

# MEMCOMPUTING

## FROM ABSTRACT MACHINES TO PRACTICAL REALIZATIONS

MEMCOMPUTING IS A COMPUTING PARADIGM RECENTLY INTRODUCED TO DESCRIBE A NEW CLASS OF MACHINES BASED ON (NON VON NEUMANN) ARCHITECTURES FORMED BY INTERCONNECTED MEMORY CELLS CAPABLE TO CHANGE THEIR STATE ACCORDING TO THE STIMULI FROM THE COLLECTIVE STATE OF THE NETWORK.

THE POWER OF THESE MACHINES CAN BE INCREASED EXPONENTIALLY IF WE EMBED IN THE NETWORK SOME EXTRA INFORMATION RELATED TO THE PROBLEM AIMED TO SOLVE. WE CALL THIS FEATURE INFORMATION OVERHEAD. BY TAKING ADVANTAGE OF THIS EMBEDDED INFORMATION WE CAN EXPONENTIALLY REDUCE THE COMPLEXITY OF MANY PROBLEMS SUCH AS THE NON DETERMINISTIC POLYNOMIAL (NP) ONES. IN FACT, THEY CAN BE IN PRINCIPLE SOLVED BY A MEMCOMPUTING MACHINE WITH ONLY POLYNOMIAL RESOURCES (TIME, SPACE, ENERGY).

IT WILL ALSO BE PRESENTED A PRACTICAL REALIZATION OF THESE MACHINES USING WHAT WE NAMED SELF-ORGANIZING LOGIC GATES, I.E., LOGIC GATES THAT CAN ACCEPT INPUTS FROM ALL TERMINALS, INCLUDING THE CONVENTIONAL OUTPUT TERMINALS. MOREOVER, IT WILL BE SHOWED HOW TO USE THEM TO SOLVE NP PROBLEMS WITH POLYNOMIAL RESOURCES.

*M. Boella*  
**ISMB**

Istituto Superiore Mario Boella

### EVENTS 2016

FRIDAY

# 17

JUNE 2016



SPEAKER

**FABIO LORENZO  
TRAVERSA**

FABIO LORENZO TRAVERSA RECEIVED THE LAUREA DEGREE IN NUCLEAR ENGINEERING AND THE PH.D. DEGREE IN PHYSICS FROM POLITECNICO DI TORINO, IN 2004 AND 2008, RESPECTIVELY. HE WAS A RESEARCHER FELLOW WITH THE ELECTRONICS DEPARTMENT, POLITECNICO DI TORINO, IN 2008. FROM 2009 TO 2014, HE WAS WITH THE DEPARTAMENT D'ENGINYERIA ELECTRÒNICA, UNIVERSITAT AUTÒNOMA DE BARCELONA (UAB), BARCELONA, SPAIN FIRST AS A POST-DOCTORAL RESEARCHER AND THEN AS A RESEARCH FELLOW. DURING THE SAME PERIOD, HE WAS ALSO A VISITING RESEARCHER AT THE UNIVERSITY OF CALIFORNIA-SAN DIEGO, AND AT THE NEW YORK UNIVERSITY. SINCE 2015 HE IS SCIENTIST AT UNIVERSITY OF CALIFORNIA SAN DIEGO AND CURRENTLY VISITING PROFESSOR AT POLITECNICO DI TORINO. IN 2016 HE FOUNDED LOGATE COMPUTING INC. WITH MAX DI VENTRA AND JOHN BEAN. HIS CURRENT RESEARCH INTERESTS INCLUDE PHYSICS-BASED SIMULATION OF TRANSPORT IN NANO-DEVICES, ANALYSIS AND DESIGN OF SYSTEMS WITH MEMORY, MEMCOMPUTING, STABILITY ANALYSIS OF NONLINEAR CIRCUITS AND SYSTEMS, AND NOISE ANALYSIS OF NONLINEAR CIRCUITS.



11:00|12:00



SITI  
SALA CDA

SI PREGA DI CONFERMARE LA PARTECIPAZIONE VIA MAIL, SCRIVENDO A [COMUNICAZIONE@ISMB.IT](mailto:COMUNICAZIONE@ISMB.IT)

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