Entwining physics and electronics, I explore and design unconventional computational architectures that can transcend computing to an open, interactive and evolving system that can solve a diverse range of problems.

Research outputs

Training energy-based single-layer Hopfield and oscillatory networks with unsupervised and supervised algorithms for image classification

Non-volatile resistive switching mechanism in single-layer MoS2 memristors: insights from ab initio modelling of Au and MoS2 interfaces

Two-Layered Oscillatory Neural Networks with Analog Feedforward Majority Gate for Image Edge Detection Application

Supported Pt Nanoclusters on Single-Layer MoS2 for the Detection of Cortisol: From Atomistic Scale to Device Modeling

Oscillatory neural network learning for pattern recognition: an on-chip learning perspective and implementation

SIFT-ONN: SIFT Feature Detection Algorithm Employing ONNs for Edge Detection

Building Oscillatory Neural Networks: AI Applications and Physical Design Challenges

Simulation and implementation of two-layer oscillatory neural networks for image edge detection: bidirectional and feedforward architectures

A Mixed-Signal Oscillatory Neural Network for Scalable Analog Computations in Phase Domain

Energy-Performance Assessment of Oscillatory Neural Networks Based on VO 2 Devices for Future Edge AI Computing

Oscillatory Neural Networks Applications for Edge Computing
Roadmap for Unconventional Computing with Nanotechnology

Enabling Multi-programming Mechanism for Quantum Computing in the NISQ Era

Oscillatory Neural Network for Edge Computing: A Mobile Robot Obstacle Avoidance Application

Role of ambient temperature in modulation of behavior of vanadium dioxide volatile memristors and oscillators for neuromorphic applications

Réseaux de neurones oscillants pour des calculs économiques en énergie
Abernot, M., Boschetto, G., Carapezzi, S., Delacour, C., Gil, T. & Todri-Sanial, A., 1 Nov 2022, In: Techniques de l'Ingenieur. TIP402WEB, h5040

TCAD Electrothermal Simulations of Beyond-CMOS VO2 temperature-sensing neuron devices
Carapezzi, S. & Todri-Sanial, A., 1 Nov 2022

Capillary-force-driven self-assembly of carbon nanotubes: from ab initio calculations to modeling of self-assembly

Oscillatory Neural Networks for Obstacle Avoidance on Mobile Surveillance Robot E4

On-Chip Learning with a 15-neuron Digital Oscillatory Neural Network Implemented on ZYNQ Processor

Solving the Travelling Salesman Problem in Continuous Phase Domain with Neuromorphic Oscillatory Neural Networks
Delacour, C. & Todri-Sanial, A., 1 Sept 2022

Ab Initio Computer Simulations on Interfacial Properties of Single-Layer MoS2 and Au Contacts for Two-Dimensional Nanodevices

Method for recognizing a pattern in an image and associated devices
Electro-thermal simulations of beyond-CMOS vanadium dioxide devices and oscillators

Simulation Toolchain for Neuromorphic Oscillatory Neural Networks Based on Beyond-CMOS Vanadium Dioxide Devices

Multi-programming Cross Platform Benchmarking for Quantum Computing Hardware

How Frequency Injection Locking Can Train Oscillatory Neural Networks to Compute in Phase

Analyzing Strategies for Dynamical Decoupling Insertion on IBM Quantum Computer


Carbon Nanotube SRAM in 5-nm Technology Node Design, Optimization, and Performance Evaluation - Part II: CNT Interconnect Optimization

Effects of Dynamical Decoupling and Pulse-level Optimizations on IBM Quantum Computers

Oscillatory Neural Network as Hetero-Associative Memory for Image Edge Detection

Enabling multi-programming mechanism for quantum computing in the NISQ era

Assessing doping strategies for monolayer MoS₂ towards non-enzymatic detection of cortisol: a first-principles study

Introduction to the Special Issue on Monolithic 3D: Technology, Design and Computing Systems Applications Perspectives

How Parallel Circuit Execution Can Be Useful for NISQ Computing?
Advanced Design Methods From Materials and Devices to Circuits for Brain-Inspired Oscillatory Neural Networks for Edge Computing  

How Parallel Circuit Execution Can Be Useful for NISQ Computing?  

Graphene and Carbon Nanotubes for Electronics Nanopackaging  

Mapping Hebbian Learning Rules to Coupling Resistances for Oscillatory Neural Networks  

Insights Into the Dynamics of Coupled VO2 Oscillators for ONNs  

Digital Implementation of Oscillatory Neural Network for Image Recognition Applications  

Exploring 1D and 2D Nanomaterials for Health Monitoring Wearable Devices  

Analyzing crosstalk error in the NISQ era  

Oscillatory Neural Networks for Edge AI Computing  

Multi-Scale Modeling and Simulation Flow for Oscillatory Neural Networks for Edge Computing  

Frequency Injection Locking-Controlled Oscillations for Synchronized Operations in VO2 Crossbar Devices  

Analyzing crosstalk error in the NISQ era  

qprof: a gprof-inspired quantum profiler  
Oscillatory Neural Networks Using VO2 Based Phase Encoded Logic

Dedicated Wearable Sensitive Strain Sensor, Based on Carbon Nanotubes, for Monitoring the Rat Respiration Rate †

A Hardware-Aware Heuristic for the Qubit Mapping Problem in the NISQ Era

1D Nanomaterial-Based Highly Stretchable Strain Sensors for Human Movement Monitoring and Human–Robotic Interactive Systems

Electrochemical Glucose Sensor using Single-Wall Carbon Nanotube Field Effect Transistor

Stretchable Strain Sensors for Human Movement Monitoring

Review—Energy Autonomous Wearable Sensors for Smart Healthcare: A Review

Energy Autonomous Wearable Sensors for Smart Healthcare: A Review

Importance of Interconnects: A Technology-System-Level Design Perspective

Piezoelectric biosensor

Piezoresistive sensor device with amplification module

Emerging technologies and computing paradigms for the Internet of Everything applications. International Journal of Circuit, Theory, and Applications

Reliable Power Delivery and Analysis of Power-Supply Noise During Testing in Monolithic 3D ICs
Investigation of Pt-Salt-Doped-Standalone- Multiwall Carbon Nanotubes for On-Chip Interconnect Applications

Editorial TVLSI Positioning - Continuing and Accelerating an Upward Trajectory

Power-Supply Noise Analysis for Monolithic 3D ICs Using Electrical and Thermal Co-Simulation

SmartVista: Smart autonomous multi modal sensors for vital signs monitoring

Atomistic- to Circuit-Level Modeling of Doped SWCNT for On-Chip Interconnects

A high-reliability and low-power computing-in-memory implementation within STT-MRAM.

Variability study of MWCNT local interconnects considering defects and contact resistances-Part I: Pristine MWCNT

Variability study of MWCNT local interconnects considering defects and contact resistances-Part II: Impact of charge transfer doping

Understanding Electromigration in Cu-CNT Composite Interconnects: A Multiscale Electrothermal Simulation Study

Challenges and Progress on Carbon Nanotube Integration for BEOL Interconnects
Atomistic to circuit level modeling of defective doped SWCNTs with contacts for on-chip interconnect application

Addressing the Thermal Issues of STT-MRAM From Compact Modeling to Design Techniques

A physics-based investigation of Pt-salt doped carbon nanotubes for local interconnects

A Robust Dual Reference Computing-in-Memory Implementation and Design Space Exploration Within STT-MRAM

Power Supply Noise Aware Task Scheduling on Homogeneous 3D MPSoCs Considering the Thermal Constraint

Progress on carbon nanotube BEOL interconnects

Synchronised 4-phase resonant power clock supply for energy efficient adiabatic logic

Atomics-to-circuits simulation investigation of CNT interconnects for next generation CMOS technology

The impact of vacancy defects on CNT interconnects: From statistical atomistic study to circuit simulations

Electrical performance of carbon-based power distribution networks with thermal effects

A Survey of Carbon Nanotube Interconnects for Energy Efficient Integrated Circuits

Electromigration alleviation techniques for 3D integrated circuits
Design methodology for 3D power delivery networks

Carbon Nanotubes for Interconnects: Process, Design and Applications

Exploring Carbon Nanotubes for 3D Power Delivery Networks

Alleviating Through-Silicon-Via Electromigration for 3-D Integrated Circuits Taking Advantage of Self-Healing Effect

Temperature Impact Analysis and Access Reliability Enhancement for 1T1MTJ STT-RAM

A clustering technique for fast electrothermal analysis of on-chip power distribution networks

Investigation of the power-clock network impact on adiabatic logic

Electrothermal Analysis of Carbon Nanotubes Power Delivery Networks for Nanoscale Integrated Circuits

Present and future prospects of carbon nanotube interconnects for energy efficient integrated circuits

Reliability and performance evaluation for STT-MRAM under temperature variation

Exploration of carbon nanotubes for efficient power delivery

Lumped electro-thermal modeling and analysis of carbon nanotube interconnects

A Study of 3-D Power Delivery Networks With Multiple Clock Domains
Investigation of electrical and thermal properties of carbon nanotube interconnects

Physical design and analysis of doped carbon nanotube interconnects

Physical Design for 3D Integrated Circuits

Quantitative evaluation of reliability and performance for STT-MRAM

On analysis of on-chip DC-DC converters for power delivery networks

Message from the general and program chairs

A node clustering reduction scheme for power grids electrothermal analysis
Magnani, A., de Magistris, M., Maffucci, A. & Todri-Sanial, A., 2 Sept 2015, SPI 2015 - 19th IEEE Workshop on Signal and Power Integrity. Institute of Electrical and Electronics Engineers, 4 p. 7237399

Guest Editorial: Special issue on advances in design of ultra-low power circuits and systems in emerging technologies

Statistical energy study for 28nm FDSOI devices

A body-biasing of readout circuit for STT-RAM with improved thermal reliability

An architecture-level cache simulation framework supporting advanced PMA STT-MRAM

Carbon-based Power Delivery Networks for nanoscale ICs: Electrothermal performance analysis
On the Performance Exploration of 3D NoCs with Resistive-Open TSVs

Habilitation - Design Space Exploration Of Emerging Technologies For Energy Efficiency
Todri-Sanial, A., 17 Dec 2014

A Delay Probability Metric for Input Pattern Ranking Under Process Variation and Supply Noise

An SRAM Based Monitor for Mixed-Field Radiation Environments

Multiple Cell Upset Classification in Commercial SRAMs

An intra-cell defect grading tool

Evaluating a radiation monitor for mixed-field environments based on SRAM technology

Exploring potentials of perpendicular magnetic anisotropy STT-MRAM for cache design

A Complete Resistive-Open Defect Analysis for Thermally Assisted Switching MRAMs

A Comprehensive Evaluation of Functional Programs for Power-Aware Test

Electro-thermal-characterization of Through-Silicon Vias

Globally Constrained Locally Optimized 3-D Power Delivery Networks

iBoX - Jitter based Power Supply Noise sensor

Investigation of horizontally aligned carbon nanotubes for efficient power delivery in 3D ICs
Path delay test in the presence of multi-aggressor crosstalk, power supply noise and ground bounce

Performance exploration of partially connected 3D NoCs under manufacturing variability

Power supply noise-aware workload assignments for homogeneous 3D MPSoCs with thermal consideration

Protecting combinational logic in pipelined microprocessor cores against transient and permanent faults

Test and diagnosis of power switches

Timing-aware ATPG for critical paths with multiple TSVs

TSV aware timing analysis and diagnosis in paths with multiple TSVs

Adaptive Source Bias for Improved Resistive-Open Defect Coverage during SRAM Testing

A novel method to mitigate TSV electromigration for 3D ICs

On the correlation between Static Noise Margin and Soft Error Rate evaluated for a 40nm SRAM cell

On the reuse of read and write assist circuits to improve test efficiency in low-power SRAMs

Multiple-cell-upsets on a commercial 90nm SRAM in dynamic mode
SEU monitoring in mixed-field radiation environments of particle accelerators
Tsiligiannis, G., Dilillo, L., Bosio, A., Girard, P., Pravossoudovitch, S., Todri, A., Virazel, A., Mekki, J., Brugger, M.,
Components and Systems, RADECS. Institute of Electrical and Electronics Engineers, 4 p. 6937419

SRAM soft error rate evaluation under atmospheric neutron radiation and PVT variations
Saigné, F., 19 Sept 2013, 2013 IEEE 19th International On-Line Testing Symposium (IOLTS). Institute of Electrical and

Characterization of an SRAM based particle detector for mixed-field radiation environments
Tsiligiannis, G., Dilillo, L., Bosio, A., Girard, P., Pravossoudovitch, S., Todri-Sanial, A., Virazel, A., Mekki, J., Brugger, M.,
Vailé, J-R., Wrobel, F. & Saigné, F., 8 Aug 2013, 5th IEEE International Workshop on Advances in Sensors and
Interfaces IWASI. Institute of Electrical and Electronics Engineers, p. 75-80 6 p.

Worst-case power supply noise and temperature distribution analysis for 3D PDNs with multiple clock domains

Testing a Commercial MRAM Under Neutron and Alpha Radiation in Dynamic Mode
F., 1 Aug 2013, In: IEEE Transactions on Nuclear Science. 60, 4, p. 2617-2622

Computing detection probability of delay defects in signal line tsvs
IEEE European Test Symposium (ETS). Institute of Electrical and Electronics Engineers, 6 p. 6569349

A built-in scheme for testing and repairing voltage regulators of low-power srams
Test Symposium (VTS). Institute of Electrical and Electronics Engineers, p. 1-6 6 p. 6548894

Analyzing the effect of concurrent variability in the core cells and sense amplifiers on SRAM read access failures
Conference on Design & Technology of Integrated Systems in Nanoscale Era (DTIS). Institute of Electrical and Electronics
Engineers, p. 39-44 6 p.

Effect-cause intra-cell diagnosis at transistor level
Electronic Design (ISQED 2013). Institute of Electrical and Electronics Engineers, p. 460-467 8 p.

Uncorrelated Power Supply Noise and Ground Bounce Consideration for Test Pattern Generation

Test solution for data retention faults in low-power SRAMs
Automation & Test in Europe Conference & Exhibition (DATE). Institute of Electrical and Electronics Engineers, p. 442-447
6 p.

A Study of Tapered 3-D TSVs for Power and Thermal Integrity
Low-power SRAMs power mode control logic: Failure analysis and test solutions

Analyzing resistive-open defects in SRAM core-cell under the effect of process variability

Fast and accurate electro-thermal analysis of three-dimensional power delivery networks

Frequency domain power and thermal integrity analysis of 3D power delivery networks
Todri-Sanial, A., 2013, 2013 17th IEEE Workshop on Signal and Power Integrity, SPI 2013. Institute of Electrical and Electronics Engineers, 4 p. 6558328

Performance characterization of TAS-MRAM architectures in presence of capacitive defects

Impact of Resistive-Bridge Defects in TAS-MRAM Architectures

Power Supply Noise Sensor Based on Timing Uncertainty Measurements

Why and How Controlling Power Consumption during Test: A Survey

Evaluation of test algorithms stress effect on SRAMs under neutron radiation

Coupling-based resistive-open defects in TAS-MRAM architectures

Defect analysis in power mode control logic of low-power SRAMs

Through-Silicon-Via resistive-open defect analysis

A pseudo-dynamic comparator for error detection in fault tolerant architectures
Fault localization improvement through an intra-cell diagnosis approach

Impact of resistive-open defects on the heat current of TAS-MRAM architectures

Failure Analysis and Test Solutions for Low-Power SRAMs

Power-Aware Test Pattern Generation for At-Speed LOS Testing

Power supply noise and ground bounce aware pattern generation for delay testing

A study of path delay variations in the presence of uncorrelated power and ground supply noise

Power Delivery for Multicore Systems

Reliability Analysis and Optimization of Power-Gated ICs

Enhancement of the ATLAS trigger system with a hardware tracker finder FTK

Reliability and performance studies of DC-DC conversion powering scheme for the CMS pixel tracker at SLHC

Performance studies of CMS Pixel Tracker using DC-DC conversion powering scheme

The fast track real time processor and its impact on muon isolation, tau and b-jet online selections at ATLAS
A study of reliability issues in clock distribution networks

A study of decoupling capacitor effectiveness in power and ground grid networks

Electromigration study of power-gated grids

Power distribution studies for CMS forward tracker

Power supply noise aware workload assignment for multi-core systems

Analysis and optimization of power-gated ICs with multiple power gating configurations

Electromigration and voltage drop aware power grid optimization for power gated ICs

**Press/Media**

First Eindhoven-Taiwan Summer School on semiconductors and photonics to take place at TUE
Martijn J.R. Heck, Lin-Lin Chen & Aida Todri-Sanial
22/08/23
1 item of Media coverage