

Federico Corradi, Ph.D.

RESEARCH & DEVELOPMENT SCIENTIST · NEUROMORPHIC ENGINEERING EXPERT

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Academic Experience

PostDoc Researcher, Neuromorphic Cognitive Systems Group

Zürich, Switzerland

UNIVERSITY OF ZÜRICH

Jun. 2016 - Jan. 2017

- Working towards a new generation of brain-inspired computing platforms, i.e. neuromorphic processors. Development and implementation of deep neural networks algorithms in neuromorphic hardware. Exploring deep neural networks algorithms for visual pattern identification and classification. Development of neural network architectures tailored to neuromorphic hardware (processors, silicon retinas, and silicon cochleas).

Undergraduate Researcher, Neuromorphic Cognitive Systems Group

Zürich, Switzerland

UNIVERSITY OF ZÜRICH

Mar. 2011 - Jul. 2015

- Worked for the EU FP7 ERC project Neurop 257219 project. One of the main goal was to build event-based VLSI models of cortical circuits for brain-inspired computation.
- Developed a variety of mixed-signal analog/digital VLSI neuromorphic devices (Spikebetter, ROLLS, Ziggi) for emulating basic processes and functions of neural spiking systems.
- Realized a neuromorphic system capable of recording from neural tissue. This system is conceived as event-based Brain-Machine Interface that exploits asynchronous logic to sense and transmit information collected from neural tissue

Employments

Inilabs GmbH

Zürich, Switzerland

RESEARCH & DEVELOPMENT SCIENTIST

Aug. 2015 - Feb. 2017

- Inilabs develops and sells neuromorphic technologies.
- Characterization of a variety of Dynamic Vision Sensors, DAVIS and DVS. Development of a new generation of DVS.
- Characterization and development of the Dynamic Neuromorphic Asynchronous Processor, Dynap-se product.
- Involved in the Neuromorphic Processor Project (NPP) that is sponsored by Samsung. One of the main goals is to develop a digital deep neural network accelerator. Specifically, I have been working on developing Convolutional Neural Networks tailored toward easy implementation in the neural accelerator. These CNN exploit the sparse output data from the silicon retina (DVS).

University of Zürich and ETH Zürich

Zürich, Switzerland

POSTDOC RESEARCHER

2016 - 2017

50% position in Neuromorphic Engineering, Neuroscience. Development of Neural Network algorithms for embedded systems.

Development of neuromorphic hardware.

Flyer Communication

Rome, Italy

SYSTEM ADMINISTRATOR

2009 - now

Unix System administrator for a web-based company.

University of Zürich and ETH Zürich

Zürich, Switzerland

PH.D. STUDENT

2011 - 2015

Ph.D. in Neuromorphic Engineering, Neuroscience.

Immobiliare.it, Xoolab Development

Rome, Italy

WEBSITE DEVELOPER

2008/2009

Web developer in Php, Mysql, Ajax.

Education

University of Zürich and ETH Zürich

Zürich, Switzerland

PH.D. IN NEUROSCIENCE AND NATURAL SCIENCES

2011 - 2015

My Ph.D. has focused at the interface between neuroscience and neuromorphic engineering, it was carried under the supervision of prof. Giacomo Indiveri. I've been investigating basic research questions that are related to the way neural circuits carry out computation and at the same time in developing a new generation of computing technologies based on neuromorphic circuits on CMOS VLSI technology. The title of my Ph.D. dissertation is "Distributed Information Processing in Neural-Inspired Microelectronic Circuits". In addition, I have successfully completed the international Ph.D. program in Neuroscience offered by the UZH and ETH.

Università La Sapienza

Rome, Italy

M.Sc. IN PHYSICS

2007 - 2010

MSc Thesis at the Italian Institute of Health (ISS) under the supervision of Prof. P. del Giudice and Prof. L. Zanella. I've been working in the computational neuroscience field researching on neuromorphic hardware. The title of my MSc thesis is "Attractor Dynamics in a Network of Spiking Neurons on VLSI Neuromorphic Chips"

Universiteit Leiden

Leiden, The Netherlands

INTERN IN PHYSICS LABORATORY

2005 - 2006

Worked in the MiniGRAIL team that is part of the Quantum Physics and Applications at Ultra Low Temperatures in the Lion Laboratory under the supervision of Prof. Giorgio Frossati. I participated, as exchange student during the one year Erasmus program, in testing and developing electronic instruments at low temperature for the gravitational radiational antenna. Provided research for the BSc Thesis that has been presented in Parma University.

Università degli studi di Parma

Parma, Italy

B.Sc. IN PHYSICS

2003 - 2007

Title of my BSc thesis "Study of High Quality Factor Capacitive Transducers, for Gravitational Antennas".

Teaching Experience

UZH Teaching Assistant

Zürich, Switzerland

UNIVERSITÄT ZÜRICH

Fall 2012

- Neuromorphic Engineering I

UZH Teaching Assistant

Zürich, Switzerland

UNIVERSITÄT ZÜRICH

Spring 2012

- Neuromorphic Engineering II

ETH Teaching Assistant

Zürich, Switzerland

EIDGENÖSSISCHE TECHNISCHE HOCHSCHULE ZÜRICH

Fall 2011

- Laboratory Electronics: Analog Circuit Design

ETH Teaching Assistant

Zürich, Switzerland

EIDGENÖSSISCHE TECHNISCHE HOCHSCHULE ZÜRICH

Spring 2011

- Physics Laboratory

Unix Instructor

Rome, Italy

PERFORMA S.R.L

2009/2010

- Unix System Administrator

Extracurricular Activity

Peer Reviewer IEEE Transactions on Circuits and Systems

Online

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, IEEE

Sep. 2015 - PRESENT

- Reviewed multiple papers on circuits and systems.

Peer Reviewer IEEE Transaction Neural Networks and Learning Systems

Online

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, IEEE

Sep. 2012 - PRESENT

- Reviewed multiple papers on neuromorphic engineering and learning systems.

Peer Reviewer Frontiers in Neuromorphic Engineering

Online

FRONTIERS IN NEUROSCIENCE

Sep. 2015 - PRESENT

- Reviewed multiple papers on neuromorphic engineering and learning systems.

IEEE Computational Intelligence Society

Online

MEMBER

Sep. 2014 - PRESENT

- Gained expertise computational intelligence and learning systems.
- Participated on several IEEE conferences and won an award.

Live video performers, visual artists and vj meeting

Lecture @ Mediamatic, Amsterdam

INVITED ARTIST

Workshop @ LPM, Amsterdam

- Actively participated in the annual LivePerformesMeeting as a teacher in the workshop that is focusing on "Bio algorithms for generative visuals"
- Tools: Mathematics, Dynamical Systems, C/C++, OpenFrameworks

Honors & Awards

INTERNATIONAL

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| 2014 | Honorary Mention , For the manuscript entitled "Mapping Arbitrary Mathematical Functions and Dynamical Systems to Neuromorphic VLSI Circuits for Spike-based Neural Computation", by the Neural Systems and Applications Circuits and Systems Technical Committee. | ISCAS, Melbourne
NSA Track |
| 2010 | MSc "summa cum laude" , Top physics student with evaluation of the MSC 110/110 with outstanding honor. | University of Rome,
La Sapienza, Italy |

Certification

Laser Safety Officer for technical applications

Zürich

UVEX ACADEMY

Feb. 2016

- The title fulfills the requirements of the German D6UV rule 11 (hitherto BGV B2) 'Accident prevention regulation for laser beam'.

Peer-reviewed journal papers

A Sensitive Dynamic and Active Pixel Vision Sensor for Color or Neural Imaging Applications

Biomedical Circuits and Systems,
IEEE Transactions on

D.P. MOEYS, F. CORRADI, CHENGHAN LI, S. BAMFORD, L. LONGINOTTI, F. F. VOIGT, S. BERRY, G. TAVERNI, F. HELMCHEN, T. DELBRUCK
doi:10.1109/TBCAS.2017.2759783

2017

NullHop: A Flexible Convolutional Neural Network Accelerator Based on Sparse Representations of Feature Maps

submitted

A. AIMAR, H. MOSTAFA, E. CALABRESE, A. RIOS-NAVARRO, R. TAPIADOR-MORALES, I. LUNGU, M. B MILDE, F. CORRADI, A. LINARES-BARRANCO, SC LIU, T. DELBRUCK
arXiv

2017

A Neuromorphic Event-Based Neural Recording System for Smart Brain-Machine-Interfaces

Biomedical Circuits and Systems,
IEEE Transactions on, Vol. 99

F. CORRADI, AND G. INDIVERI
doi:10.1109/TBCAS.2015.2479256

2015

Real time unsupervised learning of visual stimuli in neuromorphic VLSI systems

Nature Scientific Reports, Vol. 5

M. GIULIONI, F. CORRADI, V. DANTE, AND P. DEL GIUDICE
doi:10.1038/srep14730

2015

A Re-configurable On-line Learning Spiking Neuromorphic Processor comprising 256 neurons and 128K synapses

Frontiers in Neuroscience, Vol. 9

N. QIAO, H. MOSTAFA, F. CORRADI, M. OSSWALD, F. STEFANINI, D. SUMISLAWSKA, AND G. INDIVERI
doi:10.3389/fnins.2015.00141

2015

Towards a Neuromorphic Vestibular System

Biomedical Circuits and Systems,
IEEE Transactions on, Vol. 8

F. CORRADI, D. ZAMBRANO, M. RAGLIANTI, G. PASSETTI, C. LASCHI, AND G. INDIVERI
doi:10.1109/TBCAS.2014.2358493

2014

Peer-reviewed conference papers

Steering a Predator Robot using a Mixed Frame/Event-Driven Convolutional Neural Network

P.M. DIEDERIK, F. CORRADI, E. KERR, P. VANCE, G. DAS, D. NEIL, D. KERR, TOBI DELBRÜCK

*IEEE Event-Based Control,
Communication and Signal
Processing*
2016, Krakow, POL

Decision Making and Perceptual Bistability in Spike-Based Neuromorphic VLSI Systems

F. CORRADI, H. YOU, M. GIULIONI, G. INDIVERI
doi:10.1109/ISCAS.2015.7169245

*IEEE International Symposium on
Circuits and Systems*
2015, Lisbon, PT

Neuromorphic Architectures for Spiking Deep Neural Networks

G. INDIVERI, F. CORRADI, AND N. QIAO
doi:10.1109/IEDM.2015.7409623

*IEEE International Electron Devices
Meeting*
2015, Washington, DC, USA

Toward Neuromorphic Intelligent Brain-machine Interfaces: an Event-based Neural Recording and Processing System

F. CORRADI, D. BONTRAGER, AND G. INDIVERI
doi:10.1109/BioCAS.2014.6981793

*IEEE Biomedical Circuits and
Systems Conference*
2014, Lausanne, CH

Mapping Arbitrary Mathematical Functions and Dynamical Systems to Neuromorphic VLSI Circuits for Spike-Based Neural Computation

F. CORRADI, C. ELIASMITH, AND G. INDIVERI
doi:10.1109/ISCAS.2014.6865117

*IEEE International Symposium on
Circuits and Systems*
2014, Melbourne, VIC, AU

A spiking implementation of the lamprey's Central Pattern Generator in neuromorphic VLSI

E. DONATI, F. CORRADI, C. STEFANINI, G. INDIVERI
doi:10.1109/BioCAS.2014.6981775

*IEEE Biomedical Circuits and
Systems Conference*
2014, Lausanne, CH

A Hybrid Analog/Digital Spike-Timing Dependent Plasticity Learning Circuit for Neuromorphic VLSI Multi-Neuron Architectures

H. MOSTAFA, F. CORRADI, F. STEFANINI, AND G. INDIVERI
doi:10.1109/ISCAS.2014.6865270

*IEEE International Symposium on
Circuits and Systems*
2014, Melbourne, VIC, AU

Automated synthesis of asynchronous event-based interfaces for neuromorphic systems

H. MOSTAFA, F. CORRADI, M. OSSWALD, AND G. INDIVERI
doi:10.1109/ECCTD.2013.6662213

*IEEE European Conference on
Circuit Theory and Design*
2013, Dresden, DE

Implementation of a Neuromorphic Vestibular Sensor with Analog VLSI Neurons

G. PASSETTI, F. CORRADI, M. RAGLIANTI, D. ZAMBRANO, C. LASCHI, AND G. INDIVERI
doi:10.1109/BioCAS.2013.6679667

*IEEE Biomedical Circuits and
Systems Conference*
2013, Rotterdam, NL

Demonstrations at international conferences

Convolutional Neural Network Driven by Dynamic Vision Sensor Playing RoShamBo

I.-A. LUNGU, F. CORRADI, T. DELBRUCK

*IEEE Symposium on Circuits and
Systems*
2017, Baltimore, MD, USA

Learning to recognize visual stimuli in neuromorphic VLSI

F. CORRADI, M. GIULIONI
doi:10.1109/BioCAS.2012.6418494

*IEEE Biomedical Circuits and
Systems Conference*
2012, Hsinchu, TW

Skills

VLSI design of mixed signal analog/digital circuits	Virtuoso ADE, AMS, Layout Suite Cadence, Spice
Printed circuit board design	Altium, Eagle
Software design	C/C++, Python, OpenFrameworks
Neural network simulation of deep and/or spiking networks	Caffe Deep Learning Framework, Brian, Matlab
Dynamical System Analysis	Xppaut, Mathematica
Linux system administration of web-servers and always-on systems	Linux, Unix, Mysql, Apache2, Bash
Web design	Php, Nodejs, Mongodb, Ajax, Javascript, Css
Lanugages	Italian (mother tongue), English (fluent)