europass Curriculum vitae

PERSONAL INFORMATION

Giacomo Mazzamuto

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https://github.com/gmazzamuto https://github.com/lens-biophotonics

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CURRENT WORKING LEVEL

EPR: Level III Researcher

WORK EXPERIENCE

jul 2019 – present

Level III Researcher

Consiglio Nazionale delle Ricerche, Istituto Nazionale di Ottica CNR-INO

Light-sheet microscopy, software development, image processing, big data management, Artificial Intelligence.

- design, development and operation of a processing pipeline for 3D, high-resolution, hyperspectral images (whole-organ light-sheet tomographies, e.g. whole mouse brain). The pipeline comprises: volumetric image stitching, single-pixel classification using Convolutional Neural Networks (CNN), feature extraction (e.g. cell counting and segmentation), lossy and lossless compression.
- Big Data management (single dataset size >10 TB)
- Data curation

jul 2018 – jun 2019

Assegnista di ricerca

European Laboratory for Non-Linear Spectroscopy (Laboratorio Europeo di Spettroscopie non Lineari - LENS), Università di Firenze

Human Brain Project, Specific Grant Agreement 2 (HBP-SGA2).

nov 2016 – jun 2018

Tecnologo di I livello, categoria EP

European Laboratory for Non-Linear Spectroscopy (Laboratorio Europeo di Spettroscopie non Lineari - LENS), Università di Firenze

Project: Human Brain Project (HBP-SGA1)

Profile: Big data software engineer / machine learning developer

apr 2015 – nov 2016

Assegnista di ricerca

Consiglio Nazionale delle Ricerche, Istituto Nazionale di Ottica CNR-INO

Project GRANCASSA ("Grafene ed effetto Casimir per Sensoristica Avanzata")

apr 2012 – mar 2015

Assegnista di ricerca

European Laboratory for Non-Linear Spectroscopy (Laboratorio Europeo di Spettroscopie non Lineari - LENS), Università di Firenze

Project MALICIA (Light-Matter Interfaces in Absence of Cavities), single-photon quantum emitters based on organic Dibenzoterrylene (DBT) molecules in anthracene crystals.

EDUCATION AND TRAINING

apr 2012 – nov 2015

International Doctorate in Atomic and Molecular Photonics

European Laboratory for Non-Linear Spectroscopy (Laboratorio Europeo di Spettroscopie non Lineari - LENS), Università di Firenze

Tesi: Single Organic Molecules and Light Transport in Thin Films (SSD: FIS/03)

Final examination: excellent

2009 – dec 2011

Master of Science in Physics and Astrophysics

Università degli Studi di Firenze Final examination: 110/110 *cum laude*

2004 – dec 2008 **Bachelor of Science in Physics**

Università degli Studi di Firenze Final examination: 110/110

1999 – 2004 **Diploma di Maturità Scientifica**

Liceo Scientifico N. Copernico, Prato Final examination: 100/100 *con encomio*

SELECTED PROJECTS

01/10/2020 – 31/12/2021 **(PI)** BIGBRAIN – Gestione dei big data per la mappatura ad alta risoluzione dell'intero cervello, Fondazione CR Firenze

22/08/2018 – present **(Co-PI)** Imaging and analysis techniques to construct a cell-census atlas of the human brain, BRAIN Initiative Cell Census Network, US National Institute of Health (NIH), Grant n. 1U01MH117023-01

01/10/2020 – present REPAIR – Restoring Cardiac Mechanical Function by Polymeric Artificial Muscular Tissue, Grant Agreement n. 952166 European Commission

01/04/2020 – present Human Brain Project SGA3. Grant agreement n. 945539 European Commission

01/04/2018 – 31/03/2020 Human Brain Project SGA2. Grant agreement n. 785907 European Commission

14/11/2016 – 31/03/2018 Human Brain Project SGA1. Grant agreement n. 720270 European Commission

01/01/2018 – 31/12/2018 Member of the Joint Technical Committee 1 of the International Organization for Standardization (ISO) SC29, "Coding of Audio, Picture, Multimedia and Hypermedia Information" and UNINFO (Ente Italiano federato all'UNI per le tecnologie informatiche e loro applicazioni)

SOFTWARE DEVELOPMENT

C++ GUI SPIMlab: a data acquisition and control software Ligh Sheet Microscopy. https://github.com/lens-biophotonics/SPIMlab

Python package ZetaStitcher: a tool designed to sitch large volumetric images such as those produced by Light-Sheet Fluorescence Microscopes. https://github.com/lens-biophotonics/ZetaStitcher

C++ library MCPlusPlus: A Monte Carlo C++ code for radiative transport. G. Mazzamuto, L. Pattelli. www.lens.unifi.it/quantum-nanophotonics/mcplusplus

CUDA CUDA-accelerated Electromagnetic scattering for Large Ensembles of Spheres. https://github.com/disordered-photonics/celes

COMPETENCES

Other languages

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interaction	Spoken production	
English	C2	C2	C1	C1	C1
	TOEFL IBT, score 109/120, September 2013 (Test Of English as a Foreign Language)				
French	B2	C1	B1	B2	B2
	DELF (Diplôme d'Études en Langue Française)				

Levels: A1 and A2: Basic user – B1 and B2: Independent user – C1 and C2: Proficient user
Common European Framework of Reference for Languages

Digital skills Advanced knowledge of operating systems: Linux, UNIX, Mac OS, Windows.

Advanced knowledge of the following programming languages and tools: C, C++, Qt framework, Python (Numpy, Scipy, Pandas, Dask, Jupyter), Bash scripting, Boost C++ Libraries, MATLAB, FFTW, GSL

PUBLICATIONS

[1] Michele Sorelli, Irene Costantini, Leonardo Bocchi, Markus Axer, Francesco Saverio Pavone, and **Giacomo Mazzamuto**. "Fiber enhancement and 3D orientation analysis in label-free two-photon fluorescence microscopy". en. In: *Scientific Reports* 13.1 (Mar. 2023), p. 4160. URL: https://doi.org/10.1038/s41598-023-30953-w.

[2] Lorenzo Pattelli and **Giacomo Mazzamuto**. "Experimental imaging and Monte Carlo modeling of ultrafast pulse propagation in thin scattering slabs". In: *Journal of Biomedical Optics* 27.08 (June 2022). URL: https://doi.org/10.1117/1.JBO.27.8.083020.

[3] Marie-Hélène Bourget, Lee Kamentsky, Satrajit S. Ghosh, **Giacomo Mazzamuto**, Alberto Lazari, Christopher J. Markiewicz, Robert Oostenveld, Guiomar Niso, Yaroslav O. Halchenko, Ilona Lipp, Sylvain Takerkart, Paule-Joanne Toussaint, Ali R. Khan, Gustav Nilsonne, Filippo Maria Castelli, The BIDS Maintainers, and Julien Cohen-Adad. "Microscopy-BIDS: An Extension to the Brain Imaging Data Structure for Microscopy Data". In: *Frontiers in Neuroscience* 16 (2022), p. 871228. URL: https://doi.org/10.3389/fnins.2022.871228.

[4] Luca Pesce, Marina Scardigli, Vladislav Gavryusev, Annunziatina Laurino, **Giacomo Mazzamuto**, Niamh Brady, Giuseppe Sancataldo, Ludovico Silvestri, Christophe Destrieux, Patrick R. Hof, Irene Costantini, and Francesco S. Pavone. "3D molecular phenotyping of cleared human brain tissues with light-sheet fluorescence microscopy". In: *Communications Biology* 5.1 (2022), p. 447. URL: https://doi.org/10.1038/s42003-022-03390-0.

[5] Claudia Capitini, Luca Pesce, Giulia Fani, **Giacomo Mazzamuto**, Massimo Genovese, Alessandra Franceschini, Paolo Paoli, Giuseppe Pieraccini, Michael Zasloff, Fabrizio Chiti, Francesco S. Pavone, and Martino Calamai. "Studying the trafficking of labeled trodusquemine and its application as nerve marker for light-sheet and expansion microscopy". en. In: *The FASEB Journal* 36.12 (Dec. 2022). URL: https://doi.org/10.1096/fj.202201276R.

[6] Marina Scardigli, Luca Pesce, Niamh Brady, **Giacomo Mazzamuto**, Vladislav Gavryusev, Ludovico Silvestri, Patrick R. Hof, Christophe Destrieux, Irene Costantini, and Francesco S. Pavone. "Comparison of Different Tissue Clearing Methods for Three-Dimensional Reconstruction of Human Brain Cellular Anatomy Using Advanced Imaging Techniques". In: *Frontiers in Neuroanatomy* 15 (2021), p. 90. URL: https://doi.org/10.3389/fnana.2021.752234.

[7] L Silvestri, MC Müllenbroich, I Costantini, AP Di Giovanna, **G Mazzamuto**, A Franceschini, D Kutra, A Kreshuk, C Checcucci, LO Toresano, P Frasconi, L Sacconi, and FS Pavone. "Universal autofocus for quantitative volumetric microscopy of whole mouse brains". In: *Nature Methods* 18.8 (2021), pp. 953–958. URL: https://doi.org/10.1038/s41592-021-01208-1.

[8] I Costantini, **G Mazzamuto**, M Roffilli, A Laurino, FM Castelli, M Neri, G Lughi, A Simonetto, E Lazzeri, Luca Pesce, C Destrieux, L Silvestri, V Conti, R Guerrini, and Pavone FS. "Large-scale, cell-resolution volumetric mapping allows layer-specific investigation of human brain cytoarchitecture". In: *Biomedical Optics Express* 12.6 (2021). Publisher: Optical Society of America, pp. 3684–3699. URL: https://doi.org/10.1364/BOE.415555.

[9] Irene Costantini, Enrico Baria, Michele Sorelli, Felix Matuschke, Francesco Giardini, Miriam Menzel, **Giacomo Mazzamuto**, Ludovico Silvestri, Riccardo Cicchi, Katrin Amunts, Markus Axer, and Francesco Saverio Pavone. "Autofluorescence enhancement for label-free imaging of myelinated fibers in mammalian brains". In: *Scientific Reports* 11.1 (2021), p. 8038. URL: https://doi.org/10.1038/s41598-021-86092-7.

[10] Simone Zanotto, **Giacomo Mazzamuto**, Francesco Riboli, Giorgio Biasiol, Giuseppe C. La Rocca, Alessandro Tredicucci, and Alessandro Pitanti. "Photonic bands, superchirality, and inverse design of a chiral minimal metasurface". In: *Nanophotonics* (2019). Publisher: De Gruyter. URL: https://doi.org/10.1515/nanoph-2019-0321.

[11] M Caroline Müllenbroich, Ludovico Silvestri, Antonino P Di Giovanna, **Giacomo Mazzamuto**, Irene Costantini, Leonardo Sacconi, and Francesco S Pavone. "High-Fidelity Imaging in Brain-Wide Structural Studies Using Light-Sheet Microscopy". In: *eNeuro* (2018). Publisher: Society for Neuroscience, ENEURO–0124. URL: https://doi.org/10.1523/ENEURO.0124-18.2018.

[12] **G Mazzamuto**, I Costantini, M Neri, M Roffilli, L Silvestri, and FS Pavone. “Automatic Segmentation of Neurons in 3D Samples of Human Brain Cortex”. In: *International Conference on the Applications of Evolutionary Computation*. Springer, 2018, pp. 78–85. URL: https://doi.org/10.1007/978-3-319-77538-8_6.

[13] **Giacomo Mazzamuto**. “HEVC for high-resolution biomedical tomographies”. In: *121st MPEG meeting, International Organization for Standardization (ISO)*. 2018, p. m42109.

[14] P Lombardi, AP Ovvyan, S Pazzagli, **G Mazzamuto**, G Kewes, O Neitzke, N Gruhler, O Benson, WHP Pernice, FS Cataliotti, and C Toninelli. “Photostable Molecules on Chip: Integrated Sources of Nonclassical Light”. In: *ACS Photonics* 5.1 (2018), pp. 126–132. URL: https://doi.org/10.1021/acsphotonics.7b00521.

[15] Amos Egel, Lorenzo Pattelli, **Giacomo Mazzamuto**, Diederik S. Wiersma, and Uli Lemmer. “CELES: CUDA-accelerated simulation of electromagnetic scattering by large ensembles of spheres”. In: *Journal of Quantitative Spectroscopy and Radiative Transfer* 199 (2017), pp. 103–110. URL: https://doi.org/10.1016/j.jqsrt.2017.05.010.

[16] Lorenzo Pattelli, **Giacomo Mazzamuto**, Diederik S Wiersma, and Costanza Toninelli. “Diffusive light transport in semitransparent media”. In: *Physical Review A* 94.4 (2016). Publisher: APS, p. 043846. URL: https://doi.org/10.1103/PhysRevA.94.043846.

[17] Günter Kewes, Max Schoengen, Oliver Neitzke, Pietro Lombardi, Rolf-Simon Schönfeld, **Giacomo Mazzamuto**, Andreas W Schell, Jürgen Probst, Janik Wolters, Bernd Löchel, Costanza Toninelli, and Oliver Benson. “A realistic fabrication and design concept for quantum gates based on single emitters integrated in plasmonic-dielectric waveguide structures”. In: *Scientific Reports* 6.28877 (2016). Publisher: Nature Publishing Group. URL: https://doi.org/10.1038/srep28877.

[18] **Giacomo Mazzamuto**, Lorenzo Pattelli, Costanza Toninelli, and DS Wiersma. “Deducing effective light transport parameters in optically thin systems”. In: *New Journal of Physics* 18.2 (2016). Publisher: IOP Publishing, p. 023036. URL: https://doi.org/10.1088/1367-2630/18/2/023036.

[19] Fabrizio Sgrignuoli, **Giacomo Mazzamuto**, Niccolò Caselli, Francesca Intonti, Francesco Saverio Cataliotti, Massimo Gurioli, and Costanza Toninelli. “Necklace state hallmark in disordered 2D photonic systems”. In: *ACS Photonics* 2.11 (2015), pp. 1636–1643. URL: https://doi.org/10.1021/acsphotonics.5b00422.

[20] **G Mazzamuto**, A Tabani, S Pazzagli, S Rizvi, A Reserbat-Plantey, K Schädler, G Navickaite, L Gaudreau, FS Cataliotti, F Koppens, and C Toninelli. “Single-molecule study for a graphene-based nano-position sensor”. In: *New Journal of Physics* 16.11 (2014). Publisher: IOP Publishing, p. 113007. URL: https://doi.org/10.1088/1367-2630/16/11/113007.

CONFERENCES

Invited talks

- **G. Mazzamuto**. Large-scale imaging and feature extraction using advanced high-resolution microscopy techniques. Scuola di Biofotonica e Intelligenza Artificiale, 5 – 9 September **2022**, Firenze.
- **G. Mazzamuto**. Image processing and management of large datasets in Light-Sheet Microscopy. Laserlab Europe, Workshop Better Data for better science, 28 – 29 October **2021**.
- **G. Mazzamuto**. Large-scale high-resolution imaging of biological samples with advanced microscopy techniques. V Summer School ”Photonics meets Biology“, 16 – 20 September **2019**, Heraklion (Crete), Greece.

Reviewer

- Reviewer for the European Molecular Imaging Meeting EMIM 2022
- Reviewer for the European Molecular Imaging Meeting EMIM 2021

Given talks

- **G. Mazzamuto** et al. High-speed light-sheet microscopy imaging and data post-processing using custom hardware and software solutions. Jan 28 – Feb 2, 2023, San Francisco (CA), USA.
- **G. Mazzamuto** et al. Deep learning strategies for scalable analysis of high-resolution brain imagery. European Conference on Biomedical Optics (ECBO), 23 – 27 June **2019**, Munich, Germany.
- **G. Mazzamuto** et al. Processing Big Data in High-Resolution 3D Microscopy of Brain Samples. SPIE BIOS @ Photonics West, 2 – 7 February **2019**, San Francisco (CA), USA.
- **G. Mazzamuto** et al. A processing pipeline for big data in high-resolution microscopy. TOPIM TECH 2018 - BIG DATA in IMAGING, 09 – 14 July **2018**, Chania, Crete
- **G. Mazzamuto** et al. A software pipeline for efficient processing of 3D high-resolution microscopy images of large brain samples. 2nd HBPSC 2018, Transdisciplinary Research Linking Neuroscience, Brain Medicine and Computer Science. February **2018**, Lubljana, Slovenia.
  https://youtu.be/1CC3L9womcY?t=33
- **G. Mazzamuto**. *HEVC for high-resolution biomedical tomographies*, 121st MPEG Meeting (International Organization for Standardization – ISO) January, **2018**, Gwangju, South Korea.
- **G. Mazzamuto** et al. Diffusive light transport in semitransparent media. Strongly disordered optical systems, Cargèse (Corse, France), September **2016**.
- **G. Mazzamuto** et al. ORGANIC MOLECULES for QUANTUM OPTICS: Sensing and Communicating at the nano-scale. FISMAT 2015, Sept 28 – Oct 2, **2015**, Palermo, Italy.
- **G. Mazzamuto** et al. Single-molecule study for a graphene-based nano-position sensor. CLEO Europe **2015**, Munich, Germany.