

Bassel Al Homssi

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ACADEMIC QUALIFICATIONS

Doctor of Philosophy (PhD) in Electrical Engineering RMIT University	2020
Master of Telecommunications Engineering The University of Melbourne	2017
Master of Science in Electrical Engineering American University of Sharjah	2016
Bachelor of Science in Electrical Engineering American University of Sharjah	2014

PROFESSIONAL EXPERIENCE

Assistant Professor , Department of Computer Engineering University of Sharjah, Sharjah, UAE	<i>Aug 2024 – Present</i>
Lecturer (Assistant Professor) , Department of Engineering & Technology University of New South Wales, Sydney, Australia	<i>Dec 2022 – Jul 2024</i>
Research Fellow , Department of Engineering RMIT University, Melbourne, Australia	<i>Jun 2021 – Dec 2022</i>
Research Fellow , Department of Engineering & IT Deakin University, Melbourne, Australia	<i>Jun 2021 – Dec 2021</i>
Research Assistant , Department of Engineering RMIT University, Melbourne, Australia	<i>Aug 2020 – Jun 2020</i>
Research Officer , Department of Engineering RMIT University, Melbourne, Australia	<i>Jan 2019 – Jun 2020</i>
Graduate Teaching Assistant , Department of Engineering American University of Sharjah, Sharjah, UAE	<i>Jan 2015 – Jun 2016</i>

HIGHLIGHTS

Field of Specialization

- *Major field of specialization:* Intelligent Telecommunication and Network Engineering
- *Fine field specialization:* Satellite Communications and AI in space

Research Fundings and Awards

- A total of 4 personal funded grants in the past two years (funded: 2 SmartSat CRC, 1 AOARD/AFRL, 1 INRC) with a total of ~\$2.1 million.
- A total of 2 collaborative grants in the past two years (funded: Defense Trailblazer, ARC) with a total of ~\$1.7 million.

Academic Honors and Awards

- Led the network design for the largest IoT network in Australia which won the following awards:
 - Municipal Association of Victoria (MAV) *Technology Awards for Excellence 2020*
 - IoT Alliance Australia (IoTAA) *Smart Cities Award for 2020*
- Graduate assistantship scholarship at the American University of Sharjah, 2015-2016
- Certification of Engineer-in-Training (EIT) licensed by the NCEES Fundamentals of Engineering (FE), USA, 2014

Mentorship

- Currently supervising 2 post-docs and 2 PhD students
- Completions: 2 PhD students, 1 MS student, and several undergraduate senior projects

Membership of professional bodies

- TPC in several major *IEEE Comsoc* conferences: *IEEE Globecom 2023* and *IEEE VTC 2023*.
- IEEE membership since 2017

CAREER DETAILS

Assistant Professor | University of Sharjah | Sharjah, United Arab Emirates | 08/2024 – Ongoing

This role is involved in shaping the academic experiences of the students, delivering lectures that aim to inspire and engage. My responsibilities extend beyond teaching, as I am actively involved in advancing research in my field and collaborating with colleagues on innovative projects. I also participate in various academic committees, contributing to the university's strategic initiatives. Balancing these duties with my commitment to mentoring students and pursuing professional development, I strive to enhance the university's reputation for excellence while making a meaningful impact on both my discipline and the broader academic community.

Lecturer (Assistant Professor) | UNSW | Canberra, Australia | 12/2022 – 07/2024

This role is research focused and relies on my expertise in AI and wireless systems to engage industry and government partners in the development of state-of-the-art intelligent wireless systems. This includes conducting research and consulting industry partners in the fields of autonomous spacecraft, machine learning, computer vision, and distributed AI. My role includes teaching, graduate mentorship, securing funding, project budgeting, and leading research projects in the field of intelligent space systems as the chief Investigator, with a combined total of \$2.1 million dollars in funding.

SmartSat CRC Project, \$1.10M in funds (2023 - 2024)

- Develop state-of-the-art artificial intelligence techniques for cybersecure and resilient space systems.
- Assemble a team of academics and professional engineers to attain AI-enabled cybersecurity.

Intel Neuromorphic Research Community, \$50k in funds (2023 - 2024)

- Develop neuromorphic computing algorithms utilizing distributed and transfer learning for satellite constellations.
- Liaise with Intel to establish research activities and algorithm testing on neuromorphic hardware.

SmartSat CRC Project, \$750k in funds (2023 - 2024)

- Develop state-of-the-art artificial intelligence techniques for smart multi-modal optical surveillance systems for spacecrafts.
- Manage a team of researchers to develop machine learning algorithms to detect, characterize, and measure objects in space from a spacecraft.

US Air Force Research Laboratory Project, \$225k in funds (2023 - 2024)

- Develop cutting-edge distributed inferencing and federated learning techniques for distributed-edge-AI miniaturized satellite constellations.
- Lead a team of researchers and professional engineers to establish and operate the AI test range.

Key Academic Achievements:

- Publishing in top venues including high ranked journals and conference proceedings as well as military-based publications.
- Providing teaching tutorials and developing material for undergraduate and graduate courses including Artificial Intelligence for Satellite constellations.
- Leading a team of PhD students and Research fellows to develop cutting-edge research and state-of-the-art AI models for satellite communications.
- Supervising higher degree by research students to complete their PhD both as lead supervisor and co-supervisor.

Research Fellow | RMIT University | Melbourne, Australia | 6/2021 – 11/2022

This role entailed providing consultancy and data analytics to industry partners to achieve AI-enabled next-generation satellite constellations.

UK-Australia Space Bridge Project: OneWeb (2022)

- Develop an AI-enabled channel prediction technique for high frequency bands (Q/V-bands). This entailed building a novel proactive channel model for the V-band, which utilizes temporal prediction of the channel for both long- and short-term using machine learning and artificial intelligence.
- Apply RF engineering techniques including signal detection, processing, and measurement analysis for both geostationary and low-Earth orbit satellite links.

SmartSat CRC Project: FLEET Space (2021)

- Engage in cutting-edge research in the fields of massive MIMO for cellular and cell-free networks, IoT over satellite, and machine learning for IoT applications.
- Investigate 5G and beyond 5G technologies for the integration of terrestrial-satellite next generation networks, specifically for IoT networks.

Key Academic Achievements:

- Publishing in top venues including high ranked journals and conference proceedings as well as military-based publications.
- Providing teaching tutorials and developing material for undergraduate and graduate courses including Artificial Intelligence for Satellite constellations.
- Co-supervising PhD students to develop cutting-edge research and state-of-the-art AI models for satellite communications.

Research Fellow | Deakin University | Melbourne, Australia | 6/2021 – 12/2021

This role involved the continuous collaboration with business partners to achieve significant research milestones that integrate analytic concepts and practical approaches. Publishing research achievements to engage the scientific community and broader public with new findings and exciting paradigms.

SmartSat CRC Project: Nova Systems and Australian Defense (2021)

- Apply coding techniques using Python, Matlab, and NS-3 (Network Simulator-3) to develop a simulation environment for a practical geostationary relay communication link.
- Liaise with both Nova System engineers and researchers from the Australian DSTG (Defense Science and Technology Group).

Key Academic Achievements:

- Engaging in cutting-edge research including massive MIMO for cellular and cell-free networks and machine learning for satellite communication networks.
- Publishing in top venues including high ranked journals and conference proceedings.
- Collaboration with other researchers (local and international) to develop high end research.

Research Assistant | RMIT University | Melbourne, Australia | 8/2020 – 6/2021

This role entailed the collaboration with academic and industry partners to achieve high impact research outcomes that integrate analytic concepts and practical approaches. The teaching component included grading coursework and teaching tutorials and labs for various courses, as well as providing support to course coordinators and students. Publishing research achievements to engage the scientific community and broader public with new findings and exciting paradigms.

Key Achievements:

- Publishing in top venues including high ranked journals and conference proceedings.
- Providing teaching tutorials and assisting in developing material for undergraduate and graduate courses including Wireless Sensor Networks and Internet of Things courses.
- Supervision of capstone projects for undergraduate students, as well as PhD students in research projects.
- Collaboration with other researchers (local and international) to develop high-end research.

Research Officer | RMIT University | Melbourne, Australia | 3/2019 – 6/2020

This role entailed the design and end-to-end implementation of the largest IoT network in Australia in collaboration with local governments.

Northern Melbourne Smart Cities Network Project (2019-2021)

- Lead the network development, design, and deployment for the Northern Melbourne Smart Cities Network (awarded AUD1.42 million) which involved the deployment of 50 IoT gateways and 300 IoT sensors.

- Conduct RF testing and quality assurance pre- and post-deployment to ensure seamless connectivity and quality of service provided by the wireless IoT network.
- Manage a multi-disciplinary team composed of government, industry partners, and academics toward the successful deployment of the largest IoT network in Australia.

Graduate Teaching Assistant | American University of Sharjah | Sharjah, UAE | 1/2015 – 6/2016

Facilitate achievement of research initiatives, organize course schedules, and manage learning activities. Undertake multiple roles to support course coordinators and mentor students in a variety of undergraduate core electrical engineering subjects.

Key Achievements:

- Leverage excellent communication, problem-solving, and organizational skills to ensure course continuity, assessment, and quality.
- Handle confidential information in a professional and ethical manner.

INDUSTRY PARTNERSHIPS AND GRANTS

	Funding Body	Role	Institution	Industry Partner	Grant Title	Funding	Duration
1	SmartSat CRC	Primary Investigator	UNSW	N/A	Cyber Secure and Resilient Intelligent Space Systems	AUD \$1.1M	2023 – 2026
2	AOARD	Primary Investigator	UNSW	US Air Force Laboratory	Distributed inferencing and federated learning for distributed-edge-AI miniaturised satellite constellations	USD \$150k	2023 – 2024
3	SmartSat CRC	Primary Investigator	UNSW	Infinity Avionics	Smart Multi-Modal Optical Surveillance System for Spacecraft (SMOS)	AUD \$750k	2023 – 2025
4	INRC	Primary Investigator	UNSW	Intel	Neuromorphic Computing for Intelligent Space Systems	AUD \$100k	2023 – 2026
5	Defense Trailblazer	Co-investigator	UNSW with UoA	Lockhead Martin	Sensing and Detection of Airborne Hypersonic Vehicles using Extreme AI	AUD \$1M	2023 – 2025
6	UK-Australia Bridge	Primary Researcher	RMIT University	OneWeb	V-Band Radio Channel Prediction for Next Generation LEO Constellations	AUD \$150k	2022
7	SmartSat CRC	Primary Researcher	Deakin University	Nova Systems	Application of AI for Satellite Enterprise Management	AUD \$150k	2021
8	SmartSat CRC	Primary Researcher	RMIT University	FLEET	Hybrid Terrestrial-Satellite Access System for IoT Applications	AUD \$150k	2021

TEACHING EXPERIENCE

My teaching approach is principally geared toward putting concepts in a pragmatic setting, this offers a unique advantage of unifying seemingly unrelated concepts and revealing the practicality in seemingly abstract concepts. In my courses, I have shifted away from the conventional textbook-driven assignments to interactive thought-provoking practical assessments. I had the privilege to teach a vast range of courses, largely focused on electronics, systems engineering, communication engineering and programming, summarized as follows:

Course Name	Level	University (Year)	Role
<i>Space-borne Imaging</i>	Graduate	University of New South Wales (2023)	Course Development, teaching, and grading

Wireless Sensor Networks	Undergraduate /Graduate	RMIT University (2019-2022)	Course Development, teaching, and grading
Network Engineering	Undergraduate /Graduate	RMIT University (2019-2022)	Tutorials, and grading
Satellite Communications	Undergraduate /Graduate	RMIT University (2019)	Teaching, labs, tutorials, and grading
Introduction to Circuit Analysis	Undergraduate	American University of Sharjah (2015)	Tutorials, Labs, and grading
Advanced Circuit Analysis	Undergraduate	American University of Sharjah (2016)	Labs, tutorials, and grading
Introduction to Computing	Undergraduate	RMIT University (2019-2020)	Teaching, tutorials, and grading
Fundamentals of Electronics	Undergraduate	American University of Sharjah (2015) RMIT University (2018)	Tutorials, Labs, and grading
Advanced Electronics	Undergraduate	American University of Sharjah (2016) RMIT University (2018)	Tutorials, labs, tutorials, and grading
Introduction to Electromagnetics	Undergraduate	American University of Sharjah (2016)	Tutorials and grading
Power System Analysis	Undergraduate	American University of Sharjah (2016)	Labs and grading
Microwave Engineering	Undergraduate	American University of Sharjah (2015)	Tutorials and grading
Introduction to Control Systems	Undergraduate	American University of Sharjah (2015-2016)	Labs, tutorials, and grading
Signals and Systems	Undergraduate	RMIT University (2018)	Labs, tutorials, and grading
Communications Engineering	Undergraduate	RMIT University (2018)	Labs, tutorials, and grading

SEMINARS AND CONFERENCES

- Seminar at UNSW Canberra on 19th September 2023 on “Artificial Intelligence for Satellite Constellations and Space Systems”.
- Seminar at RMIT University on 30th of September 2020 on “Performance Modeling and Enhancement of Next Generation Wireless IoT Networks”.
- Conference presentation on 24th of May 2018 on “Free Spectrum for IoT” in the IEEE International Conference on Communications in Kansas City, USA.

PROFESSIONAL SERVICE

- TPC at IEEE conferences such as ICC and Globecom
- Reviewed papers for *IEEE Communications Magazine*, *IEEE Transactions on Wireless Communications*, *IEEE Transactions on Communications*, *IEEE Wireless Communications Letters*, *IEEE Internet of Things Journal*, *IEEE Internet of Things Magazine*, and *IEEE Journal on Selected Areas in Communications*.
- Examiner for PhD dissertations, research presentation milestones, and MSc presentations.
- Member at the IEEE

PUBLICATIONS & PEER-REVIEWED CONFERENCES

Journals:

[J20] A. Al-Hourani and **B. Al Homssi**, "Doppler Shift Distribution in Satellite Constellations," in *IEEE Communications Letters*. **[Published]**

[J19] J. Choi, B. Li, **B. Al Homssi**, J. Park and S. -L. Kim, "Spectrum Sharing Through Marketplaces for O-RAN Based Non-Terrestrial and Terrestrial Networks," in *IEEE Internet of Things Magazine*, vol. 7, no. 5, pp. 128-134, September 2024.

- [J18] K. Dakic, **B. Al Homssi**, S. Walia and A. Al-Hourani, "Spiking Neural Networks for Detecting Satellite Internet of Things Signals," in *IEEE Transactions on Aerospace and Electronic Systems*, vol. 60, no. 1, pp. 1224-1238, Feb. 2024.
- [J17] **B. Al Homssi** et al., "Artificial Intelligence Techniques for Next-Generation Massive Satellite Networks," in *IEEE Communications Magazine*, vol. 62, no. 4, pp. 66-72, April 2024.
- [J16] J. Ding, **B. Al Homssi**, J. Choi and D. Qu, "Analytic Modeling for Grant-Free Transmission in Cell-Free Massive MIMO: A Stochastic Geometry Approach," in *IEEE Internet of Things Journal*, vol. 11, no. 10, pp. 17141-17153, May 2024.
- [J15] **B. Al Homssi** et al., "Deep Learning Forecasting and Statistical Modeling for Q/V-Band LEO Satellite Channels," in *IEEE Transactions on Machine Learning in Communications and Networking*, vol. 1, pp. 78-89, 2023.
- [J14] K. Dakic, **B. Al Homssi**, M. Lech and A. Al-Hourani, "HybNet: A Hybrid Deep Learning-Matched Filter Approach for IoT Signal Detection," in *IEEE Transactions on Machine Learning in Communications and Networking*, vol. 1, pp. 18-30, 2023.
- [J13] J. Ding, **B. Al Homssi** and J. Choi, "Multi-Stage Decoding in Dense Distributed Networks for MTC," in *IEEE Transactions on Vehicular Technology*, vol. 72, no. 9, pp. 12401-12406, Sept. 2023.
- [J12] M. Nemati, **B. Al Homssi**, S. Krishnan, J. Park, S. Loke, and J. Choi, "Non-Terrestrial Networks with UAVs: A Projection on Flying Ad-Hoc Networks," in *MDPI Drones*, vol. 6, no. 11, pp. 334, October 2022.
- [J11] C. Chan, **B. Al Homssi**, and A. Al-Hourani, "Performance Evaluation of Random Access Methods for IoT-over-Satellite," in *MDPI Remote Sensing*, vol. 14, no. 17, pp. 4323, August 2022.
- [J10] **B. Al Homssi** et al., "Next Generation Mega Satellite Networks for Access Equality: Opportunities, Challenges, and Performance," in *IEEE Communications Magazine*, vol. 60, no. 4, pp. 18-24, April 2022.
- [J9] **B. Al Homssi** and A. Al-Hourani, "Optimal Beamwidth and Altitude for Maximal Uplink Coverage in Satellite Networks," in *IEEE Wireless Communications Letters*, vol. 11, no. 4, pp. 771-775, April 2022.
- [J8] B. Manzoor, A. Al-Hourani and **B. Al Homssi**, "Improving IoT-Over-Satellite Connectivity Using Frame Repetition Technique," in *IEEE Wireless Communications Letters*, vol. 11, no. 4, pp. 736-740, April 2022.
- [J7] B. Manzoor, **B. Al Homssi** and A. Al-Hourani, "IoT Coverage Enhancement Using Repetition in Energy Constrained Devices: An Analytic Approach," in *IEEE Transactions on Green Communications and Networking*, vol. 6, no. 2, pp. 1122-1131, June 2022.
- [J6] **B. Al Homssi** and A. Al-Hourani, "Modeling Uplink Coverage Performance in Hybrid Satellite-Terrestrial Networks," in *IEEE Communications Letters*, vol. 25, no. 10, pp. 3239-3243, Oct. 2021.
- [J5] **B. Al Homssi**, K. Dakic, S. Maselli, H. Wolf, S. Kandeepan and A. Al-Hourani, "IoT Network Design Using Open-Source LoRa Coverage Emulator," in *IEEE Access*, vol. 9, pp. 53636-53646, 2021.
- [J4] B. Manzoor, **B. Al Homssi**, A. Al-Hourani and S. Kandeepan, "Optimal Repetition Rate for Maximal Coverage," in *IEEE Wireless Communications Letters*, vol. 10, no. 4, pp. 800-804, April 2021.
- [J3] **B. Al Homssi** et al., "A Framework for the Design and Deployment of Large-Scale LPWAN Networks for Smart Cities Applications," in *IEEE Internet of Things Magazine*, vol. 4, no. 1, pp. 53-59, 2021.
- [J2] **B. Al Homssi**, A. Al-Hourani, Z. Krusevac and W. S. T. Rowe, "Machine Learning Framework for Sensing and Modeling Interference in IoT Frequency Bands," in *IEEE Internet of Things Journal*, vol. 8, no. 6, pp. 4461-4471, 2021.
- [J1] **B. Al Homssi**, A. Al-Hourani, S. Chandrasekharan, K. M. Gomez and S. Kandeepan, "On the Bound of Energy Consumption in Cellular IoT Networks," in *IEEE Transactions on Green Communications and Networking*, vol. 4, no. 2, pp. 355-364, 2020.

Conferences:

- [C10] **B. A. Homssi**, C. C. Chan, K. Dakic, J. A. Attari and A. Al-Hourani, "V-band Radio Channel Modeling for Mega Satellite Networks," *ICC 2024 - IEEE International Conference on Communications*, Denver, CO, USA, 2024, pp. 5045-5050.
- [C9] K. Dakic, **B. Al Homssi** and A. Al-Hourani, "Spiking-UNet: Spiking Neural Networks for Spectrum Occupancy Monitoring," *2024 IEEE Wireless Communications and Networking Conference (WCNC)*, Dubai, United Arab Emirates, 2024, pp. 1-6.

- [C8] A. Al-Hourani, **B. Al Homssi** and A. Valentine, "Developing Industry-Focused Internet-of-Things Course for Wireless Access Networks," *2023 IEEE International Conference on Teaching, Assessment and Learning for Engineering (TALE)*, Auckland, New Zealand, 2023, pp. 1-4.
- [C7] S. W. Loke, J. Choi, **B. A. Homssi** and S. Kim, "Computing with the Internet of Flying-Things from Sky to Space," *2023 22nd International Symposium on Communications and Information Technologies (ISCIT)*, Sydney, Australia, 2023, pp. 52-57.
- [C6] K. Dakic, C. C. Chan, **B. A. Homssi**, K. Sithamparanathan and A. Al-Hourani, "On Delay Performance in Mega Satellite Networks with Inter-Satellite Links," *GLOBECOM 2023 - 2023 IEEE Global Communications Conference*, Kuala Lumpur, Malaysia, 2023, pp. 4896-4901.
- [C5] C. C. Chan, **B. Al Homssi** and A. Al-Hourani, "A Stochastic Geometry Approach for Analyzing Uplink Performance for IoT-over-Satellite," *ICC 2022 - IEEE International Conference on Communications*, Seoul, Korea, Republic of, 2022, pp. 2363-2368.
- [C4] K. Dakic, **B. Al Homssi**, A. Al-Hourani and M. Lech, "LoRa Signal Demodulation Using Deep Learning, a Time-Domain Approach," *2021 IEEE 93rd Vehicular Technology Conference (VTC2021-Spring)*, 2021, pp. 1-6.
- [C3] B. Manzoor, A. Al-Hourani, **B. Al Homssi**, K. Magowe, S. Kandeepan and K. G. Chavez, "Evaluating Coverage Performance of NB-IoT in the ISM-band," *2020 27th International Conference on Telecommunications (ICT)*, Bali, Indonesia, 2020, pp. 1-5.
- [C2] **B. Al Homssi**, A. Al-Hourani, K. G. Chavez, S. Chandrasekharan, and S. Kandeepan, "Energy-Efficient IoT for 5G: A Framework for Adaptive Power and Rate Control," *2018 12th International Conference on Signal Processing and Communication Systems (ICSPCS)*, Cairns, Australia, 2018, pp. 1-6.
- [C1] **B. Al Homssi**, A. Al-Hourani, R. Evans, K. Chavez, S. Kandeepan, W. Rowe, and M. Loney, "Free Spectrum for IoT: How Much Can It Take?" *2018 IEEE International Conference on Communications Workshops (ICC Workshops)*, Kansas City, MO, 2018, pp. 1-6.