.A Allam, and Frances Cleary, "Development of Ultra-Wideband Textile-Based Metamaterial Absorber for mm-Wave Band Applications ", The 16th European Conference on Antennas and Propagation (EuCap), 2021.

Gökberk Akarsu, Mehmet Faruk Cengiz, Diaa E. Fawzy, E. Buse Zengin, A.M.M.A. Allam, Hany Taher, Frances Cleary, **Mohammed Farouk Nakmouche**, "Development of A Novel Ultra-Wideband Textile-Based Metamaterial Absorber for mm-wave Band Applications", The 17th International Workshop on Antenna Technology (IWAT), 2021.

Mehmet Faruk Cengiz, **Mohammed Farouk Nakmouche**, Diaa E. Fawzy, A.M.M.A. Allam, Gökberk Akarsu, Hany Taher, "Design of Triple-Band Bandpass Filter using Inverted Microstrip Ridge Gap Waveguide for Ka-Band Applications", 10th International Conference on Electrical and Electronics Engineering (ICEEE), 2021.

Gökberk Akarsu, E. Buse Zengin, **Mohammed Farouk Nakmouche**, Mehmet Faruk Cengiz, Diaa E. Fawzy, A.M.M.A. Allam, Hany Taher, "Development of A Symmetric Metamaterial Absorber with Bandwidth Improvements for 5G Millimeter-Wave Applications", 10th International Conference on Electrical and Electronics Engineering (ICEEE), 2021.

Mohammed Cherif Derbal, **Mohammed Farouk Nakmouche**, Mourad Nedil, A.M.M.A. Allam, Diaa E. Fawzy, Mohamed Fathy Abo Sree, "Dual Band Antenna Design Using Pixeled DGS for Energy Harvesting Applications", 10th International Conference on Electrical and Electronics Engineering (ICEEE), 2021.

Gökberk Akarsu, **Mohammed Farouk Nakmouche**, Diaa E. Fawzy, A.M.M.A. Allam, "A Novel Ultra-Wideband Metamaterial-Based Perfect Absorber for 5G Millimeter-Wave Applications", 10th International Conference on Electrical and Electronics Engineering (ICEEE), 2021.

M. F. Nakmouche et al., "Machine Learning Based Design of Ku Band Ridge Gap Waveguide Slot Antenna Loaded with FSS for Satellite Internet Applications," 2021 IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting (APS/URSI), 2021, pp. 1881-1882.

I. E. Lamri, A. Mansoul, **M. F. Nakmouche** and M. Belattar, "Design of Novel UWB 4-element MIMO Microstrip Patch Antenna for Sub-6 GHz 5G Applications," 2021 International Conference on Radar, Antenna, Microwave, Electronics, and Telecommunications (ICRAMET), 2021, pp. 7-11.

M. I. Magray, **M. F. Nakmouche** and J. -H. Tarng, "A Thin Dual Slot Based Offset-Fed Beam Tilted mmWave 5G AiP Design," 2021 International Symposium on Antennas and Propagation (ISAP), 2021, pp. 1-2. **M. F. Nakmouche**, M. Idrees Magray, A. M. M. A. Allam, D. E. Fawzy, D. B. Lin and J. -H. Tarng, "Low-Cost AiP Array Design Using Machine Learning for mmWave Mobile Systems," 2021 International Symposium on Antennas and Propagation (ISAP), 2021, pp. 1-2.

M. F. Nakmouche, A. M. M. A. Allam, D. E. Fawzy and D. B. Lin, "Low Profile Dual Band H-Slotted DGS Based Antenna Design Using ANN for K/Ku Band Applications," 8th International Conference on Electrical and Electronics Engineering (ICEEE), 2021, pp. 283-286.

G. Akarsu, **M. F. Nakmouche**, D. E. Fawzy, A. M. M. A. Allam, K. Başköy and M. F. Cengiz, "A Novel 5G Wideband Metamaterial Based Absorber for Microwave Energy Harvesting Applications," 8th International Conference on Electrical and Electronics Engineering (ICEEE), 2021, pp. 309-312.

M. F. Nakmouche, A. M. M. A. Allam, D. E. Fawzy, D. Bing Lin and M. F. Abo Sree, "Development of H-Slotted DGS Based Dual Band Antenna Using ANN for 5G Applications," 15th European Conference on Antennas and Propagation (EuCAP), 2021, pp. 1-5.

M. F. Nakmouche, D. E. Fawzy, A. M. M. A. Allam, H. Taher and M. F. A. Sree, "Dual Band SIW Patch Antenna Based on H-Slotted DGS for Ku Band Application," 7th International Conference on Electrical and Electronics Engineering (ICEEE), 2020, pp. 194-197.

M. F. Nakmouche and M. Nassim, "Impact of Metamaterials DGS in PIFA Antennas for IoT Terminals Design," 6th International Conference on Image & Signal Processing & their Applications (ISPA), 2019, pp. 1-4.

M. F. Nakmouche, H. Taher, D. E. Fawzy and A. M. M. A. Allam, "Development of a Wideband Substrate Integrated Waveguide Bandpass Filter Using H-Slotted DGS," IEEE Conference on Antenna Measurements and Applications (CAMA), 2019, pp. 1-4.

M. F. Nakmouche, H. Taher, D. E. Fawzy and G. Kahraman, "Parametric Study of Different Shapes-Slotted Substrate Integrated Waveguide for Wideband Applications," 18th Mediterranean Microwave Symposium (MMS), 2018, pp. 251-254.

REFERENCE LIST

Prof. Ghyslain Gagnon, École de technologie supérieure Montreal (PhD Advisor).

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Prof. Dominic Deslandes, École de technologie supérieure Montreal (PhD Advisor).

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Principal Research Officer Gaozhi (George) Xiao, National Research Council Canada (My Former Manager at NRC).

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Prof. Mourad Nedil, University of Quebec in Abitibi-Témiscamingue (Collaborator).

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