



INTERNATIONAL CONFERENCE ON COMPUTING, INTERNET OF THINGS AND MICROWAVE SYSTEMS First Edition

29-31 July 2024 UQO & RMC CANADA



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Advanced Program

Session	Topics
A	Antennas & Propagation
B	Passive & Active Components, Circuits & Subsystems
C	Computer Science, Intelligent Systems and Information Technologies

Keynotes

ADVANCED ANTENNAS FOR MM-WAVE WIRELESS COMMUNICATION SYSTEMS:



Professor Tayeb A. Denidni, INRS-EMT, University of Quebec, Canada:

Professor Denidni received the M.Sc. and Ph.D. degrees in electrical engineering from Laval University, Quebec City, QC, Canada, in 1990 and 1994, respectively. From 1994 to 2000, he was a Professor with the Engineering Department, Université du Québec à Rimouski (UQAR), Rimouski, QC, Canada, where he founded the Telecommunications laboratory. Since 2000, he has been with the Institut National de la Recherche Scientifique (INRS), University of Quebec, Montreal, QC, Canada.

He founded the RF Laboratory, INRS—Energie, Matériaux et Télécommunications (INRS-EMT), Montreal. He has extensive experience in antenna design. He served as a principal investigator for many research projects sponsored by NSERC, FCI, and numerous industries. His current research interests include reconfigurable antennas using electromagnetic bandgap and frequency-selective surface structures, dielectric resonator antennas, meta-material antennas, adaptive arrays, switched multi-beam antenna arrays, ultrawideband antennas, microwave, and development for wireless communications systems. Professor Denidni is an elected IEEE Fellow.

METHODS FOR UAV DETECTION:



Pr. Miodrag Bolić, University of Ottawa, Canada:

Miodrag Bolic received his Ph.D. degree in electrical engineering from Stony Brook University, US, in 2004. Since 2004 he has been with the University of Ottawa, Canada, where he is Professor and Associate Director of Computer Engineering program with the School of Electrical Engineering and Computer Science. He is a Director of the Computational Analysis and Acceleration Research Group and Health Devices Research Group. His current research interests include signal processing, machine learning and uncertainty quantification for biomedical and autonomous vehicle applications.

He has published about 90 journal papers and has 5 patents. He also published a book, Pervasive Cardiovascular and Respiratory Monitoring Devices: Model-Based Design, in 2023 with Academic Press/Elsevier. Prof. Bolic leads several projects related to UAV intruder detection and infrastructure inspection based on UAVs.

AI in CYBERSECURITY:



Dr. Ranwa Al Mallah , Assistant Professor of Cybersecurity at the Royal Military College of Canada

Ranwa Al Mallah received her Ph.D. from Polytechnique Montréal, and she is currently an Assistant Professor of Cybersecurity at the Royal Military College of Canada. Dr. Al Mallah has published extensively in prestigious, peer-reviewed journals and collaborated with leading scientists on impactful research projects. Her expertise lies in the intersection of Artificial Intelligence (AI) and cybersecurity, focusing on both the application of AI in cybersecurity defenses and the security challenges within AI systems themselves.

ADVANCED INTEGRATED ELECTRONICS FOR EMERGING APPLICATIONS:



Dr. Ahmad Hassan , Polytechnique Montréal , Canada:

Ahmad Hassan (Member, IEEE) received the Ph.D. degree in electrical engineering from Polytechnique Montréal, Canada, in 2019. From 2019 to 2021, he was a Postdoctoral Fellow with the Polystim Neurotechnologies Laboratory in the Department of Electrical Engineering at Polytechnique Montréal, Canada. Then, from 2021 to 2022, he was a Postdoctoral Fellow with the Integrated Systems Laboratory in the Department of Electrical and Computer Engineering at the University of Toronto, Canada. He joined the electrical engineering department of Polytechnique Montréal as an assistant professor in 2023.

During his research, he contributed to various research and industrial projects and has authored more than 45 research works in international journals and symposiums. His research is oriented towards emerging technologies including integrated circuits for harsh environments and photonic computing. He was a recipient of FRQNT Postdoctoral research scholarship.

CUBESAT DEVELOPMENT FROM COMPONENTS-OFF-THE-SHELF:



Pr. Ahmed Iyanda Sulyman, Embry-Riddle Aeronautical University Prescott, Arizona USA:

Sulyman Ahmed Iyanda Sulyman (SM'09) received the Ph.D. degree from the Department of Electrical and Computer Engineering, Queen's University, Kingston, ON, Canada, in 2006. He was a Teaching Fellow with Queen's University from 2004 to 2006, a Post-Doctoral Fellow with the Royal Military College of Canada, Kingston, from 2007 to 2009, and an Assistant/Associate Professor with King Saud University, Riyadh, Saudi Arabia, from 2009 to 2016. He is currently a Full Professor with the Department of Computer, Electrical, and Software Engineering, College of Engineering, Embry-Riddle Aeronautical University at Prescott, Prescott, AZ, USA. His current research interests include wireless communications and networks, with most recent contributions in the areas of millimeter-wave 5G cellular technologies and the Internet of Things.

THE ADVANTAGE OF THE TECHNOLOGICAL ADVANCEMENTS TO IMPROVE THE QUALITY OF LIFE OF PATIENTS :



Dr. Ali Karime, Royal Military College of Canada:

Ali Karime received his BAsC, MASc, and PhD in Electrical and Computer Engineering from the University of Ottawa in 2007, 2009 and 2014, respectively. He then worked for several years as a quality assurance consultant with the Government of Canada, while maintaining a part time teaching position at the University of Ottawa from 2014 until 2020. In July 2020, he joined the Royal Military College of Canada as an Assistant Professor at the Department of Electrical and Computer Engineering. His research interests include Internet of Things (IoT), embedded systems, and artificial intelligence.

RECENT ADVANCES IN NEUROMORPHIC COMPUTING: THE NEXT LEVEL OF BRAIN-LIKE AI PROCESSORS :



Dr. Idir Mellal, University of Toronto, at the Krembil Brain Institute, Toronto, Canada:

Idir Mellal received his Ph.D. degree in Electrical Engineering from the University of Quebec in Outaouais, Gatineau, Canada, in 2018. He started his first Postdoctoral Fellowship (PDF) at the University of Ottawa in Canada in 2018. In March 2019, he started his second PDF at the University of Toronto, at the Krembil Brain Institute, Toronto, Canada. His primary interest is building an effective and robust neuromorphic system mimicking biological neurons for neurocomputing. His research area includes FPGA design and Hardware AI Accelerator systems. Idir Mellal has a long experience in Hardware Design and Digital Implementation with outstanding industrial experience.

Monday 29 July 2024

8h00 – 9h00

Registration

9h00 – 10h00

Opening Ceremony

Coffee Break

10h30 – 11h00



KEYNOTE 1: Professor Tayeb A. Denidni, INRS-EMT, University of Quebec, Canada

11h10 – 12h40

Session 1A

Antennas & Propagation

Session 1B

Passive & Active Components,
Circuits & Subsystems

Session 1C

Computer Science,
Intelligent Systems and
Information Technologies

Lunch

14h00 – 14h30



KEYNOTE 2: Dr. Ahmad Hassan, Polytechnique Montréal, Canada

Coffee Break

15h00 – 16h30

Session 2A

Antennas & Propagation

Session 2B

Passive & Active Components,
Circuits & Subsystems

Session 2C

Computer Science,
Intelligent Systems and
Information Technologies

16h40 – 17h10



KEYNOTE 3: Dr. Ali Karime, Royal Military College of Canada

20H30: Gala Ceremony

Tuesday 30 July 2024

9h00 – 9h30



KEYNOTE 4: Pr. Ahmed Iyanda Sulyman, Embry-Riddle Aeronautical University Prescott, Arizona

USA

Coffee Break

10h00 – 11h30

Session 3A

Antennas & Propagation

Session 3C

Computer Science, Intelligent
Systems and Information
Technologies

Session 4C

Computer Science, Intelligent
Systems and Information
Technologies

11h40 – 12h10



KEYNOTE 5 : Pr. Miodrag Bolić, University of Ottawa, Canada

12h15 – 12h45



KEYNOTE 6 : Dr. Ranwa Al Mallah, Assistant Professor of Cybersecurity at the Royal Military College of Canada

Lunch

14h15 – 15h45

Session 4A

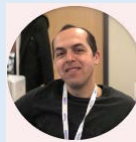
Antennas & Propagation

Session 5C

Computer Science, Intelligent Systems and Information Technologies

Coffee Break

16h15 – 16h45



KEYNOTE 7: Dr. Idir Mellal, University of Toronto, at the Krembil Brain Institute, Toronto, Canada

Closing Ceremony

Wednesday 31 July 2024

Guided Tour



A: Antennas & Propagation

Session 1A (11h10 – 12h40: Monday 29 July 2024)

Chairs: Prof. Pr. Talbi Larbi, University of Quebec in Outaouais, Canada

Prof. Saad Chakkor, ENSAT, University of Abdelmalek Essaadi, Morocco

ID 3: Miniaturized UHF RFID Tag Based on Dipole Antenna Loaded with Hexagonal Split Ring Resonators (H-SRR), Mounted on Metallic Objects.

Zakaria Errachidi, Chahboun Noha, Oukaira Aziz, Laaziz Yassin

ID 4: A 28 GHz 64-element array patch antenna for 5G Application.

Farid El Ghaoual, Jamal Zbitou, Mostafa Hefnawi, Ahmed Lakhssassi and Mohamed Latrach

ID 11: TE50 Mode SIW Waveguide-fed Yagi Antenna Array Operating at 5.8 GHz.

Ridha Omrani, Halim Boutayeb and Siwar Louati

ID 16: High Directivity Improvements using the Theory of Characteristic Modes for High-Resolution Imaging of Brain Tumors.

Mouad El Moudden, Badiia Ait Ahmed, Ibtisam Amdaouch, Mohamed Zied Chaari, Juan Ruiz-Alzola and Otman Aghzout

ID 75: Design and Optimization of a High-Performance Circularly Polarized Microstrip Patch Antenna Array for 24 GHz Applications.

Mohamed Lemine El Haiddad, Mostafa Hefnawi, Salaheddine aourik, Noha Chahboun, ER-Rebyiy Ridouan

ID 54: A Compact Implantable MIMO Antenna for Wireless Capsule Endoscopy.

Amjad Iqbal, Muath Al-Hasan, Ismail Ben Mabrouk and Tayeb A. Denidni

ID 22: Conception and simulation of original multi-band patch antenna and Analysis on SAR for Human Eye Model.

Mouna Khadiri, Hassan Ammor and Jalal Baayer

Session 2A (15h00 – 16h30: Monday 29 July 2024)

Chairs : Prof . Yassin LAAZIZ, ENSAT, University of Abdelmalek Essaadi, Morocco

Dr Bilel Mnasri, University of Quebec in Outaouais, Canada

ID 25: Aperture-Stacked Patch Antenna array with Front-to-Back Ratio Enhancement for Radar Application at 28 GHz.

Salaheddine Aourik, Ahmed Errkik and Samira Khouli

ID 27 : A Wideband Rectenna Using An Inverse Class-F Rectifier Circuit for Energy Harvesting Applications.

Meghdad Khodaei, Halim Boutayeb and Larbi Talbi

ID 28: Revolutionizing Early Breast Cancer Detection: Insights from Radiofrequency-Based Imaging and Simulation Studies.

Samiya Qanoune

ID 30: A Superstrate Based Metasurface to Enhance the Performance of Miniaturized UWB Fractal Antenna

Youssef Barkal, Jamal Zbitou, Larbi El Abdellaoui, Aziz Oukaira

ID 33: Design and Analysis of a 77-84 GHz Back Cavity Metasurface Antenna Using for Frequency Diversity Imaging

Zahra Tavasolisirat, Halim Boutayeb and Larbi Talbi

ID 35 : Electromagnetic Simulation of Radiated Fields Inside an Aircraft Cockpit.

Husam Osman, Joey Bray and Yahia Antar

Session 3A (10h00 – 11h30: Tuesday 30 July 2024)

Chairs : Prof . Mostafa Hefnawi, Royal Military College (Rmcc), Canada

Prof . Aytouna Fouad, ENSATé, University of Abdelmalek Essaadi, Morocco

ID 37: Compact and Broadband Dipole Antenna Array with Low Mutual Coupling for 5G Applications.

Ferdinand Kouakou Claude Diaha, Farzad Karami and Halim Boutayeb

ID 40: Comparative Analysis of Advantages and Challenges for 5G and 6G Technologies.

Oukaira Aziz, Talbi Larbi, Baaziz Nadia and Ahmed Lakhssassi

ID 41: Review of CMOS Gilbert Cell Mixers for 5G.

Abdelmounim Sellidj, Mustapha Cherif Eddine Yagoub, Rachida Touhami, Said Gaoua and Abderrahim Belalia

ID 43: High-Resolution Hadamard-based CDM-MIMO Automotive Radar.

Zakaria Benyahia, Mostafa Hefnawi, Mohamed Aboulfatah, Hassan Abdelmounim

ID 53: Dual-band Hybrid Dielectric Resonator-patch Antenna for Microwave and Mm-wave Applications

Mohamed Bizan and Tayeb Denidni

Session 4A (14h15 – 15h45: Tuesday 30 July 2024)

Chairs : Prof . Tayeb A.Denidni , INRS-EMT, University of Quebec, Canada

Prof . Samira Khouliji, ENSATé, University of Abdelmalek Essaadi, Morocco

ID 59: Enhancing FSO/RF Link Performance under Extreme Weather Conditions: A Novel Hybrid System with a High-Directivity Parabolic Reflector Antenna.

Abdellah Yassine el Harrak, Mounia Chakkour, Fahd Chaoui, Badiia Ait Ahmed, Mohamed Zied Chaari and Otman Aghzout.

ID 62: E-Band Beam Steering Antenna Array Based on Substrate Integrated Frequency Selective Structure.

Bilel Mnasri, Pedram Shojaaddini, Hari Krishna Pothula and Halim Boutayeb

ID 63: Patch-based Learning for Radar-based Fall Event Detection using Gramian Angular Field.

Ankita Dey, Sreeraman Rajan, Gaozhi Xiao and Jianping Lu

ID 73: Modeling and Numerical Simulation of Argon-Based DBD Plasma Jets: Mathematical Approaches and Local Energy Approximation.

Moustapha Ouali and Youssef Lagmich

ID 23: CRLB for Direction of Arrival and Amplitude/Phase Estimates of Incident Plane Waves Using Multi-Input Interferometry.

Bilel Mnasri, Halim Boutayeb

ID 76: High-Gain and Wide-Bandwidth Multilayer Printed Antenna Array for 5G Applications .

Abderrahim Bellekhiri, Noha Chahboun, Jamal Zbitou, Aziz Oukaira and Yassin Laaziz

B: Passive & Active Components, Circuits and Subsystems

Session 1B (11h10 – 12h40: Monday 29 July 2024)

Chairs : Prof . Jamil Akhtar, Manipal University Jaipur (MUJ), India

Prof . Abdelhadi Ennaji, ENSEM, University of Hassan II Morocco

ID 2: A Novel Design of a Reconfigurable BandpassFilter in planar technology for RF applications.

Mohamed Guermal, Mostafa Hefnawi, Fouad Aytouna, ER-Rebyiy Ridouane

ID 6: Design and Transformation of a Miniature LPF to a BSF Filter Using Modified Stepped Impedance

Soufiane El Maimouni, Fouad Aytouna, Otman Oulhaj, Mohamed Latrach

ID 24: Filtering Matching Topology for Designing a Wideband, Highly Efficient FPA.

Mohamed Boumalkha, Badr Nasiri, Mohammed Lahsaini and Moulay El Hassane Archidi

ID 7: Electromagnetic Scattering from Aircraft in Motion: Algorithm and Analysis.

Mohammad Marvasti and Halim Boutayeb

ID 52: Physical-layer security solutions for IoT devices using Radio Frequency Fingerprints.

Zachary A. Traynor, Ian M. Curtin, Calvin T. Henggeler and Ahmed Iyanda Sulyman

ID 78: Design of an S-band power amplifier using loadpull.

Paula Atchike, Jamal Zbitou, Pascal Dherbécourt and Ahmed El Oualkadi

Session 2B (15h00 – 16h30: Monday 29 July 2024)

Chairs : Prof. Ahmed Iyanda Sulyman, Embry-Riddle Aeronautical University Prescott, Arizona

Prof. Nasiri Badr, university of Moulay-Ismaïl, Meknes, Morocco

ID 36: Design of Compact Bandpass Filter Based on Transversal Signal Interference for Millimeter-Wave Applications.

Barou Salaheddine, LATRACH Mohamed, LAAZIZ Yassin, CHAHBOUN Noha

ID 72: Advanced Metaheuristic Algorithms for Efficient MPPT in PV Systems under Changing Shading Conditions.

Youssef Mhanni and Youssef Lagmich

ID 21: Energy Optimization of Photovoltaic: Sun-Path Tracker Systems inside a Smartgrids.
Hraich Abdellatif and Haddi Ali

ID 44: Reference-Free Passive RF Imaging Using Near-Field Spatial Processing.
Paul Brennan, Kevin Chetty, Wenda Li, Shelly Vishwakarma, Fabiola Colone and Amin Amiri

ID 70: Electromechanical Faults Recognition Based on MCSA Approach Using Principal Component Analysis and Power Spectrum Density.
Pascal Dore, Saad Chakkor, Ahmed El Oualkadi and Mostafa Baghourri

C: Computer Science, Intelligent Systems and Information Technologies

Session 1C (11h10 – 12h40: Monday 29 July 2024)

Chairs : Prof. Ranwa Al Mallah, RMC, Kingston, Canada
Prof. Boutaina HDIOUD, ENSIAS, Rabat, Morocco

ID 67: Ensemble based Android Malware Detection using a Bio-inspired Meta-heuristic Feature Engineering Approach.

Abdul Khadar Jilani and Shirina Samreen

ID 5: Drone Assist Indoor Locating System for Trapped Victim Using Smartphone Application in a 3D Space.

Akm Zahidul Islam, Dalia Hanna and Alexander Ferworn

ID 8: Optimizing Wind Farm Maintenance in Northern Morocco through SCADA System Failure Data Analys.

Mohamed Bousla, Youness El Mourabit and Ali Haddi

ID 10: Optimization of Electric Vehicle Charge Scheduling in Multiple Parking Lots: A Method Based on Metaheuristics and High Performance Computing.

Katerina Brooks, Vincent Roberge and Mohammed Tarbouchi

ID 13: Toward Increased Energy Efficiency and Proactive Management of Electrical Grids Based on AI.
Aziz Oukaira, Ali Karime, Vincent Roberge and Mohammed Tarbouchi

ID 29: XAI approach to drug dosage optimization and review-based prediction of side effects.

Maroua Oumlaz, Iram Kamdar, Yassine Oumlaz, Aziz Oukaira, Amrou Zyad Benelhaouare and Ahmed Lakhssassi

ID 32: A cheating detection system in online exams through real-time facial emotion recognition of students.
Ilhame Khabbachi, Abdelhamid Zouhair, Aziz Mahboub and Ghalia Mdaghri-Alaoui

Session 2C (15h00 – 16h30: Monday 29 July 2024)

Chairs : Prof . Noha Chahboun, ENSAT , University of Abdelmalek Essaadi, Morocco
Prof . Sarfaraz Nawaz, Swami Kesvanand Institute of Technology, Jaipur, India

ID 14: Throwing Motion Control utilizing 3-Link Robot with Using YOLO model for Intelligent Fish Farm.
Chih-Jer Lin and Yu-Han Ding

ID 17: EdgeMob: A Context-Aware Dynamic Service Migration for Wearable IoT in Healthcare.

Imran Raza, Sana Latif and Syed Asad Hussaain

ID 18 AI-Enabled Electroencephalogram (EEG) Analysis for Depression Relapse Detection in Quadriplegic Patients.

Sana Yaseen, Imran Raza, Alice Othmani and Syed Asad Hussaain

ID 20: Catboost3D: A Novel CatBoost-based Approach for Efficient Classification of 3D Models.

Mohcine Bouksim, Mohamed Amine Madani, Fatima Rafii Zakani, Khadija Arhid, Taoufiq Gadi and Mohamed Aboufatah

ID 26: Training Environments for Reinforcement Learning Cybersecurity Agents.

Alexandre Legere, Li Li, Francois Rivest and Ranwa Al Mallah

ID 31: Exploring learner achievement analysis using KMeans, SVM, and EM clustering in a Unity-Based Virtual Reality Learning Environment.

Ghalia Mdaghri Alaoui, Abdelhamid Zouhair, El Mokhtar En-Naimi and Ilhame Khabbachi

Session 3C (10h00 – 11h30: Tuesday 30 July 2024)

Chairs : Prof . Kulwant Singh, Manipal University Jaipur, India

Prof . Abdelhamid Zouhair, FST of Tangier, University of Abdelmalek Essaadi, Morocco

ID 42: Improving Accessibility and Comfort: Evaluation of a Space-Frame Tricycle Modification Kit for Disabled Riders
Shih-Che Cho and Yao-San Lin

ID 46: Optimized FPGA-Based 16-bits Squarers Using LUTs and a Divide-and-Conquer Approach.
Noureddine Chabini and Rachid Beguenane

ID 47: Enhancing Development Productivity: A Novel Block-based System Design Tool for Heterogeneous Demonstrators.
Hasan Aljzaere, Dang Phuc Vo and Wolfram Hardt

ID 50: Noise Injection into Anchor for Improving Deep Neural Networks for Localization in WSNs for Internet of Things.
Jehan Esheh and Sofiene Affes

ID 55: Game Theory Applied to Deception in Network Security
David Haighton and Sylvain Leblanc

ID 56: Accuracy-Aware Low-Complexity Deep Learning Models for Automatic Modulation Recognition.
Mobin Vaziri, Shervin Vakili and Pierre Langlois

ID79 : Self-Evolving Programs: A Novel Approach Leveraging LLMs and Quine Programs
Ali Mohammad Saghiri and Nan Wang

Session 4C (10h00 – 11h30: Tuesday 30 July 2024)

Chairs : Prof . Marzouki Faouzi, ENSATé, University of Abdelmalek Essaadi, Morocco

Prof . Anass Belcaid, ENSATé, University of Abdelmalek Essaadi, Morocco

ID 57: Vulnerabilities of Automatic Dependent Surveillance-Broadcast on Aircraft: Survey.
Hasan Ali and Sylvain Leblanc

ID 58: Enhancing Equity Trading through Ensemble Learning with Reddit Sentiment Analysis and Explainable Artificial Intelligence.
Joon Choi and Mariam El Mezouar

ID 48: Simulation-Based Evaluation of Secure Communication Algorithms with Global Awareness in Game Engine Environments.
Hasan Aljzaere, Omar Elsayed and Wolfram Hardt

ID 65: COVID-19 Classification Using Pre-trained Models and Disease Severity Score Masks.
Ebrahim Nehary, Sreeraman Rajan and Carlos Rossa

ID 69: 3D Efficient HWSN Protocol for Water Quality Monitoring Using Firefly Algorithm
Ouiam Amenchar, Mostafa Baghour, Saad Chakkor, Aziz Dkiouak and Youssef Lagmich

ID 34: Towards NEOM: Predicting Carbon Emission Using Machine Learning Approaches.
Hossam Meshref, Ammar Alqarni, Ahmed Mobarki, Fahad Almalki and Hasan Alruqi

Session 5C (14h15 – 15h45: Tuesday 30 July 2024)

Chairs : Prof . Joey Bray, Royal Military College (Rmcc), Canada

Prof . Ali Haddi, ENSATé, University of Abdelmalek Essaadi, Morocco

ID 74: Enhancing Diabetes Detection Through Data Preprocessing: A Comparative Analysis of Machine Learning Algorithms
Btissam El Aziz, Yassin Laaziz, Mohamed Eddabbah and Younes Ommene

ID 77: Accurate Classification of Visual Evoked Potential Signals Using Spectral Analysis and feature extraction Algorithms Combination.
Zineb Cheker, Mohamed Fekrouni, Pascal Doré, Saad Chakkor, Mostafa Baghour, Jawhar Laamech, Ahmed El Oualkadi and Rachid Belfkih

ID 80: Cybersecurity Threats using Application Programming Interface (API).
Abu Kamruzzaman, Kutub Thakur and Md Ali

ID 81: The Application of Layered Authentication in Cybersecurity
Md Ali, Kutub Thakur and Muath Obaidat

ID 82: Cybersecurity Based on Converged Form of Blockchain, Internet-of-Things and Machine Learning in Smart Micro-Grid.
Dhaou Said, Aziz Oukaira and Ahmed Lakhssassi

ID 49: Analysis of Privacy Risks of Vehicle Telematics.
Hasan Aljzaere, Raj Kumar Kaladi and Wolfram Hardt

ID 68: Decentralized Platoon Management Based on Blockchain: A SWOT Analysis Research Perspective.
Ali Mohammad Saghiri and Nan Wang