10th international conference on

APPLications in Electronics Pervading Industry, Environment and Society

APPLEPIES 2022

26-27 September 2022, Genova

www.applepies.eu (Free) registration required

DAY 1 Monday 26 September

10.15-10.30 Opening and Introduction

10.30-11.00 Invited Talk 1 – L. Benini (ETH Zurich) - Many Shades of TinyML: an Open-Hardware Platform Perspective

11.00-12.45 Session S1 (Full Oral) – Internet of Things

Lunch break 12.45-14.00

14.00-15.00 Invited Talk 2 – STMicroelectronics, Driving innovation

M. Losi - Automotive digital technologies

D. Pau - Deeply quantized Neural Networks for in-sensor and microcontroller computing

G. Ricotti - Smart Power Technologies

B. Murari - High tech Land vision

15.00-15.30 Invited Talk 3 – E. Sangiorgi (Univ. Bologna) – A Chips Act for Europe: vision and remarks

Break 15.30-16.00

16.00-17.15 Session SS1 (Short Oral)

17.15-18.45 Session S2 (Full Oral) - Hardware acceleration

DAY 2 Tuesday 27 September

8.50-9.00 Introduction of Day2

9.00-10.30 Session S3 (Full Oral) – Machine Learning

Break 10.30-11.00

11.00-12.15 Session SS2 (Short Oral)

12.15-12.45 Invited Talk 4 – M. Chiabrera (Inventum Semiconductors)

Lunch break 12.45-14.00

14.00-15.45 Session S4 (Full Oral) - Transport, Energy, Security, Health

Break 15.45-16.00

16.00-16.30 Invited Talk 5 – C. Cavazzoni (Leonardo HPC Labs)

16.30-16:45 Closing Conference

Session S1 (Full Oral) – Internet of Things - 11.00-12.45 Monday 26 September

Chair: Massimo Ruo Roch

A. Bentivogli, T. Polonelli, M. Magno, G Comai. *Enabling Predictive Maintenance on Electric Motors through a Self-sustainable Wireless Sensor Node*

M. Fresta, F. Bellotti, A. Capello, M. Cossu, L. Lazzaroni, A. De Gloria, R. Berta. *Efficient Uploading of .csv Datasets into a Non-Relational Database Management System*

F. Lo Valvo, G. Baiamonte, G. C. Giaconia. *Microcontroller based Edge Computing for Pipe Leakage Detection*

F. Zonzini, M. Zauli, L. De Marchi. eSysId: *Embedded System Identification for Vibration Monitoring at the Extreme Edge*

A. Vella, G. Galioto, G. C. Giaconia. *Microcontroller Based Portable Measurement System for GaN and SiC Devices Characterization*

A. Bertacchini, Y. Ricci. *Design-Time Tool for Energy Harvesting Solutions*

C. Riboldi, D. Crafa, M. Carminati. *Design and Validation of an Electronic Unit for Monitoring Water Distribution in Plastic Pipes*

Session S2 (Full Oral) - Hardware acceleration - 17.15-18.45 Monday 26 September

Chair: Sergio Saponara

S. Di Matteo, S. Saponara, R. Locatelli. *Design and Implementation on FPGA of a HW Accelerator for Post-Quantum RLWE Polynomial Operations*

T. Addabbo, A. Fort, E. Landi, R. Moretti, M. Mugnaini, V. Vignoli. *A Novel Front-End Circuit for the Digital Conversion of QCM-D Responses for FPGA-based Frequency Measurements*

A. Donisi, L. Di Benedetto, R. Liguori, G. D. Licciardo, A. Rubino. *A FPGA HardWare Architecture for AZSPWM based on a Taylor Series Decomposition*

F. Cosimi, F. Tronci, S. Saponara, P. Gai. *Analysis, Design and Synthesis of an Execution Tracing Unit (ETU) based on AUTOSAR Run-Time Interface (ARTI)*

K. Koleci, L. Cecchetti, G. Masera, M. Martina, M. Ruo Roch. *A Side Channel Attack methodology applied to Code-based Post Quantum Cryptography*

G. Ciarpi, G. Puccioni, M. Mestice, D. Monda, D. Rossi, S. Saponara. *A 2 GHz Wide Tuning Range LC-Tank Digitally Controlled Oscillator in 28 nm CMOS Technology*

Session S3 (Full Oral) - Machine Learning - 9.00-10.30 Tuesday 27 September

Chair: Antoni Martínez-Ballesté

E. Ragusa, M. Pastorino Ghezzi, R. Zunino, P. Gastaldo. *Affordance segmentation using RGB-D sensors for application in portable embedded systems*

R. Molina, V. Carrer, M. Ballina, M. Liz Crespo, L. Bollati, D. Sequeiro, S. Marsi, G. Ramponi. *ML-based classifier for precision agriculture on embedded systems.*

L. Lazzaroni, F. Bellotti, A. Capello, M. Cossu, A. De Gloria, R. Berta. *Deep Reinforcement Learning for Automated Car Parking*

A. Elhanashi, K. Gasmi, A. Begni, P. Dini, Q. Zheng, S. Saponara. *Machine learning techniques for anomaly-based detection system on CSE-CIC-IDS2018 dataset*

M. Ruo Roch, M. Martina, D. Errico, M. Re, V. Colombo, G. C. Cardarilli. *AI-based Sound Event Detection on IoT nodes: Requirements Evaluation*

M. Angioli, M. Barbirotta, A. Cheikh, A. Mastrandrea, F. Menichelli, S. Jamili, M. Olivieri. *Contextual Bandits Algorithms for Reconfigurable Hardware Accelerators*

Session S4 (Full Oral) - Transport, Energy, Security, Health - 14.00-15.45 Tuesday 27 September

Chair: Mauro Olivieri

N. Nicodemo, R. Di Rienzo, A. Verani, F. Baronti, R. Roncella, R. Saletti. *Low-Cost Lithium-Ion Battery Characterization Setup Based on Auxiliary Batteries*

G. Mezzina, C. L. Saragaglia, M. Barbareschi, S. De Simone, A. Moriconi, D. Serra, D. De Venuto. *Model-based Vital Control Architecture for Highly Automated Train Operations*

M. Hajj Hassan, A. Ibrahim, A. Moshen. *Simulation of the Exposure of the Human Head to 5G Electromagnetic Radiation*

D. Iero, R. Carotenuto, M. Merenda, F. Della Corte. *A Short-range Free-Space Optical Communication System for Space-Assembled Microsatellites*

M. Mestice, G. Biondi, G. Ciarpi, D. Rossi, S. Saponara. *A Low-Area, Low-Power, Wide Tuning Range Digitally Controlled Oscillator for Power Management Systems in 28 nm CMOS technology*

A. di Toma, G. Brunetti, N. Sasanelli, M. N. Armenise, C. Ciminelli. *Sorting of live/dead Escherichia Coli by means of dielectrophoresis for rapid antimicrobial susceptibility testing*

Session SS1 (Short Oral) - 16.00-17.15 Monday 26 September

Chair: Davide Brunelli

J. Agnelli, D. Benedetti, N. Fantuzzi. *Soluble mandrel technology to produce parts in composite material for Formula 1*

L. Urbinati, M. R. Casu. *A Reconfigurable 2D-Convolution Accelerator for DNNs Quantized with Mixed-Precision*

W. F. Samayoa, B. Valinoti, R. Molina, L. G. Garcia Ordonez, M. L. Crespo, S. Carrato, A. Cicuttin, S. Levorato. Diagnostic analytics for pixelated particle detectors: A case study

M. Cossu, R. Berta, A. Capello, L. Lazzaroni, A. De Gloria, F. Bellotti. *Developing a Toolchain for Synthetic Driving Scenario Datasets*

A. Martínez-Ballesté, N. Villalobos, E. Batista, P. López-Aguilar, A. Solanas. *Ticketing Systems for Smart Public Transportation: Tools at the User Side*

G. Campiti, M. Tagliente, G. Brunetti, M. N. Armenise, C. Ciminelli. *Debris Detection and Tracking through On-board LiDAR*

L. Canese, G. C. Cardarilli, L. Di Nunzio, R. Fazzolari, M. Re, <u>S. Spanò</u>. *Automatic IP core generator for FPGA-based Q-Learning hardware accelerators.*

<u>J. Qadir</u>, I. Butun, P. Gastaldo, D. D. Caviglia. *Review of Security Vulnerabilities in LoRaWAN*

<u>G. Sansone</u>, M. Cococcioni. *Experiments on Speeding Up the Recursive Fast Fourier Transform by using AVX-512 SIMD instructions*

<u>L. Gemma</u>, M. Bernard, D. Brunelli. *An Image Processing Algorithm to Optimize the Output Configuration of a Photonic Integrated Circuit*

M. A. Mansoori, <u>M. R. Casu</u>. *Multi-objective Framework for Training and Hardware Co-optimization in FPGAs*

<u>A. Torrisi</u>, F. Baggio, D. Brunelli. *Transiently-Powered Batteryless Device-to-Device Communication Protocol Simulator*

Session SS2 (Short Oral) - 11.00-12.15 Tuesday 27 September

Chair: Maurizio Martina

H. Li, H. Wu, Q. Zheng, Y. Liu, <u>A. Elhanashi</u>, S. Saponara. *Digital Modulation Recognition Method Based on High-order Cumulant Feature Learning*

G. Brunetti, N. Saha, G. Campiti, <u>A. di Toma</u>, N. Sasanelli, F. Hassan, M. N. Armenise, C. Ciminelli. *Integrated Photonics for NewSpace*

<u>S. Jamili</u>, A. Cheikh, A. Mastrandrea, M. Barbirotta, F. Menichelli, M. Angioli, M. Olivieri. *Implementation of Dynamic Acceleration Unit Exchange on a RISC-V Soft-Processor*

<u>A. Capello</u>, L. Forneris, A. Pighetti, F. Bellotti, L. Lazzaroni, M. Cossu, A. De Gloria, R. Berta. *Investigating High-Level Decision Making for Automated Driving*

Y. He, H. Wu, Q. Zheng, Y. Liu, <u>A. Elhanashi</u>, S. Saponara. *A Blind Modulation Classification Method Based on Decision Tree and High Order Cumulants*

<u>F. Rossi</u>, L. Fiaschi, M. Cococcioni, S. Saponara. *Design and FPGA Synthesis of BAN Processing Unit for non-Archimedean Number Crunching*

A. Alessandrini, N. Baldanzini, L. Berzi, F. Cignini, T. Favilli, A. Niccolai, F. Ortenzi, <u>L. Pugi</u>. *Prototyping and Preliminary Testing of a Revamped Electric Bus with a Fast Recharge System*

<u>E. Batista</u>, O. Villanova, J: Rosell-Llompart, F. J. Huera-Huarte, A. Martínez-Ballesté, A. Solanas. *On the Deployment of Low-Cost Sensors to Enable Context-Aware Smart Classrooms*

Z. Sun, H. Wu, Q. Zheng, Y. Liu, <u>A. Elhanashi</u>, S. Saponara. *Modulation Recognition Method Based on BP Neural Network*

<u>M. Grammatikakis</u>, S. Ninidakis, G. Kornaros, D. Bakoyiannis. *Towards Efficient Gateways and Servers for Biosensors*

<u>G. Simonte</u>, R. Di Rienzo, F. Baronti, R. Roncella, R. Saletti. *Improvement of Sodium-Metal Halide Battery electrical equivalent model including temperature dependency*

M. Cocci, <u>L. Pugi</u>, E. Boni, M. Delogu, A. Rocchetti, L. Socci, N Andreini. *Radio Frequency Drying of Wool Fabrics*

M. Cocci, M. Delogu, L. Berzi, <u>L. Pugi</u>. *Preliminary Design and Simulation of a Transport and Winding System of an Innovative Radio Frequency Dryer*

A. Begni, P. Dini, S. Saponara. *Design and Test of an LSTM-based Algorithm for Li-ion Batteries Remaining Useful Life Estimation*

M. Donati, A. Bechini, C. D'Anna, B. Fattori, M. Marini, M. Olivelli, S. Pelagatti, G. Ricci, E. Schirinzi, G. Siciliano, M. Tavosanis, F. Torri, N. Vanello, L. Fanucci. *A clinical tool for prognosis and speech rehabilitation in dysarthric patients: the DESIRE project*