

EMANUELA FORMAGGIO

Curriculum Vitae

GENERAL DATA

Place and date of birth: Sassari, March 17th, 1980.

Phone (office): +39 0458126394

e-mail: emanuela.formaggio@univr.it

EDUCATION

July 1999: High school degree in Scientific Studies.

March 2005: Master's degree in Electronic Engineering at the University of Padua. Thesis title: "Identificazione di modelli della cinetica del cortisolo a livello d'organo"; supervisor Prof. Gianna Maria Toffolo.

June 2005: Professional qualification as engineer.

April 2010: Ph.D. in Bioengineering received from the Department of Information Engineering, University of Padua. Thesis title: "Integrating electroencephalography (EEG) and functional Magnetic Resonance Imaging (fMRI) in epilepsy"; supervisor Prof. Gianna Maria Toffolo.

PROFESSIONAL BACKGROUND AND CURRENT POSITION

- **2010-2016** research fellowship with Foundation IRCCS San Camillo Hospital, Venice, related to quantitative analyses of EEG signal in controls and in patients with cognitive and motor deficit.
- **2006-2010** research fellowship at the Department of Neurological and Movement Sciences at University of Verona, related to EEG-fMRI coregistration in patients with stroke and epilepsy.
- **06/2005-07/2005** research fellowship at the Department of Information Engineering, University of Padua, related to mathematical model implementation for biomedical application.

MAIN SCIENTIFIC INTERESTS

- Evaluation of EEG brain oscillatory activity during robot-assisted hand performance in stroke patients.
- Study of EEG modification induced by transcranial magnetic stimulation (TMS) in controls, in unresponsive wakefulness syndrome and minimally conscious state patients.
- Evaluation of electrical (EEG) and hemodynamic (fMRI) activity during active and passive movements, motor imagery and electrical stimulation.
- High density EEG source localization for presurgical evaluation in patients with epilepsy.

- Intraoperative electrocorticography (ECoG) analysis during awake brain stimulation.
- EEG analysis during hyperbaric oxygen breathing in professional divers.

LANGUAGE SKILLS

Italian, mother language.

English, good written and spoken.

COMPUTER SKILLS

Operative Systems: Windows

Software: LabVIEW (Evaluation), SPICE, SAAM 2, SPSS.

Software for fMRI images processing: BRAIN VOYAGER, SPM, MRIcro.

Software for EEG data processing: EEGLAB, BRAIN VISION ANALYZER, Micromed System Plus, Econnectome.

Programming languages: JAVA and MATLAB

Acquisition software EEG-fMRI: Micromed System Plus

Acquisition software MRI, fMRI: Syngo; MAGNETOM Symphony 1.5T e MAGNETOM Allegra 3T (Siemens)

REFEREE ACTIVITY

She is reviewer for the following peer-reviewed journals:

- Neuroimage
- Behavioural and Brain Research
- Neuroscience Letters
- Medical & Biological Engineering & Computing
- Journal of Neurology, Neurosurgery, and Psychiatry
- IEEE Transactions on Biomedical Engineering
- Journal of Neuroengineering and Rehabilitation
- PLoS One
- Artificial Intelligence in Medicine
- Brain Topography
- Clinical EEG and Neuroscience
- Guest Associate editor for Frontiers, research topic "The role of neuroimaging in the pre-surgical evaluation of the epileptic patient", Frontiers in Neurology, Epilepsy.

For the conference:

- 19th European Signal Processing Conference 2011 (EUSIPCO 2011)

THESIS ADVISOR

Since 2007 she has been co-advisor of 6 students in Bioengineering Master's degree, University of Padua; 4 students in Health Professions of Rehabilitation Sciences Master's degree, University of Verona; 2 post-graduate students (European Social Fund), University of Verona.

SCHOOLS AND WORKSHOP

- XXIII annual school *Metodi avanzati di Elaborazione dei segnali biomedici*, National Bioengineering Group, September 20-23, 2004 Bressanone (BZ), Italy.
- XXV annual school *Neuro-Robotica: neuroscienze e robotica per lo sviluppo di macchine intelligenti*, National Bioengineering Group, September 25-29, 2006 Bressanone (BZ), Italy.
- *EEG-fMRI User Meeting*, Micromed s.r.l, October 26-27, 2006 Mogliano Veneto (TV), Italy.
- XXVI annual school *Genomica e Proteomica computazionale*, National Bioengineering Group, September 24-28, 2007, Bressanone (BZ), Italy.
- International Workshop: *Dense Array EEG and Epilepsy*, 26 January 2008 Policlinico G.B. Rossi, Verona, Italy.
- Graduate course in *Le epilessie temporali: processo diagnostico-terapeutico e nuovi criteri classificativi*, 16 February 2008, Policlinico G.B. Rossi, Verona, Italy.
- Graduate course in *Neuroimaging*, 11 April 2008, Limena (PD), Italy.
- Graduate course in *Image Registration- 2D, 3D, Rigid and Deformable Scenes*, April-2 May 2008, Verona, Italy.
- Workshop: *Coregistration EEG-fMRI and Epilepsy*, Policlinico G.B. Rossi, 30 May 2008, Verona, Italy.
- Workshop: *Brain Computer Interface durante International Conference on Simulation, Modeling and Programming for Autonomous Robots (SIMPAN 2008)*, 4 November 2008, Venezia, Italy.
- Graduate course "*Introduzione ad un ambiente per il calcolo scientifico*", Verona, 13-22 January 2009.
- XXVIII annual school *Bioingegneria per le neuroscienze cognitive*, National Bioengineering Group, September 7-11, 2009 Bressanone (BZ), Italy.
- Workshop: *Co-registrazioni EEG-fMRI nelle epilessie: applicazioni cliniche ed in ambito di ricerca*, 19 February 2010, Modena, Italy.
- Graduate course "*Motor learning and Re-learning: esercizio, immaginazione e motivazione*", 30 June – 1 July 2011, Ancona, Italy.
- International workshop: "*Multimodal Brain Imaging in Epilepsy*", Policlinico G.B. Rossi, 23 March 2012, Verona, Italy.
- Workshop: "*Giornata di Studio sull'Epilessia. Le epilessie dei lobi parietale ed occipitale: processo diagnostico-terapeutico e criteri classificativi*", Policlinico G.B. Rossi, 24 March 2012, Verona, Italy.
- International workshop "*Brain connectivity in epilepsy and sleep*", 21 November 2013, Modena, Italy.

CONFERENCES

- 12th Annual Meeting Human Brain Mapping, June 11-15, 2006, Florence, Italy.
- 37th National Congress of Italian Neurological Society (SIN), October 14-18, 2006, Bari, Italy.
- 38th National Congress of Italian Neurological Society (SIN), October 13-17, 2007, Florence, Italy.
- 8th National Congress of SIAMOC, October 24-27, 2007, Cuneo, Italy.
- 13th European Congress of Clinical Neurophysiology, May 4-8, 2008, Istanbul.
- National Congress of Italian Clinical Neurophysiology Society (SINC), May 15-17, 2008, Venice, Italy.
- 1st National Congress of Bioengineering, July 3-5, 2008, Pisa, Italy.
- 15th Annual Meeting Human Brain Mapping, June 18-23, 2009, San Francisco, CA, USA.
- 2nd National Congress of Bioengineering, July 8-10, 2010, Torino, Italy.
- 14th European Congress of Clinical Neurophysiology and 4th International Conference on Transcranial Magnetic and Direct Current Stimulation, June 21-25, 2011, Rome, Italy.
- 29th International Epilepsy Congress, August 28 – September 1, 2011, Rome, Italy.
- 3^o International Congress of Addiction: new evidences from Neuroimaging and Brain Stimulation, November 13, 2012, Verona, Italy.
- 19th Annual Meeting Human Brain Mapping, June 16-20, 2013, Seattle, WA, USA.

INVITED LECTURES AND TALKS

- Electrical stimulation in EEG-fMRI studies: Technical issues and solutions. EEG-fMRI User Meeting, Micromed, 26 October 2006, Mogliano Veneto (TV), Italy.
- BOLD activation during electrical stimulation of median nerve in normal and presurgical evaluation. Workshop: "Coregistration EEG-fMRI and Epilepsy", Policlinico G.B. Rossi, 30 May 2008, Verona, Italy.
- Integrating EEG and fMRI in epilepsy. 5 April 2011, Department of Computer Science, University of Verona, Verona, Italy.
- L'integrazione fRMN-EEG. 8th C.I.R.M.A.N.M.E.C Meeting "Trapianti d'organo e Neuroscienze riabilitative", 13 May 2011, Venice, Italy
- Coregistrazione EEG-fMRI nell'analisi del movimento. II Graduate course in Neurological Rehabilitation "Motor learning and Re-learning: esercizio, immaginazione e motivazione"., 30 June – 1 July 2011, Ancona, Italy.
- Imaging multimodale. "Risonanza magnetica ad alto campo: applicazioni e prospettive cliniche". Auditorium Centro Servizi Sanitari, 9 November 2012, Trento, Italy.
- Evidenze di plasticità neurale dopo training con strumenti tecnologici. 7th National Congress SIRAS: Ricerca, innovazione e nuove tecnologie in riabilitazione. November 14-16, 2013, Rome, Italy
- Le interfacce corpo-macchina per il miglioramento dell'efficacia dell'esercizio fisioterapico. 14th National Congress of Italian Neurological Society, May 8-10, 2014, Genova, Italy.

AWARDS

- Oral presentation award at the 13th European Congress of Clinical Neurophysiology, with the following presentation: 'Continuous EEG-fMRI study in patients with partial epilepsy and focal interictal slow-rate discharges on EEG' May 9, 2008, Istanbul, Turkey. M. Avesani, E. Formaggio, S.F. Storti, F. Milanese, A. Gasparini, A. Baraldo, R. Cerini, L.G. Bongiovanni, R. Pozzi Mucelli, A. Fiaschi, P. Manganotti.
- Winner of the "Patron editor" - 2010 award for the PhD thesis: "Integrating electroencephalography (EEG) and functional magnetic resonance imaging (fMRI) in epilepsy".

OTHER ACTIVITIES

1988-1993: swimming with Rovigonuoto.

1993-2004: athletics with Assindustria Sport Padova.

2008-2013: swimming (master) with Rovigonuoto. XII European Masters Championships, Cadiz (Spain)

2009. 14th World Master Championships, Riccione (Italy) 2012.

JOURNALS PUBLICATIONS

1. Avesani M., Milanese F., Formaggio E., Gasparini A., Cerini R., Bongiovanni L.G., Pozzi Mucelli R., Fiaschi A., Manganotti P. Continuous EEG-fMRI in presurgical evaluation of a patient affected by symptomatic seizures: BOLD activation linked to interictal epileptic discharges caused by cavernoma. ***The Neuroradiology Journal***, 21(2): 183-191, April 2008.
2. Avesani M., Formaggio E., Storti S., Alessandrini F., Bongiovanni L.G., Cordioli C., Beltramello A., Fiaschi A., Manganotti P.. fMRI in epilepsy with spike and wave activity evoked by eye closure: different BOLD activation in a patient with idiopathic partial epilepsy with occipital spikes and a control group. ***The Neuroradiology Journal***, 21(2): 159-165, April 2008.
3. Avesani M., Formaggio E., Fuggetta G., Fiaschi A., Manganotti P. Corticospinal excitability in human subjects during nonrapid eye movement sleep: single and paired-pulse transcranial magnetic stimulation study. ***Experimental Brain Research***, 187(1): 17-23, May 2008.
4. Manganotti P., Avesani M., Formaggio E., Milanese F., Gasparini A., Cerini R., Bongiovanni L.G., Pozzi Mucelli R., Fiaschi A. Continuous EEG-fMRI study in patients with partial epilepsy and focal interictal slow-wave discharges on EEG. ***Magnetic Resonance Imaging***, 26(8): 1089-100, Jun 2008.

5. Formaggio E., Storti S.F., Avesani M., Cerini R., Milanese F., Gasparini A., Accler M., Pozzi Mucelli R., Fiaschi A., Manganotti P. *EEG and fMRI coregistration to investigate the cortical oscillatory activities during finger movement*. **Brain Topography**, 21(2):100-111, 2008.
6. Formaggio E., Avesani M., Storti S.F., Cerini R., Milanese F., Gasparini A., Accler M., Pozzi Mucelli R., Fiaschi A., Manganotti P. *Effect of a magnetic field (1.5T) on brain oscillatory activities*. **The Neuroradiology Journal**, 21(5): 629-635, 2008.
7. Del Felice A., Zanoni T., Avesani M., Formaggio E., Storti S., Fiaschi A., Moretto G., Manganotti P. *EEG-fMRI coregistration in non-ketotic hyperglycemic occipital seizures*. **Epilepsy Research**, 85(2-3): 321-4, 2009.
8. Manganotti P., Formaggio E., Avesani M., Storti S.F., Accler M., Sala F., Magon S., Zoccatelli G., Pizzini F., Alessandrini F., Fiaschi A., Beltramello A. *Steady state activation in somatosensory cortex after changes in stimulus rate during median nerve stimulation*. **Magnetic Resonance Imaging**, 27(9): 1175-86, 2009.
9. Storti S.F., Formaggio E., Beltramello A., Fiaschi A., Manganotti P. *Wavelet analysis as a tool for investigating movement-related cortical oscillations in EEG-fMRI coregistration*. **Brain Topography**, 23(1): 46-57, 2010.
10. Manganotti P., Accler M., Formaggio E., Avesani M., Milanese F., Baraldo A., Storti S.F., Gasparini A., Cerini R., Pozzi Mucelli R., Fiaschi A. *Changes in cerebral activity after decreased upper-limb hypertonus: an EEG-fMRI study*. **Magnetic Resonance Imaging**, in press.
11. Piccione F., Cavinato M., Manganotti P., Formaggio E., Storti S., Battistin L., Cagnin A., Tonin P., Dam M. *Behavioural and neurophysiological effects of repetitive transcranial magnetic stimulation (rTMS) on minimally conscious state: a case study*, **Neurorehabilitation and Neural Repair**, 2010, in Press.
12. Formaggio E., Storti S.F., Cerini R., Fiaschi A., Manganotti P. *Brain oscillatory activity during motor imagery in EEG-fMRI coregistration*. **Magnetic Resonance Imaging**, 28(10): 1403-1412, 2010.
13. Borelli P., Avesani M., Formaggio E., Storti S.F., Zanoni T., Moretto G., Fiaschi A., Cerini R., Manganotti P. *EEG-fMRI as an useful tool to detect epileptic foci associated with secondary bilateral synchrony*. **Seizure - European Journal of Epilepsy**, 19 (9): 605-608, 2010.
14. Formaggio E., Storti S.F., Bertoldo A., Manganotti P., Fiaschi A., Toffolo G.M. *Integrating EEG and fMRI in epilepsy*. **Neuroimage**, 54(4): 2719-2713, 2011.
15. Manganotti P., Brigo F., Zoccatelli G., Alessandrini F., Pizzini F.B., Beltramello A., Storti S., Formaggio E., Fiaschi A., Bongiovanni L.G. *Highly focal BOLD activation on functional MRI in a*

- patient with progressive myoclonic epilepsy and diffuse giant somatosensory evoked potentials, **Epilepsy & Behavior**, 20(3): 579-582, 2011.*
16. Manganotti* P., Storti* S.F., Formaggio E., Acler M., Zoccatelli G., Pizzini F.B., Alessandrini F., Bertoldo A., Toffolo G.M., Bovi P., Beltramello A., Moretto G., Fiaschi A. *These authors equally contributed to this work. *Effect of median-nerve electrical stimulation on BOLD activity in acute ischemic stroke patients. **Clinical Neurophysiology**, 123(1): 142-153, 2012.*
 17. Del Felice A., Formaggio E., Storti S.F., Fiaschi A., Manganotti P. *The gating role of the thalamus to protect sleep: An f-MRI report. **Sleep Med**, 13(4): 447-9, 2012.*
 18. Manganotti P., Formaggio E., Storti S.F., De Massari D., Zamboni A., Bertoldo A., Fiaschi A., Toffolo G.M. *Time-frequency analysis of short-lasting modulation of EEG induced by intracortical and transcallosal paired TMS over motor areas. **Journal of Neurophysiology**, 107: 2475-2484, 2012.*
 19. Storti S.F., Formaggio E., Franchini E., Bongiovanni L.G., Cerini R., Fiaschi A., Michel C.M., Manganotti P. *A multimodal imaging approach to the evaluation of post-traumatic epilepsy. **Magn Reson Mater Phy**, 25: 345-360, 2012.*
 20. Formaggio E., Storti S.F., Tramontano V., Casarin A., Bertoldo A., Fiaschi A., Talacchi A., Sala F., Toffolo G.M., Manganotti P. *Frequency and time-frequency analysis of intraoperative ECoG during awake brain stimulation. **Front Neuroeng**, 2013; 6:1. doi: 10.3389/fneng.2013.00001. 2013 Feb 25.*
 21. Formaggio E., Storti S.F., Boscolo Galazzo I., Gandolfi M., Geroin C., Smania N., Spezia L., Waldner A., Fiaschi A., Manganotti P. *Modulation of event-related desynchronization in robot-assisted hand performance: brain oscillatory changes in active, passive and imagined movements. **J Neuroeng Rehabil**, 10(1):24, 2013. doi: 10.1186/1743-0003-10-24.*
 22. Storti S.F., Formaggio E., Nordio R., Manganotti P., Fiaschi A., Bertoldo A., Toffolo G.M. *Automatic selection of resting-state networks with functional magnetic resonance imaging. **Front Neurosci**, 2013;7:72. doi: 10.3389/fnins.2013.00072.*
 23. Storti S.F., Boscolo Galazzo I., Del Felice A., Pizzini F.B., Arcaro C., Formaggio E., Mai R., Manganotti P. *Combining ESI, ASL and PET for quantitative assessment of drug-resistant focal epilepsy. **Neuroimage** 2013. doi:pII: S1053-8119(13)00665-4. 10.1016/j.neuroimage.2013.06.028.*
 24. Storti S.F., Formaggio E., Bertoldo A., Manganotti P., Fiaschi A., Toffolo G.M. *Modelling hemodynamic response function in epilepsy. **Clin Neurophysiol**, 124(11):2108-18, 2013.*

25. Manganotti P., Formaggio E., Storti S.F., Fiaschi A., Battistin L., Tonin P., Piccione F., Cavinato M. *Effect of High-Frequency Repetitive Transcranial Magnetic Stimulation on Brain Excitability in Severely Brain-Injured Patients in Minimally Conscious or Vegetative State.* **Brain Stimul**, 6:913-921, 2013.
26. Boscolo Galazzo I., Storti S.F., Formaggio E., Pizzini F.B., Fiaschi A., Beltramello A., Bertoldo A., Manganotti P. *Investigation of brain hemodynamic changes induced by active and passive movements: a combined arterial spin labeling – BOLD fMRI study.* **J of Magn Reson Imag**, 2013, in press.
27. Manganotti P., Formaggio E., Del Felice A., Storti S.F., Zamboni A., Bertoldo A., Fiaschi A., Toffolo G.M. *Time-frequency analysis of short-lasting modulation of EEG induced by TMS during wake, sleep deprivation and sleep.* **Front Hum Neurosci**, 2013; 7:767. doi: 10.3389/fnhum.2013.00767.
28. Storti S.F., Formaggio E., Moretto D., Bertoldo A., Pizzini F.B., Beltramello A., Fiaschi A., Toffolo G.M., Manganotti P. *Effect of voluntary repetitive long-lasting muscle contraction activity on the BOLD signal as assessed by optimal hemodynamic response function.* **Magn Reson Mater Phy**, 27(2):171-184, 2014.
29. Formaggio E., Storti S.F., Boscolo Galazzo I., Bongiovanni L.G., Cerini R., Fiaschi A., Manganotti P. *Reproducibility of EEG-fMRI Results in a Patient With Fixation-Off Sensitivity.* **Clin EEG Neurosci**, 2014; 45(3):212-217.
30. Storti S.F., Del Felice A., Formaggio E., Boscolo Galazzo I., Bongiovanni L.G., Cerini R., Fiaschi A., Manganotti P. *Spatial and Temporal EEG-fMRI Changes During Preictal and Postictal Phases in a Patient With Posttraumatic Epilepsy.* **Clin EEG Neurosci**, 2014; doi: 10.1177/1550059414523960.
31. Formaggio E., Storti S.F., Boscolo Galazzo I., Gandolfi M., Geroin C., Smania N., Fiaschi A., Manganotti P. *Time-Frequency Modulation of ERD and EEG Coherence in Robot-Assisted Hand Performance.* **Brain Topography**, DOI: 10.1007/s10548-014-0372-8.
32. Gandolfi M., Formaggio E., Geroin C., Storti S.F., Boscolo Galazzo I, Waldner A., Manganotti P., Smania N. *Electroencephalographic Changes of Brain Oscillatory Activity After Upper Limb Somatic Sensation Training in a Patient With Somatosensory Deficit After Stroke.* **Clin EEG Neurosci**, 2014; DOI: 10.1177/1550059414536895.
33. Patena L., Formaggio E., Storti S.F., Faralli F., Melucci M., Gagliardi R., Ricciardi L., Ruffino G. *Tracking EEG changes during exposure to hyperbaric oxygen.* **Clin Neurophysiol**, 2014, DOI: 10.1016/j.clinph.2014.05.013.
34. Cavinato M., Genna C., Manganotti P., Formaggio E., Storti S.F., Campostrini S., Arcaro C., Casanova E., Petrone V., Piperno R., Piccione F. *Coherence and Consciousness: Study of Fronto-*

Parietal Gamma Synchrony in Patients with Disorders of Consciousness. **Brain Topogr**, 2014,
DOI: 10.1007/s10548-014-0383-5.

CHAPTER IN BOOK

- Bertoldo A., Formaggio E., Storti S.F., Costruzione e analisi delle mappe di attivazione e risposta funzionale, " Bioingegneria per le Neuroscienze Cognitive". Pàtron, Bologna, 2009, pag. 113.

In riferimento al D.lsg 196/03 "Codice in materia di protezione dei dati personali", autorizzo il trattamento dei miei dati personali e professionali per esigenze di selezione e comunicazione.

Verona, August 05, 2014

Emanuela Formaggio