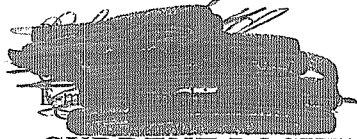# ALI IBRAHIM

CURRENT POSITION

Technical Consultant

Genova, Italy (VAT 02600390997)   **2018–Present**

Assistant Professor

School of Engineering, Lebanese International University   **2018–Present**

EDUCATION

University of Genova, Genova, Italy & Lebanese University
**Ph.D. in Electronic and Computer Engineering, Robotics and Telecommunications
& in Industrial Control with distinct (Very Honored)**   **2016**
Thesis: "Architectures and Hardware Implementation of Embedded Electronic
Systems for Tactile Information Processing"

Lebanese University, Beirut, Lebanon & University of Technology of Compiegne (France)
Master 2 Research (M2R) in Industrial Control   **2009**
Thesis: "Electro Active Polymer IPMC and its Integration as Artificial Muscle in
the Myoelectric Hands"

Lebanese University, Beirut, Lebanon
Master 1 sciences in Physics, branch: Electronics   **2008**
Areas of concentration: Electronic circuits design, Microcontrollers, VHDL, Matlab

RELATED EXPERIENCE

Postdoc Researcher   **2016 – 2018**

Project: "Development of Embedded Electronic Systems for Artificial Skin to Provide
The Sense of Touch of Upper Limb Prostheses"

Digital Systems RTL Designer   **2013 – Present**

  - FPGA implementation of Machine Learning algorithm for sensors data
    processing using VHDL.

  - Designing parallel and cascaded architectures to meet real time constraints.
    Implementation of the interface electronic system between ADC converter
    and an FPGA for tactile sensors.

  - Developing the data acquisition block of the system, the control unit and the
    computing one.

  - The design of computing units that include: Matrix multiplication, multiply
    and accumulate units, Coordinate Rotational Digital Computer (CORDIC)
    unit for vector rotation and sine & cosine functions computation,

exponential function, Sin and cosine hyperbolic functions, Singular Value Decomposition (SVD), Square roots.

- Design optimization for real time operation and low power consumption. Some techniques such as approximate (inexact) computing has been used to implement approximate adders, approximate multipliers, and approximate CORDIC to reduce the power consumption.

- Design and Implementation of exponential function with the integration of inexact circuit blocks aiming to reduce the energy consumption of SoftMax and tangent hyperbolic functions used for embedded machine learning application.

- **Ongoing work:** Implementation of Long-Short Term Memory (LSTM) recurrent neural network for sensors data classification.

- **Students Supervision:** knowledge gained based on students following activity in the digital design flow using Cadence for the implementation of small single blocks i.e. adders and more complex circuits such as SoftMax for embedded neural networks.

Research and Development   **2011 – 2013**
In charge of research to improve the electronic systems, projects installation.

Project Developer   **2007 – 2010**
Develop electronic projects, designing PCB boards, programming Microcontrollers, technician.

INTERESTS, TECHNICAL SKILLS, AND HOBBIES

Interests
Digital Electronics, Digital Signal Processing, sensing systems, data processing, embedded systems for electronic skin, Embedded Machine Learning, Energy Efficient Embedded Computing, Approximate computing Techniques.
Social and scientific subjects, electronics evolution.

Technical Skills
Digital systems, Embedded Electronics.
Field Programmable Gate Array (FPGA), Hardware Description Language (VHDL, Verilog).
Digital Signal Processing DSP, Hardware implementation, Sensors interface.

Hobbies
Reading, Swimming, Football, Computer and Internet.

LANGUAGES

Arabic – Native language
English – good in speaking, read/write with good efficiency
French – good in speaking, reading and writing.
Italian – speak, read, and write with good efficiency

PUBLICATIONS

A- BOOKS

1- River Publishers Series in Electronic Materials and Devices, "Electronic Skin: Sensors and Systems", Ali Ibrahim and Maurizio Valle (editors), December 2020.

B- JOURNALS AND CONFERENCES

2- Ibrahim A., Chible H., Valle M., Ansovini F. "FPGA Implementation of Serial Communication Interface of Multichannel High Speed ADCs", 20th LAAS International Science Conference "Advanced Research for Better Tomorrow"; 27-29 March 2014; Hadath, Lebanon; pp: 745-746.

3- L. Seminara, L. Pinna, A. Ibrahim, L. Noli, M. Capurro, S. Caviglia, P. Gastaldo, M. Valle, "Electronic Skin: achievements, issues and trends", The 2nd International Conference on System-integrated Intelligence: New Challenges for Product and Production Engineering, July 2nd - 4th, 2014: Bremen, Germany.

4- Ibrahim A., Chible H., Valle M., "A High Accuracy FPGA Implementation of Fixed Point Square Root for Singular Value Decomposition Computation", 21th LAAS International Science Conference "Horizon 2020", USJ, Beirut, Lebanon; 04/2015.

5- Ibrahim A., Valle M., Noli L., Chible H.,"Singular Value Decomposition FPGA Implementation for Tactile Data Processing". IEEE NEWCAS 2015, Grenoble, France 7-10 June 2015.

6- Ibrahim A., Valle M., Noli L., Chible H.,"FPGA implementation of fixed point CORDIC-SVD for E-skin systems". IEEE PRIME 2015, Glasgow, UK 29 June - 2 July 2015.

7- L. Seminara, L. Pinna, A. Ibrahim, L. Noli, S. Caviglia, P. Gastaldo, M. Valle, "Towards Integrating Intelligence in Electronic Skin", Elsevier Mechatronics Journal 2015.

8- Ibrahim A., Valle M., Noli L., Chible H.,"Assessment of FPGA Implementations of One Sided Jacobi Algorithm for Singular Value Decomposition". IEEE ISVLSI 2015, Montpellier, France 8-10 July 2015.

9- Ibrahim A., Noli L., Chible H., Valle M. (2017) Embedded Electronic Systems for Tactile Data Processing. In: De Gloria A. (eds) Applications in Electronics Pervading Industry, Environment and Society. ApplePies 2016. Lecture Notes in Electrical Engineering, vol 409. Springer, Cham.

10- M. Franceschi, A. Ibrahim, L. Seminara, L. Pinna, S. Dosen, M. Valle, Towards The Integration of E-skin into Prosthetic Devices, IEEE 12th International Conference on PhD Research in Microelectronics and Electronics (PRIME 2016), June 27-30, 2016, Lisbon, Portugal.

11- Ibrahim A., Chible H., Valle M., "Real Time FPGA Implementation of Sine and Cosine Functions for Embedded Data Processing", 22nd International Scientific Conference of LAAS "The Social Avenues of Research", At Beirut, Lebanon.

12- A. Ibrahim, L. Noli, P. Gastaldo, H. Chible, M. Valle, Embedded Electronic System Based on Dedicated Hardware DSPs for Electronic Skin Implementation, Procedia Technology, Volume 26, 2016, Pages 43-50. DOI: 10.1016/j.protcy.2016.08.007.

13- A. Ibrahim and M. Valle, Resiliency in nanometer CMOS systems: An overview, 2016 IEEE International Conference on Electronics, Circuits and Systems (ICECS), Monte Carlo, Monaco, 2016, pp. 536-539. DOI: 10.1109/ICECS.2016.7841257

14- A. Ibrahim, P. Gastaldo, H. Chible, M. Valle, Real-Time Digital Signal Processing Based on FPGAs for Electronic Skin Implementation, Sensors 2017, 17, 558.

15- A. Ibrahim, M. Valle, Approximate Computing Techniques for Low Power Implementation of Reconfigurable Coordinate Rotation Digital Computer Circuits, Journal of Low Power Electronics, June 2017.

16- L. Pinna; A. Ibrahim; M. Valle, Interface electronics for tactile sensors based on piezoelectric polymers, in IEEE Sensors Journal, vol. 17, no. 18, pp. 5937-5947, Sept. 15, 2017. doi: 10.1109/JSEN.2017.2730840

17- M. Osta, A. Ibrahim, H. Chible and M. Valle, "Approximate Multipliers Based on Inexact Adders for Energy Efficient Data Processing," 2017 New Generation of CAS (NGCAS), Genova, 2017, pp. 125-128.

18- A. Ibrahim, L. Pinna and M. Valle, "Interface Circuits Based on FPGA for Tactile Sensor Systems," 2017 New Generation of CAS (NGCAS), Genova, 2017, pp. 37-40.

19- H. Fares et al., "Distributed Sensing and Stimulation Systems for Sense of Touch Restoration in Prosthetics," 2017 New Generation of CAS (NGCAS), Genova, 2017, pp. 177-180.

20- M. Franceschi, V. Camus, A. Ibrahim, C. Enz and M. Valle, "Approximate FPGA Implementation of CORDIC for Tactile Data Processing Using Speculative Adders," 2017 New Generation of CAS (NGCAS), Genova, 2017, pp. 41-44.

21- M. Magno, A. Ibrahim, A. Pullini, M. Valle and L. Benini, "Energy Efficient System for Tactile Data Decoding Using an Ultra-Low Power Parallel Platform," 2017 New Generation of CAS (NGCAS), Genova, 2017, pp. 17-20.

22- L. Seminara et al., "Electronic skin and electrocutaneous stimulation to restore the sense of touch in hand prosthetics," 2017 IEEE International Symposium on Circuits and Systems (ISCAS), Baltimore, MD, 2017, pp. 1-4.

23- Ibrahim A., Seminara L., Pinna L., Valle M., "Achievements and Open Issues Towards Embedding Tactile Sensing and Interpretation into Electronic Skin Systems," Book chapter, to be published in the edited book "Material-Integrated Intelligent Systems. Technology and Applications" by Wiley-VCH in 2018.

24- M. Osta, A. Ibrahim, L. Seminara, H. Chible and M. Valle, "Low Power Approximate Multipliers for Energy Efficient Data Processing", Journal of Low Power Electronics (JOLPE), Vol.14, N° 1, March 2018.

25- M. Magno, A. Ibrahim, A. Pullini, M. Valle and L. Benini,"An Energy Efficient E-Skin Embedded System for Real-Time Tactile Data Decoding" Journal of Low Power Electronics (JOLPE), Vol. 14, N° 1, March 2018.

26- M. Osta, A. Ibrahim, H. Chible and M. Valle "Inexact Arithmetic Circuits for Energy Efficient IoT Sensors Data Processing", 2018 IEEE International Symposium on Circuits and Systems (ISCAS), Florence, Italy.

27- Ali Ibrahim, Luigi Pinna, Maurizio Valle, "Experimental characterization of dedicated front-end electronics for piezoelectric tactile sensing arrays", Integration, 2018.

28- Ali Ibrahim, Maurizio Valle, Real-Time Embedded Machine Learning for Tensorial Tactile Data Processing, Circuits and Systems I: Regular Papers, IEEE Transactions on, DOI: 10.1109/TCSI.2018.2852260.

29- M. Saleh, A. Ibrahim, F. Ansovini, Y. Mohanna and M. Valle, "Wearable System for Sensory Substitution for Prosthetics," 2018 New Generation of CAS (NGCAS), Valletta, Malta, 2018, pp. 110-113. doi: 10.1109/NGCAS.2018.8572173.

30- M. Alameh et al., "Live Demonstration: System based on Electronic Skin and Cutaneous Electrostimulation for Sensory Feedback in Prosthetics," 2018 IEEE Biomedical Circuits and Systems Conference (BioCAS), Cleveland, OH, USA, 2018, pp. 1-1. doi: 10.1109/BIOCAS.2018.8584710.

31- Ali Ibrahim, Mario Osta, Mohamad Alameh, Moustafa Saleh, Hussein Chible, Maurizio Valle, "Approximate Computing Methods for Embedded Machine Learning", 25th IEEE International Conference on Electronics Circuits and Systems 2018, Bordeaux, France.

32- Osta, M., Ibrahim, A., Valle, M. "FPGA implementation of approximate CORDIC circuits for energy efficient applications" (2019) art. no. 8964758, pp. 127-128, IEEE ICECS 2019.

33- Younes, H., Ibrahim, A., Rizk, M., Valle, M. "Algorithmic level approximate computing for machine learning classifiers" (2019) art. no. 8964974, pp. 113-114, IEEE ICECS 2019.

34- Osta, M., Alameh, M., Younes, H., Ibrahim, A., Valle, M.Energy efficient implementation of machine learning algorithms on hardware platforms(2019)art. no. 8965157, pp. 21-24, IEEE ICECS 2019.

35- Di Patrizio Stanchieri, G., Saleh, M., Sciulli, M., De Marcellis, A., Ibrahim, A., Valle, M., Faccio, M., Palange, E.FPGA-Based tactile sensory feedback system with optical fiber data communication link for prosthetic applications(2019) art. no. 8965172, pp. 374-377, IEEE ICECS 2019.

36- Saleh, M., Abbass, Y., Ibrahim, A., Valle, M. Experimental assessment of the interface electronic system for PVDF-based piezoelectric tactile sensors (2019) 19 (20), art. no. 4437, MDPI Sensors Journal.

37- Saleh, M., Patrizio Stanchieri, G.D., Sciulli, M., Marcellis, A.D., Abbass, Y., Ibrahim, A., Valle, M., Faccio, M., Palange, E. Live Demonstration: Tactile Sensory Feedback System based on UWB Optical Link for Prosthetics(2019) art. no. 8919060, IEEE BIOCAS 2019.

38- Younes, H., Ibrahim, A., Rizk, M., Valle, M. Data Oriented Approximate K-Nearest Neighbor Classifier for Touch Modality Recognition (2019) art. no. 8787753, pp. 241-244, IEEE PRIME 2019.

39- Gatt, E., Ibrahim, A., Valle, M., De Marcellis, A., Heidari, H. Selected articles from the NGCAS 2018 conference (2019) 15 (1), pp. 27-29, Journal of Low Power Electronics (JOLPE).

40- Alameh, M., Ibrahim, A., Valle, M., Moser, G. DCNN for Tactile Sensory Data Classification based on Transfer Learning (2019) art. no. 8787748, pp. 237-240, IEEE PRIME 2019.

41- Saleh, M., Ibrahim, A., Ansovini, F., Mohanna, Y., Valle, M. Low power electronic system for tactile sensory feedback for prosthetics (2019) 15 (1), pp. 95-103, Journal of Low Power Electronics (JOLPE).

42- Ibrahim, A., Osta, M., Alameh, M., Saleh, M., Chible, H., Valle, M. Approximate Computing Methods for Embedded Machine Learning (2019) art. no. 8617877, pp. 845-848, IEEE ICECS 2018.

43- Osta, M., Ibrahim, A., Magno, M., Eggimann, M., Pullini, A., Gastaldo, P., Valle, M. An energy efficient system for touch modality classification in electronic skin applications, (2019) 2019-May, art. no. 8702113, IEEE ISCAS 2019.

44- Alameh, M., Abbass, Y., Ibrahim, A., Valle, M. Smart tactile sensing systems based on embedded CNN implementations (2020) 11 (1), art. no. 103, MDPI Micromachines Journal.

45- A. Ibrahim, H. Younes, M. Alameh, M. Valle, "Near Sensors Computation based on Embedded Machine Learning for Electronic Skin", Procedia Manufacturing, Volume 52, 2020, Pages 295-300, ISSN 2351-9789.

46- A. Ibrahim, M. Valle, "Electronic Skin Systems", in book Electronic Skin: Sensors and Systems, River Publishers. ISBN: 9788770222167, December 2020.

47- M. Saleh, A. Ibrahim, F. Menichelli, Y. Mohanna, M. Valle, "Efficient Machine Learning Algorithm for Embedded Tactile Data Processing", International Symposium on circuits and systems ISCAS 2021.

48- H. Younes, A. Ibrahim, M. Rizk, M. Valle, "Efficient FPGA Implementation of Approximate Singular Value Decomposition based on Shallow Neural Networks", International Symposium on circuits and systems AICAS 2021.

49- Y. Abbass, M. Saleh, A. Ibrahim and M. Valle, "Embedded Feedback System for Upper Limb Prosthetics," 2020 27th IEEE International Conference on Electronics, Circuits and Systems (ICECS), Glasgow, Scotland, UK, 2020, pp. 1-4, doi: 10.1109/ICECS49266.2020.9294781.

50- M. Alameh, Y. Abbass, A. Ibrahim, G. Moser and M. Valle, "Touch Modality Classification Using Recurrent Neural Networks," in IEEE Sensors Journal, vol. 21, no. 8, pp. 9983-9993, 15 April15, 2021, doi: 10.1109/JSEN.2021.3055565.

51- H. Younes, A. Ibrahim, M. Rizk, M. Valle, "Algorithmic-level Approximate Tensorial SVM using High-Level Synthesis on FPGA", MDPI Electronics 2021.

52- H. Younes, A. Ibrahim, M. Rizk, M. Valle, "A Mixed-Precision Binary Neural Network Architecture for Touch Modality Classification", IEEE 16th Conference on PhD Research in Microelectronics and Electronics, IEEE PRIME 2021.

53- H. Younes, A. Ibrahim, M. Rizk, M. Valle, "A Shallow Neural Network for Real-Time Embedded Machine Learning for Tensorial Tactile Data Processing", IEEE Transactions on Circuits and Systems I: Regular Papers, August 2021.

54- H. Younes, A. Ibrahim, M. Rizk, M. Valle, "An Efficient Selection-Based kNN Architecture for Smart Embedded Hardware Accelerators", IEEE Open Journal of Circuits and Systems, August 2021.

55- H. Younes, A. Ibrahim, M. Rizk, M. Valle, "Hybrid Fixed-point/Binary Convolutional Neural Network Accelerator for Real-time Tactile Processing", 28th IEEE International Conference on Electronics Circuits and Systems, IEEE ICECS 2021.

AWARDS

- *Silver Leaf Award* at the IEEE Prime 2016 for the paper "Towards The Integration of E-skin into Prosthetic Devices".
- *Bronze Leaf Award* at the IEEE NGCAS 2017 for the paper "Distributed Sensing and Stimulation Systems for Sense of Touch Restoration in Prosthetics"
- *Bronze Leaf Award* at the IEEE NGCAS 2017 for the paper "Energy Efficient System for Tactile Data Decoding Using an Ultra-Low Power Parallel Platform".

RESEARCH ACTIVITIES INVOLVEMENT

- IEEE and CASS member
- Organizing committee and Publication Chair of IEEE NGCAS 2017 the first New Generation of Circuits and System Conference.
- Technical Program Committee of IEEE NGCAS 2017 the first New Generation of Circuits and System Conference.
- Review Committee Member at IEEE ISCAS 2016 in Montreal, Canada.
- Special Session co-organizer and co-Chair, Emerging Trends in Embedded Perceptive Systems, IEEE ISCAS 2016 in Montreal, Canada.
- Special Session co-organizer and co-Chair, Issues and Trends Towards Resilient and Energy Efficient Embedded Electronic Systems, IEEE ICECS 2016, Monte Carlo, Monaco.
- Special Session co-organizer and co-Chair, Energy Efficient Autonomous Smart Sensory Systems, IEEE NGCAS 2017, Genova, Italy.
- Special Session co-organizer, Advances in Sensing and Embedded Computing for Personalized Wireless Healthcare Systems, IEEE ISCAS 2018, Florence, Italy.
- Review Committee Member RCM at IEEE ISCAS 2018 in Florence, Italy.
- Session Chair at IEEE ICECS 2018 in Bordeaux, France.
- Technical Program co-chair for the IEEE New Generation of Circuits and Systems NGCAS 2018, Malta.
- Young Professional Chair for IEEE ICECS 2019 conference held in Genova, Italy.
- Publication chair for IEEE AICAS 2020 conference in Genova, Italy
- Publication chair for IEEE ICECS 2020 conference in Glasgow, UK.
- Review Committee Member for the young professional track at IEEE ICECS 2020 in Glasgow, UK.
- Special Session chair at the 6th System Integrated Intelligence (SysInt2022) conference in Genova, Italy.
- Organizing Committee at the 6th System Integrated Intelligence (SysInt2022) conference in Genova, Italy.

EDITORIAL/REVIEW ACTIVITY

- Reviews for various international journals such as IEEE transactions on Neural Network and Learning Systems (IEEE TNNLS), IEEE Sensors Journal, Journal of Circuits, Systems, and Computers (JCSC), IEEE transactions on Circuits and Systems (TCASI & TCASII), IEEE Access.
- Reviews for various international conferences such as IEEE ISCAS, IEEE ICECS, IEEE NGCAS, and IEEE PRIME.
- Corresponding Guest editor for a special issue of JOLPE - Journal of Low Power Electronics - published by American Scientific Publishers 2018.
- Managing Guest editor for a special issue of Integration, the VLSI Journal, published by ELSEVIER 2018.
- Corresponding Guest editor for a special issue of JOLPE - Journal of Low Power Electronics - to be published by American Scientific Publishers 2019.
- Editorial Board of MDPI Electronics journal as Topic Editor.

TEACHING EXPERIENCE

Lebanese International University, Lebanon
Assistant Professor, School of Engineering   **2018–present**

University of Genova, Genova, Italy
Lab instructor – "Integrated Electronic Systems (IES)" course   **2015–2017**

Smart Brain Center (SBC) institute, Al Hadath, Lebanon
Teacher – "Physics and Mathematics" secondary level courses   **2009 –2012**

Al Rasoul al Azam institute, Beirut, Lebanon
Lecturer – "Physics" Secondary level course   **2008**