

# LAURA MARZETTI

## PERSONAL INFORMATION

Surname, First name Marzetti, Laura  
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E-mail [laura.marzetti@unich.it](mailto:laura.marzetti@unich.it)  
Nationality Italian  
Place and date of birth Pescara, 11/10/1973  
Gender Female  
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## PRESENT POSITION

“G. d’Annunzio” University of Chieti-Pescara (UdA) – Chieti – Italy,  
Dept. Neuroscience, Imaging and Clinical Sciences  
*Associate Professor in Applied Physics*

“G. d’Annunzio” University of Chieti-Pescara (UdA) – Chieti – Italy  
Institute for Advanced Biomedical Technologies (ITAB)  
*Head of the "Methods and Models for Brain Oscillations - MAMBO" laboratory*

## EDUCATION AND TRAINING

2018 – September Italian Ministry of Education, Universities and Research (MIUR)  
National Scientific Qualification for the role of Full Professor in Applied Physics (02/D1)  
2008 – April “G. d’Annunzio” University of Chieti - Pescara (UdA) – Chieti, Italy  
Department of Clinical sciences and bioimaging  
PhD program title “Functional Neuroimaging: from cells to systems”.  
Thesis title: “METHODS FOR THE ESTIMATION OF FREQUENCY SPECIFIC FUNCTIONAL CONNECTIVITY IN THE BRAIN FROM EEG/MEG DATA”, A.Y. 2007/2008  
2000 – March University of Ancona - Ancona, Italy  
Master’s degree in Electronic Engineering with specialization in Biomedical Engineering,  
A.Y. 1999/2000

## RESEARCH EXPERIENCE

17 June 2015 - “G. d’Annunzio” University of Chieti e Pescara – Chieti – Italy  
16 June 2018 *Dept. Neuroscience, Imaging and Clinical Sciences*  
Assistant Professor in Tenure Track (art. 24, 3b L. 240/2010), SSD FIS/07  
01 January 2011 - “G. d’Annunzio” University of Chieti - Pescara – Chieti, Italy  
16 June 2015 *Department of Neuroscience and Imaging*  
Assistant Professor in Applied Physics  
Research program title “DEVELOPMENT OF METHODS FOR INVESTIGATING FUNCTIONAL CONNECTIVITY AT REST WITH MAGNETOENCEPHALOGRAPHY” - HUMAN CONNECTOME PROJECT (1U54MH091657-01), NATIONAL INSTITUTES OF HEALTH, USA  
01 November 2007 - “G. d’Annunzio” University of Chieti - Pescara – Chieti – Italy  
31 December 2010 *Department of Clinical Sciences and Bioimaging*  
PostDoc  
01 June 2007 - Fraunhofer FIRST Institute – Berlin – Germany  
31 August 2007 *IDA - Intelligent Data Analysis group (Head: Prof. KR Mueller)*  
Visiting student funded by POR C3/IC4E of the Abruzzo region  
23 February 2005 - “G. d’Annunzio” University of Chieti - Pescara – Chieti – Italy  
22 February 2008 *Department of Clinical Sciences and Bioimaging*  
PhD training in “Functional Neuroimaging: from cells to systems”  
16 September 2002 - Universitaet Ulm, Ulm, Germania  
31 July 2004 *Zentralinstitut fuer Biomedizinische Technik, Arbeitsbereich Biosignal- und Bildgebungstechnologie, ZIBMT*  
Research Associate, BAT IIa  
08 March 2001 - *Advanced Technologies Biomagnetics srl – Pescara - Italy*  
15 September 2002 Software development for MEG and MCG data analysis (R&D department)

## CONTRIBUTION TO SCIENCE

My early publications (2002-2005) reflect the contribution to the development of methods for computing solutions to the forward and inverse biomagnetic problems. A method based on the spherical harmonics' approximation (Lead Field Method, currently implemented as default in the FieldTrip Open source MEG toolbox), outperformed the classical Boundary Element Method in approximating the known magnetic field in simulations. For this work, I received the Samuel Williamson Prize at the 2004 International conference for Biomagnetism, Boston, USA. Later, as a PhD student (2005-2008), I began investigating methods to explore brain functional connectivity through MEG and EEG. My work, as principal investigator, has been grounded on the neurophysiologic hypothesis that large-scale communication in the brain is mediated by phase synchronization and has provided one of the earliest demonstrations that stable phase-relationships exist across multiple sets of brain areas for the different oscillatory components (methods available at [METH toolbox](#) by Guido Nolte).

As a PostDoc and Junior Researcher (2008-2015), I investigated the MEG correlates of functional connectivity as defined by the concept of the Resting State Network (RSN), a collection of brain regions that exhibits synchronous activity, in BOLD fMRI. It is noteworthy that, when I began work in the field, there was no direct evidence of electrophysiological correlates of fMRI RSNs. Although the functional role of ongoing electrophysiological activity has been recognized for decades, it was (and partially still is) debated whether and how such activity relates to the concept of RSNs. I devoted the major part of my research to investigating methods to answer this question. This research was part of the scientific work carried under the EU FP7 project Brainsync and under the Human Connectome Project. The major finding of this work is that MEG reveals rich coupling schemes that only partially overlap with RSNs. These results strongly contribute to the hypothesis that different coupling mechanism serve different functions: slow aperiodic signal fluctuations, e.g., those giving rise to fMRI RSNs, might represent coherent excitability fluctuations leading to coordinated changes in the activation of brain areas, while phase coupling mechanism might facilitate communication between neuronal populations during perceptual analyses or cognitive processing.

More recently (2015-2020), as leader of the Methods and Models for Brain Oscillation (MAMBO) laboratory of the Institute for Advanced Biomedical Technologies (ITAB) in Chieti, I continued to work along the lines sketched above. The goal of my research group is to continue developing robust functional connectivity methods for MEG and EEG. A recent example is the development of the Multivariate Phase Slope Index approach (Basti et al., 2018). Additionally, an important aspect of the MAMBO research activity is to investigate how modulations of brain activity (e.g., through externally induced brain stimulations as well as through internally driven state changes) influence the phase relationships among brain areas. A recent example is the study of MEG functional connectivity in visuo-spatial attention (D'Andrea et al., 2019). Finally, my current interests include approaches for real-time connectivity analysis.

## PUBLICATIONS

I authored more than 50 peer-reviewed publications, with over 1500 citations and h-index equal to 17 (Scopus). 20 selected articles are listed below (full list of publications at <https://www.ncbi.nlm.nih.gov/sites/myncbi/1FqSc14T-5Z5L/bibliography/44605801/public/?sort=date&direction=descending>):

1. 2019 - Marzetti L, Basti A, Chella F, D'Andrea A, Syrjälä J, Pizzella V. Brain Functional Connectivity Through Phase Coupling of Neuronal Oscillations: A Perspective From Magnetoencephalography. *Front Neurosci.* 2019;13:964. doi: 10.3389/fnins.2019.00964. eCollection 2019. Review.
2. 2019 - Sommariva S, Sorrentino A, Piana M, Pizzella V, Marzetti L. A Comparative Study of the Robustness of Frequency-Domain Connectivity Measures to Finite Data Length. *Brain Topogr.* 2019 Jul;32(4):675-695. doi: 10.1007/s10548-017-0609-4.
3. 2019 - D'Andrea A, Chella F, Marshall TR, Pizzella V, Romani GL, Jensen O, Marzetti L. Alpha and alpha-beta phase synchronization mediate the recruitment of the visuospatial attention network through the Superior Longitudinal Fasciculus. *Neuroimage.* 2019 Mar;188:722-732. doi: 10.1016/j.neuroimage.2018.12.056.
4. 2018 - Basti A, Pizzella V, Chella F, Romani GL, Nolte G, Marzetti L. Disclosing large-scale directed functional connections in MEG with the multivariate phase slope index. *Neuroimage.* 2018 Jul 15;175:161-175. doi: 10.1016/j.neuroimage.2018.03.004.
5. 2017 - Olejarczyk E, Marzetti L, Pizzella V, Zappasodi F. Comparison of connectivity analyses for resting state EEG data. *Journal of Neural Engineering* 14(3), 036017.
6. 2017 - Chella F, D'Andrea A, Basti A, Pizzella V, Marzetti L. Non-linear Analysis of Scalp EEG by Using Bispectra: The Effect of the Reference Choice. *Front Neurosci.* 2017;11:262. doi: 10.3389/fnins.2017.00262.
7. 2016 - Chella F, Pizzella V, Zappasodi F, Nolte G, Marzetti L. Bispectral pairwise interacting source analysis for identifying systems of cross-frequency interacting brain sources from electroencephalographic or magnetoencephalographic signals. *Physical Review E*, 93, 052420.

8. 2016 - Chella F, Pizzella V., Zappasodi F, Marzetti L., Impact of the reference choice on scalp EEG connectivity estimation. *J Neural Eng.* May 3;13(3):036016.
9. 2014 - Marzetti L., Di Lanzo C., Zappasodi F., Chella F., Raffone A., Pizzella V. Magnetoencephalographic alpha band connectivity reveals differential Default Mode Network interactions during focused attention and open monitoring meditation. *Front Hum Neurosci.* 8(832):1-11
10. 2014 - Chella F., Marzetti L., Pizzella V., Zappasodi F., Nolte G. Third order spectral analysis robust to mixing artifacts for mapping cross-frequency interactions in EEG/MEG. *Neuroimage* 91:146-61.
11. 2013 - Larson-Prior L.J., Oostenveld R., Della Penna S., Michalareas G., Prior F., Babajani-Feremi A., Schoffelen J.M., Marzetti L., de Pasquale F., Di Pompeo F., Stout J., Woolrich M., Luo Q., Bucholz R., Fries P., Pizzella V., Romani G.L., Corbetta M., Snyder, A.Z Adding dynamics to the Human Connectome Project with MEG. *Neuroimage* 80:190-20
12. 2013 - Marzetti L., Della Penna S., Snyder A.Z., Pizzella V., Nolte G., de Pasquale F., Romani G.L., Corbetta M. Frequency specific interactions of MEG resting state activity within and across brain networks as revealed by the Multivariate Interaction Measure. *Neuroimage* 7:172-183
13. 2013 - Betti V., Della Penna S., de Pasquale F., Mantini D., Marzetti L., Romani G., Corbetta M. Natural scenes viewing alters the dynamics of functional connectivity in the human brain. *Neuron* 79 (4):782-797
14. 2012 - Ewald A., Marzetti L., Zappasodi F., Meinecke F.C., Nolte G. Estimating true brain connectivity from EEG/MEG data invariant to linear and static transformations in sensor space. *Neuroimage* 60 (1): 476-488
15. 2012 - de Pasquale F., Della Penna S., Snyder A.Z., Marzetti L., Pizzella V., Romani G.L., Corbetta M. A Cortical Core for Dynamic Integration of Functional Networks in the Resting Human Brain. *Neuron* 74:753-764
16. 2011 - Mantini D., Della Penna S., Marzetti L., de Pasquale F., Pizzella V., Corbetta M., Romani G.L. A Signal-Processing Pipeline for Magnetoencephalography Resting-State Networks. *Brain Connectivity* 1: 49-59.
17. 2010 - de Pasquale F., Della Penna S., Snyder A.Z., Lewis C., Mantini D., Marzetti L., Belardinelli P., Ciancetta L., Pizzella V., Romani G.L., Corbetta M. Temporal dynamics of spontaneous MEG activity in brain networks. *Proc Natl Acad Sci USA*, 107: 6040-6045,
18. 2009 - Nolte G., Marzetti L., Valdes Sosa P. Minimum Overlap Component Analysis (MOCA) of EEG/MEG data for more than two sources. *J Neurosci Methods* 183:72-76
19. 2008 - Marzetti L., Del Gratta C., Nolte G. Understanding brain connectivity from EEG data by identifying systems composed of interacting sources. *Neuroimage* 42:87-98
20. 2007 - Marzetti L., Nolte G., Perrucci M.G., Romani G.L., Del Gratta C. The use of standardized infinity reference in EEG coherency studies. *Neuroimage* 36:48-63, ISSN: 1053-8119.

#### *Book Chapters*

1. 2014 - Temporal and spectral signatures of the Default Mode Network. de Pasquale, F., Marzetti, L. in *Magnetoencephalography: From Signals to Dynamic Cortical Networks*, Supek and Aine Eds. ISBN: 9783642330452, pp. 451-476
2. 2014 - Methods to estimate functional and effective brain connectivity from MEG data robust to artifacts of volume conduction. Nolte, G., Marzetti, L. in *Magnetoencephalography: From Signals to Dynamic Cortical Networks*, Supek and Aine Eds. ISBN:9783642330452, pp. 477-501

#### **RESEARCH AWARDS AND FELLOWSHIPS**

2017 December	Italian Ministry of University and Research <i>Financing fund for research activities (FFABR)</i>
2013 April	19 <sup>th</sup> Annual Meeting of the Organization for Human Brain Mapping <i>Travel Award</i>
2007 June	Abruzzo region POR C3/IC4E <i>Fellowship</i>
2007 October	Joint Meeting of the 6 <sup>th</sup> International Symposium on Noninvasive Functional Source Imaging of the Brain and Heart and The International Conference on Functional Biomedical Imaging <i>Student Paper Competition Award</i>
2005 June	11 <sup>th</sup> Annual Meeting of the Organization for Human Brain Mapping <i>Travel Award</i>
2004 August	BIOMAG 2004 <i>Samuel Williamson Award</i>

#### **INVITED PRESENTATIONS**

2020 April	INDAM (National Institute for High Mathematics) workshop 2020 - Invited Speaker, postponed to 2021 due to COVID-19
2018 June	SIAM (Society for Industrial and Applied Mathematics) Conference on IMAGING SCIENCE, June 5 -8, Bologna, Italy - Invited Speaker
2018 February	Combined Annual Meeting of the Finnish Society for Medical Physics and Medical Engineering and BIOMEPP doctoral programme, Kuopio, Finland - Keynote Speaker

- 2017 September Interdisciplinary Workshop Coupling and Causality in Complex Systems - September 25-27, 2017 - Cologne, Germany - Invited speaker
- 2017 July 5<sup>th</sup> International Workshop on Neuroinformation, dedicated to neuroimaging, and focus in EEG, MEG and MRI – July 7-9, 2017 - Key Laboratory for Neuroinformation of Ministry of Education, Chengdou, China - Keynote speaker
- 2016 October 2016 Tübingen MEG Symposium - October 26-27, 2016 - Tübingen, Germany - Invited speaker
- 2013 June "Disentangling the brain web: a perspective from MEG" Symposium CiMeC, 25-26 June 2013 - Rovereto (Italy) - Invited speaker

## ORGANIZATION OF SCIENTIFIC MEETINGS

- 2020 September World Congress of the International Organization of Psychophysiology 2020, Member of Scientific Committee, Chengdu, China – postponed to 2021 due to COVID-19
- 2020 August Biomag 2020, Member of the Award Committee, Birmingham, UK – postponed to 2021 due to COVID-19
- 2020 June International Conference of Cognitive Neuroscience 2020, Member of Scientific Committee, Helsinki, Finland – postponed to 2021 due to COVID-19
- 2018 September International Society of Psychophysiology, Chair and Symposium Organizer at the annual meeting– Lucca, Italy
- 2018 August Biomag 2018, Chair and Symposium Organizer at – Philadelphia, USA
- 2017 June Human Brain Mapping (HBM) – June 25-29, 2017 - Vancouver, Canada  
Chair and Organizer of the Symposium "*Interaction of neuronal oscillations in multiple spatio-temporal scales: from methods to cognition.*"
- 2016 October 20th International Conference on Biomagnetism (BIOMAG2016), October 1-6, 2016 - Coex, Seoul, Korea.  
Chair and Organizer of the symposium: *Revealing signatures of intrinsic coupling modes by MEG: insights from new methods*
- 2015 September MEG workshop: "Disentangling the brain Web: a perspective from MEG" – September 16-18, 2015 - Chieti, Italy  
Organizer and Chair
- 2015 June Human Brain Mapping (HBM) – June 14-18, 2015 - Honolulu, Hawaii (USA)  
Chair and Organizer of the Morning Workshop "*Time is of the essence: the role of EEG and MEG in mapping the human brain*"

## EDUCATIONAL ACTIVITIES

- 2020 July Mentor in the Neuromatch Academy (<https://neuromatch.io/academy>)
- 2019 June International Summer "Body, senses and Neural Oscillations: an integrated approach to human perception and behavior - Adriatica2019", Co-organizer, Pescara, Italy
- 2019 May TMS-EEG Science Factory 2019, May 17<sup>th</sup> -21<sup>st</sup>, Aalto University School of Science, Finland - Invited Lecture
- 2018 November Helsinki University, Finland, Opponent for PhD defense of Santeri Rouinen
- 2018 July Webinar at the Biomedical Engineering Faculty of the University of Cagliari, Italy "Phase Synchronization in MEG/EEG: methodological considerations and empirical evidence", July 10, - Invited lecturer
- 2018 April Aalto University, Finland, Opponent for PhD defense of Niko Mäkelä
- 2018 May TMS-EEG Science Factory 2018, May 18 -22, Aalto University School of Science, Finland - Invited Lecturer
- 2017 July University of Electronic Science and Technology of China Summer School – July 11-15, 2017 - UESTC, Chengdou, China – Invited Lecturer
- 2017 June Human Brain Mapping (HBM) – June 25-29, 2017 - Vancouver, Canada - Speaker at the educational course: "*EEG and MEG connectivity: Basic principles, state-of-the-art methods, and emerging vistas*"
- 2009 – 2012 & 2018 – 2017 – Member of the Board of Teachers for the PhD program in Neuroscience and Imaging, UdA, Italy  
BioMEP – H2020-MSCA-COFUND-2015 Doctoral Programme Co-supervisor of 1 PhD candidate  
University of Chieti-Pescara, Italy, Supervisor of 3 PhD students and 3 PostDocs

Since 2008-2009, responsible teacher of Applied Physics in the Medical Faculty, “G. d’Annunzio” University of Chieti-Pescara (UdA)

Since 2013-2014, responsible teacher of Physics in the Engineering Faculty, UdA

Since 2020-2021, responsible teacher of Physics in the Biomedical Engineering Faculty, UdA

## RESEARCH SUPPORT AND GRANTS

### Ongoing Research Support

H2020-ERC-2018-SyG, Project Number: 810377, Imoniemi Risto (PI), September 2019 – August 2025, *ConnectToBrain*

Role: Investigator, delegate of the PI for Analysis Methods

H2020-MSCA-COFUND, Project Number: 713645, Rami Korhonen (PI) September 2016 - August 2021, *BIOMEPP*

Role: Co-supervisor in the PhD program

### Completed Research Support

Bial Foundation Grant for Scientific Research, Laura Marzetti (PI), September 2017 - August 2019 (42.000 €)

*Mindfulness Meditation Shapes Synchronization of Brain Networks for Effective Perceptual Decision Making*

Faculty Resources Grant, "G. d'Annunzio" University of Chieti-Pescara, Laura Marzetti (PI), Years 2014-2019 (~40.000 €) *Development of methods for estimating functional connectivity with Magnetoencephalography and Electroencephalography and applications*

### Participation in Other Research Projects

H2020-FETOPEN-2014-2015-RIA, Project Number:686865, Imoniemi Risto (PI), January 2016 – December 2019, *BREAKBEN - Breaking the Nonuniqueness Barrier in Electromagnetic Neuroimaging*

Role: Investigator

NIH *Human Connectome Project*, 1U54MH091657-01, Van Essen David (PI), Fall 2010 - Winter 2015

Role: Team Member

FP7-HEALTH-200728, *BrainSync*, Maurizio Corbetta (PI), Spring 2008 - Spring 2011

Role: Team Member

## COMMISSION OF TRUST

### Institutional Responsibilities

2020 – University of Chieti-Pescara Library Management Committee

2018 – Referent for Research Quality, Department of Neuroscience, Imaging and Clinical sciences, UdA, Italy

2017 – Council Member of the Institute for Advanced Biomedical Technologies, UdA, Italy

2016 – 2018 Elected member in the Council of the Department of Neuroscience, Imaging and Clinical sciences, UdA, Italy

2016 – Member of the Departmental Commission for Quality Insurance of Research Activities Department of Neuroscience, Imaging and Clinical sciences, UdA, Italy

### Grant reviewer activity

2020 - Evaluator for European Commission - H2020 Marie Skłodowska-Curie Individual Fellowships applications, evaluator for Medical Research Council (UK) research grants

2013 – NOW Netherlands Organization for Scientific Research, FWO Flanders Organization for Scientific Research

### Editor and Reviewer activity

2019 – Editor for *Computational Intelligence and Neuroscience*, Hindawi ISSN: 1687-5273

Editor for *Brain Sciences*, MDPI, ISSN: 2076-3425, dal 2019

2018 – Editor for *Brain Topography*, Springer, ISSN: 0896-0267, dal 2018

Associate Editor for *Frontiers in Neuroscience, Brain Imaging and Methods*, ISSN 1662-4548, dal 2018

2015 Guest editor for Brain Topography special issue "Controversies in EEG Source Imaging"

2004 – Ad hoc reviewer for: Cerebral Cortex, Neuroimage, Human Brain Mapping, Journal of Neuroscience Methods, Brain Topography, Brain Connectivity, Frontiers in Human Neuroscience, Frontiers in System Neuroscience, eNeuro, PlosOne, Computational Intelligence and Neuroscience, Behavioral and Brain Functions, IEEE Transactions on Biomedical Engineering, Psychology of Consciousness: Theory, Research and Practice, eNeuro

## **MEMBERSHIP IN SCIENTIFIC SOCIETIES**

2011 - 2012	Member of the Society for Neuroscience
2013	Member of the Italian Society for Bioengineering
2005 - 2006, 2013 – 2016, 2019	Member of the Organization for Human Brain Mapping
2016 - 2017	Member of the International Organization of Psychophysiology
2018 -	Member of the Italian Society for Psychophysiology