


PERSONAL INFORMATION

Vito Paolo Pastore



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 Vito.Paolo.Pastore@unige.it

Sex Male | Date of birth 03/04/1989 | Nationality Italy

CURRENT POSITION

Assistant professor (type A)

Machine Learning Genoa (MaLGa) center, DIBRIS, University of Genoa, Genoa, Italy

WORK EXPERIENCE

01/02/2022 - now

Assistant professor (type A)

Machine Learning Genoa (MaLGa) center, DIBRIS, University of Genoa, Genoa, Italy

16/04/2020-31/01/2022

Postdoc Researcher

Italian Institute of Technology (IIT), Genoa, Italy. Humanoid Sensing and Perception.

14/03/2018 –31/03/2020

Postdoc Researcher

IBM Almaden Research Center, San Jose, California, USA. Cellular engineering group.

01/11/2017-01/03/2018

Internship

Neuroengineering and Bio-nano Technology (NBT) Lab, Dipartimento di Informatica, Bioingegneria, Robotica e Ingegneria dei Sistemi (DIBRIS), University of Genoa

Title: "Development of a partial correlation algorithm: inferring functional connectivity in in vitro neural networks.

The Internship was inserted in the European project BrainBow and was aimed in the developing of a partial correlation algorithm using C# as programming language. After the informatics implementation, VPP tested the algorithm during the master degree thesis, comparing it with other connectivity methods like transfer entropy and cross-correlation.

30/07/2015 – 01/06/2018

Teaching Assistant

Mathematical methods for engineers, master degree in Bioengineering, University of Genova

From 2015 to now, VPP has been a teaching assistant for the "Mathematical methods for engineers" course. He has been supporting the main course with a set of laboratory lessons in MATLAB, to help the students understanding how to develop informatics implementation of mathematical algorithms, like singular value decomposition, pseudo-inverse computation, integral computation and differential equations solvers.

15/05/2013 – 04/06/2017

Teaching Tutor

University of Genova

From 2013 to 2017 VPP had been a teaching tutor for biomedical engineering. In 2017 he was also a tutor for informatics engineering. As a teaching Tutor, VPP organized several lessons to support and strengthen the students preparation about the main courses of the two bachelor degrees. The supported courses included mathematical analysis, physics, informatics, chemistry and electronics.

12/09/2013-11/12/2013

Internship

Neuroengineering and Bio-nano Technology (NBT) Lab, Dipartimento di Informatica, Bioingegneria, Robotica e Ingegneria dei Sistemi (DIBRIS), University of Genova

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EDUCATION AND TRAINING

November 2014-November 2017	<p>PhD in Bioengineering and robotics (Curriculum bioengineering and bioelectronics)</p> <p>Thesis title: <i>Development of statistical and computational methods to estimate functional connectivity and topology in large-scale neuronal assemblies.</i></p> <p>Thesis defended on 13th February 2018, evaluation: Excellent</p> <p>University of Genova, Dibris, NBT - Neuroengineering and Bio-Nano Technologies Laboratory</p>
September 2012-October 2014	<p>Master Degree in bioengineering, 110/110 summa cum laude, Dignity of Press. Thesis title: "Development of a partial correlation algorithm to estimate functional connectivity in cortical networks"</p> <p>University of Genova</p>
September 2009-September 2012	<p>Bachelor in biomedical engineering, 110/110 summa cum laude. Thesis title: "Partial Correlation: development of an algorithm to identify functional connectivity in neuronal networks"</p> <p>University of Genova</p>
September 2003-September 2008	<p>High school degree, 100/100</p> <p>Science high school "Giulietta Banzi Bazoli" (LECCE)</p>

PERSONAL SKILLS

Mother tongue(s) Italian

Other language(s)

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interaction	Spoken production	
English	C1	C1	C1	C1	C1
Proficient English user					

Communication skills ▪ Good communication skills gained through tutor activity

Research Interests

- **Machine Learning**
VPP's expertise includes and is not limited to algorithms for clustering, supervised and unsupervised learning, random forest, SVM, anomaly detection. VPP developed these skills during his Postdoc in IBM research, working on a pipeline to automatically detect, unsupervised partitioning, classify and reveal anomaly for plankton species using available datasets (e.g., WHOI dataset) and the IBM lens less microscope.
- **Artificial neural network and deep learning**
Excellent skills in developing and implementing artificial neural network for classification. VPP has been developing Convolutionary Neural Network (CNN) aimed in classifying images during his postdoc experience in IBM. He implemented not only existing and published architectures, but also customized architectures to solve the problem of biological data classification, including plankton and mutated cells. VPP's skills include designing and implementing shallow ANN to solve problem of classification on vector of descriptors extracted from images. VPP's expertise includes using KERAS to implement neural networks based on TensorFlow. VPP is able to use KERAS to design and develop architectures with customized layers.
- **Python programming**
Excellent skills in python programming and all the main scientific python libraries package, acquired during the post doc in IBM. VPP has been also designing and implementing tools with graphical user interface in Python.
- **Cellular Image analysis and segmentation**
Excellent skills in cellular image analysis. VPP started developing these skills collaborating with the neurological clinic laboratory in Genova, developing a set of macros in ImageJ for a basic morphometric cellular analysis. VPP has been developing more expertise during his postdoc in IBM, working on segmentation of different type of cells, directly using code, that is, implementing the segmentation algorithms in python, using available libraries and developing customized algorithms to solve different problem of segmentation. VPP has been working on a tool with graphical user interface for filopodia extraction and analysis, on the segmentation of cells organelles and other projects.
- **Computational Neuroscience**
Investigating the dynamics of small and large-scale neuronal networks by studying the relationship between connectivity and dynamics;
- **Object Oriented programming and development of informatics toolbox**
Excellent skills in object-oriented programming acquired from the bachelor thesis when VPP started programming in C#. During the PhD, VPP developed informatics toolbox with Graphical User Interfaces. He developed two software: TOOLCONNECT and SPICODYN to analyse electrophysiological recordings of in vitro neural networks coupled to micro-electrodes arrays (MEAs). In particular, SPICODYN guides the user through a complete analysis, including the possibility to view the raw electrophysiological acquired signal, to perform spike and burst detection and analysis, to apply a functional connectivity method (cross-correlation, partial correlation, joint entropy, transfer entropy) and to perform a complete topological analysis (computing the main graph-theory parameters for neural networks analysis).

- Algorithm optimization and big data

Good skills in algorithms optimization from both the memory usage and efficiency point of view. VPP acquired such skills during the PhD, adapting specific connectivity methods to be compatible with high-density MEAs with thousands of electrodes. Good experience in multi-threading and parallel computing in optimizing algorithms.

- MATLAB programming

Excellent skills in MATLAB programming acquired during the master degree and PhD. VPP has also been a teaching assistant in a master course, teaching students how to use MATLAB to implement mathematical algorithms.

- Algorithms design and development of statistical measures

VPP developed algorithms to infer functional connectivity in *in vitro* neural networks. He started to study connectivity algorithms from the bachelor thesis and continued in the master thesis and during the PhD. He re-designed, optimized and implemented correlation-based methods: cross-correlation, partial correlation and information-theory based methods: joint entropy and transfer entropy. During his last year of PhD, he designed a correlation-based algorithm (FNCCH, Pastore et al., 2018) able to detect inhibitory functional links among neurons in neuronal networks. Moreover, he was involved in studying statistical test to assess the significance of functional connections. During his postdoc in IBM, VPP has been designing algorithms for data driven modelling, unsupervised learning and partitioning, anomaly detection and segmentation.

Organisational / managerial skills

- Excellent capacity of team-working gained through the internship, the tutor activity. During the tutor activity, VPP coordinated the team of tutors and took care of the activity organization. VPP was involved, as post doc in IBM, in the Center for Cellular Construction (CCC) project, collaborating with brilliant researcher in UCSF, SFSU, Berkley and Stanford.

Computer skills

Operating systems:

Microsoft Windows

Apple Mac Os

Linux Ubuntu

Software:

Microsoft Office

NEST

Microsoft SQL Server

Adobe Flash

NI LabVIEW

Microsoft visual Studio

Excellent skills in programming languages:

C

Matlab

Visual Basic

C#

C++

SQL

Octave

ASP.NET

Python

HTML

Java

R

- EUROPEAN COMPUTER DRIVING LICENCE (2007)

Driving Licence

Italy (A, B), California (C)

Publications

Patents (as first inventor)

- Semantic learning in a federated learning system (Number of application 17 / 022,140, 2022).
<https://patents.google.com/patent/US20220083904A1/en>. Published on 17-03-2022.
 Status: Granted.
- A deep learning approach to correlate cellular morphology and genetics (Number of application 17/175,495, 2022).
<https://patents.google.com/patent/US20220262457A1/en>. Published on date 18-08-2022.
- Volatile organic compound detection and classification (Number of application 17 / 079,684, 2022).
<https://patents.google.com/patent/US20220130491A1/en>. Published on 28-04-2022.
- Semi-supervised Classification of Microorganism (Number of application 16/823,149, 2021).
<https://patents.google.com/patent/US20210292805A1/en>. Published on 23-09-2021.
- Identification of unknown viral genomes and closest known genomes (Number of application 17/321,371, 2022).
<https://www.freepatentsonline.com/y2022/0367011.html>. Published on date 17-11-2022.

Journal Papers

- Capurro, N.*, **Pastore, V. P.***, Touijer, L.*, Odone, F., Cozzani, E., Gasparini, G., & Parodi, A. (2024). A deep learning approach for Direct Immunofluorescence pattern recognition of Autoimmune Bullous Diseases. British Journal of Dermatology, ljae142. * **Equally first contributing authors.**
- Ciranni, M., Murino, V., Odone, F., & **Pastore, V. P.** (2024). Computer vision and deep learning meet plankton: Milestones and future directions. Image and Vision Computing, 104934.
- Alfano, P. D., **Pastore, V. P.**, Rosasco, L., & Odone, F. (2024). Top-tuning: A study on transfer learning for an efficient alternative to fine tuning for image classification with fast kernel methods. Image and Vision Computing, 142, 104894.
- Ciranni, M., Odone, F., & **Pastore, V. P.** (2024). Anomaly detection in feature space for detecting changes in phytoplankton populations. Frontiers in Marine Science.
- Parodi, G., Brofiga, M., **Pastore, V. P.**, Chiappalone, M., & Martinoia, S. Deepening the role of excitation/inhibition balance in human iPSCs-derived neuronal networks coupled to MEAs during long-term development. Journal of neural engineering. 10.1088/1741-2552/acf78b.
- Pastore, V. P.**, Ciranni, M., Bianco, S., Fung, J. C., Murino, V., & Odone, F. (2023). Efficient unsupervised learning of biological images with compressed deep features. Image and Vision Computing, 137, 104764.
- Maracani, A.*, **Pastore, V. P.***, Natale, L., Rosasco, L., & Odone, F. (2023). In-domain versus out-of-domain transfer learning in plankton image classification. Scientific Reports, 13(1), 10443-10443. * **Equally first contributing authors.**
- Moro M*, **Pastore VP***, Marchesi G, Proserpio P, Tassi L, Castelnovo A, et al. Automatic video analysis and classification of sleep- related hypermotor seizures and disorders of arousal. Epilepsia. 2023; 00:1–10. <https://doi.org/10.1111/epi.17605>. * **Equally first contributing authors**
- Pastore, V.P.**, Moro, M. & Odone, F. A semi-automatic toolbox for markerless effective semantic feature extraction. Sci Rep 12, 11899 (2022). <https://doi.org/10.1038/s41598-022-16014-8>
- Moro, M., **Pastore, V. P.**, Tacchino, C., Durand, P., Bianchi, I., Moretti, P., ... & Casadio, M. (2022). A Markerless Pipeline to Analyze Spontaneous Movements of Preterm Infants. Computer Methods and Programs in Biomedicine, 107119.
- Mousumi Roy, Jun Kong, Satyananda Kashyap, **Vito Paolo Pastore**, Fusheng Wang, Ken C. L. Wong & Vandana Mukherjee. Convolutional autoencoder based model HistoCAE for segmentation of viable tumor regions in liver whole-slide images. Scientific Reports, DOI 10.1038/s41598-020-80610-9.
- Pastore, V.P.**, Zimmerman, T.G., Biswas, S.K. and Bianco S., Monitoring Water Quality Using Plankton as Biosensor. JDREAM. Journal of interDisciplinary REsearch Applied to Medicine (2020), DOI Code: 10.1285/i25327518v4i1p15.

Zimmerman T.G., **Pastore, V.P.**, Biswas, S.K. and Bianco S., Embedded system to detect, track and classify plankton using a lensless video microscope, arXiv preprint arXiv:2005.13064, (2020).

Pastore, V.P., Zimmerman, T.G., Biswas, S.K. and Bianco S., Annotation-free learning of plankton for classification and anomaly detection. Sci Rep 10, 12142 (2020). <https://doi.org/10.1038/s41598-020-68662-3>

Pastore, V.P., Massobrio, P., Godjoski, A. & Martinoia S. Excitatory-inhibitory links and network topology in large scale neuronal assemblies from multi-electrode recordings. PLoS Comput Biol. 2018;14(8): e1006381. Published 2018 Aug 27. doi:10.1371/journal.pcbi.1006381

Pastore, V. P., Godjoski, A., Martinoia, S. & Massobrio, P. SPICODYN: A Toolbox for the analysis of neuronal network dynamics and connectivity from multi-site spike signal recordings. Neuroinformatics, doi:10.1007/s12021-017-9343-z (2017).

Capodivento G, Visigalli D, Garnero M, Fancellu R, Ferrara MD, Basit A, Hamid Z, **Pastore V.P.**, Garibaldi S, Amirotti A, Mancardi G, Serrati C, Capello E, Schenone A, Nobbio L. Sphingomyelin as a myelin biomarker in CSF of acquired demyelinating neuropathies. Scientific Reports 7, 7831, doi:10.1038/s41598-017-08314-1 (2017).

Pastore, V. P., Poli, D., Godjoski, A., Martinoia, S. & Massobrio, P. ToolConnect: a functional connectivity toolbox for in vitro networks. Frontiers in Neuroinformatics 10, doi:10.3389/fninf.2016.00013 (2016).

Poli, D., **Pastore, V. P.**, Martinoia, S. & Massobrio, P. From functional to structural connectivity using partial correlation in neuronal assemblies. Journal of Neural Engineering 13, 026023 (2016).

Poli, D., **Pastore, V. P.** & Massobrio, P. Functional connectivity in in vitro neuronal assemblies. Frontiers in Neural Circuits 9, doi:10.3389/fncir.2015.00057 (2015).

Conference Papers

Sadeghi Garjan, M., Chaanine, T., Pasquale, C., **Paolo Pastore, V.**, & Ferrando, A. (2023, September). Agamas: a new agent-oriented traffic simulation framework for sumo. In European Conference on Multi-Agent Systems (pp. 396-405). Cham: Springer Nature Switzerland.

- EUMAS 2023, Naples, Italy 14-15/09/2023

Chaanine, T., Ferrando, A., Pasquale, C., **Pastore, V. P.**, Garjan, M. S., & Siri, S. (2023, September). A control-oriented highway traffic model with multiple clusters of CAVs. In 2023 IEEE 26th International Conference on Intelligent Transportation Systems (ITSC) (pp. 5198-5203). IEEE.

- ITSC 2023, Bilbao, Bizkaia, Spain 24-28/09/2023, selected for oral presentation

Touijer, L., **Pastore, V. P.**, & Odone, F. (2023, September). Food Image Classification: The Benefit of In-Domain Transfer Learning. In International Conference on Image Analysis and Processing (pp. 259-269). Cham: Springer Nature Switzerland.

- ICIAP 2023, Udine, Italy 12-14/09/2023, selected for oral presentation

Pastore, V. P., Alfano, P. D., Oke, A., Capponi, S., Eltanan, D., Woodruff-Madeira, X., ... & Bianco, S. (2023, September). An Unsupervised Learning Approach to Resolve Phenotype to Genotype Mapping in Budding Yeasts Vacuoles. In International Conference on Image Analysis and Processing (pp. 247-258). Cham: Springer Nature Switzerland.

- ICIAP 2023, Udine, Italy 12-14/09/2023

Nicora, E.*, **Pastore, V. P.***, & Noceti, N. (2023, September). GCK-Maps: A Scene Unbiased Representation for Efficient Human Action Recognition. In International Conference on Image Analysis and Processing (pp. 62-73). Cham: Springer Nature Switzerland. Equally first contributing authors.

- ICIAP 2023, Udine, Italy 12-14/09/2023, selected for oral presentation

Pastore, V. P., Touijer, L., Capurro, N., Cozzani, E., Gasparini, G., Parodi, A., & Odone, F. (2023, April). Incorporating Diagnostic Prior with Segmentation: A Deep Learning Pipeline for the Automatic Classification of Autoimmune Bullous Skin Diseases. In 2023 IEEE 20th International Symposium on Biomedical Imaging (ISBI) (pp. 1-5). IEEE.

- ISBI 2023, Cartagena de Indias, Colombia, 18-21/04/2023

Alfano, P. D., Rando, M., Letizia, M., Odone, F., Rosasco, L., & **Pastore, V. P.** (2022, August). Efficient Unsupervised Learning for Plankton Images. In 2022 26th International Conference on Pattern Recognition (ICPR) (pp. 1314-1321). IEEE.

- ICPR 2022, Montreal, Quebec, Canada 21-25/08/2022, selected for oral presentation

Pastore, V.P., Megiddo, N., Bianco, S. (2022). An Anomaly Detection Approach for Plankton Species Discovery. In: Sclaroff, S., Distanto, C., Leo, M., Farinella, G.M., Tombari, F. (eds) Image Analysis and Processing – ICIAP 2022. ICIAP 2022. Lecture Notes in Computer Science, vol 13232. Springer, Cham. https://doi.org/10.1007/978-3-031-06430-2_50

- ICIAP 2022, Lecce, Italy, 23-27/05/2022, selected for oral presentation

Pastore, V.P., Thomas Zimmerman, Sujoy K. Biswas and Simone Bianco. Establishing the baseline for using plankton as biosensor

- SPIE Photonic West 2019, San Francisco, California 02-07/02/2019, selected for oral presentation

Thomas Zimmerman, Nick Antipa, Daniel Elnatan, Alessio Murru, Sujoy Biswas, **Pastore, V.P.**, Mayara Bonani, Laura Waller, Jennifer Fung, Gianni Fenu, Simone Bianco. Stereo in-line holographic digital microscope.

- SPIE Photonic West 2019, San Francisco, California 02-07/02/2019

Sujoy Kumar Biswas, Thomas Zimmerman, Lucrezia Maini, Aminat Adebisi, Luisa Bozano, Cecelia Brown, **Pastore, V.P.** and Simone Bianco. High Throughput Analysis of Plankton Morphology and Dynamic.

- SPIE Photonic West 2019, San Francisco, California 02-07/02/2019

Pasquale, V., **Pastore, V.**, Martinoia, S. & Massobrio, P. Complexity of cortical connectivity promotes self-organized criticality

- CNS 2017, Antwerp, Belgium 15-20/06/2017

Pastore, V., Godjoski, A., Martinoia, S. & Massobrio P. A Toolbox for Dynamic and Connectivity Analysis of Neuronal Spike Trains Data

- NER 2017, Shanghai 25-28 May 2017

Pastore, V., Godjoski, A., Martinoia, S. & Massobrio P. A new connectivity toolbox to infer topological features of in-vitro neural networks

- EMBC 2015, MILANO, ITALY, 25-29/08/2015

Poli, D., **Pastore, V. P.**, Martinoia, S. & Massobrio, P. Functional connectivity in cultured cortical networks during development: comparison between correlation and information theory-based algorithms

- NER 2015, MONTPELLIER, FRANCE, 22-24/04/2015

Awards and Acknowledgments

- Master thesis recommended for publication. Title: Development of a partial correlation algorithm to estimate functional connectivity in cortical networks
- Italian National Group of Bioengineering (GNB) PhD award Alberto Mazzoldi. PhD's thesis title: Development of statistical and computational methods to estimate functional connectivity and topology in large-scale neuronal assemblies.
- PhD thesis work judged excellent by the commission of the PhD in Bioengineering