

**Prof. Roberto Merletti, Ph.D.****Curriculum Vitae, November 2022****Personal data**

Name	Roberto Merletti
Place and date of birth	Torino, March 6 1945
Citizenship	Italian
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Office Address	Dip.to di Elettronica e Telecom., Politecnico di Torino Corso Duca degli Abruzzi 24, Torino, 10129, Italy Institutional e-mail: roberto.merletti@formerfaculty.polito.it Personal e-mail: roberto@robertomerletti.it (preferred) URL: www.robertomerletti.it
Last position	Full Professor of Biomedical Engineering at the Dept. of Electronics, Politecnico di Torino, Italy (retired Nov 2015). Director of the Lab. for Engineering of the Neuromuscular System (LISiN), Politecnico di Torino, Italy (retired Nov 2015).

**University Education**

- 1968 Politecnico di Torino “Laurea” in Electronic Engineering
- 1970 The Ohio State University, Columbus, Ohio, U.S.A. Master of Science
- 1972 The Ohio State University, Columbus, Ohio, U.S.A., Doctoral Degree (PhD)

**Main teaching activities**

- 1997 - 2015 Director of the Laboratory for Engineering of the Neuromuscular System. Teaching of doctoral courses.
- 2005 -2015 Full Professor of Biomedical Engineering at the Dept of Electronics, Politecnico di Torino, Italy. Teaching of “Biomedical Instrumentation”, “Engineering of the Neuromuscular System”, “Rehabilitation Engineering”.
- 1984 - 2005 Associate Professor of Biomedical Engineering at the Dept of Electronics, Politechnic of Torino, Italy
- 1989 - 1994 Associate Professor of “Biomedical Instrumentation” and of “Biomedical Signal Processing” Department of Biomedical Eng., Boston University, USA
- 1979 - 1984 Assistant Professor of "Biomedical Instrumentation", Politecnico di Torino

## Main activities in research and industry

- 2000 - 2016 Supervisor of 10 PhD fellows (Brasil, Cina, Indonesia, Iran, Italy, Pakistan)
- 1997 - 2015 Director of the Laboratory for Engineering of the Neuromuscular System.
- 2008 - 2012 Coordinator of the Project “Technologies for Anal Sphincter analysis and Incontinence” (TASI), Compagnia di San Paolo, Torino
- 2005 - 2008
- a) Coordinator of the Marie Curie Project “Decomposition of multichannel surface electromyograms” (DEMUSE)
  - b) Partner of the European project “Cybernetic Manufacturing Systems” (CyberManS),
  - c) Coordinator of the ESA Project “Microgravity Effects on Skeletal Muscles”
  - d) Partner of the ASI Project “Osteoporosis and Muscle atrophy” (OSMA)
- 2005 - 2007 Coordinator of National Project (PRIN) “Study of Muscular and Adrenocortical Responses to Training”
- 2001 - 2004
- a) Coordinator of the European project “Neuromuscular Assessment of the Elderly worker” (NEW, 2001-2004)
  - b) Partner of the European project “On Asymmetry In Sphincters” (OASIS)
- 1997 - 2000 Partner and Member of the Management Committee of the European Concerted action “Surface Electromyography for Non Invasive EMG” (SENIAM).
- 1998 - 2001 Partner and Member of the Management Committee of the European Concerted action PROCID
- 1989 - 1994 Research activity at the Neuromuscular Research Center of Boston University (USA)
- 1973 - 1979 Research activity at the company "Sorin Biomedica" in the fields of cardiac and neuromuscular stimulation

## Services to the Scientific Community

Associate Editor of Journal of Electromyography and Kinesiology.

Member of the Editorial Board of Biomedical signal processing and control

Former member of the Editorial Board of IEEE Transactions on Biomedical Engineering.

Former member of the Editorial Board of European J. of Applied Physiology

Former member of the Editorial Board of Physiological Measurement

Guest Editor of a Special Issue of Medical Engineering and Physics (July 1999)

Guest Editor of a Special Issue of Journal of Electromyography and Kinesiology (October 2000)

Guest Editor of a Special Issue of Physiological Measurement (2009)

President of the Congress of Biomedical Engineering in Exercise and Sport (Torino, 2006)

President of the Congress of the International Society for Electrophysiology and Kinesiology (June 2006)

## Recognitions and Honors:

Senior Member of The Institute of Electrical and Electronic Engineers (IEEE)  
 Fellow of the Intern. Society for Electromyography and Kinesiology (ISEK)  
 Corresponding Member of the Slovenian Academy of Sciences and Arts (SASA)

## Summary of publications

Books	4
Chapters in international books	5
Chapters in national books	7
Publications in peer-reviewed international journals	>180
Publications on National Journals	30
Publications in Proceedings of Intern. Congresses	>150
Publications in Proceedings of National. Congresses	20

## Patents

Four patents registered by Politecnico di Torino

## Publications: Books and Chapters of Books

1. Hermens H., Freriks B, Merletti R., Stegeman D., Blok J., Rau G., Disselhorst-Klug C., Hagg G., European Recommendations for Surface Electromyography, RRD publish. ISBN 90-75452-15-2, 1999.
2. Hermens H., Freriks B, Merletti R., Stegeman D., Blok J., Rau G., Disselhorst-Klug C., Hagg G., Raccomandazioni Europee per l'Elettromiografia di Superficie, Edizione italiana a cura di R. Merletti, Coop. Lib. Univ. Torinese (CLUT), ISBN 88-7992-1525, 2000
3. Merletti (editor) , Elementi di elettromiografia di superficie, Coop. Lib. Univ. Torinese (CLUT), ISBN 88-7922-153-3, 2000
4. Pozzo M., Farina D., Merletti R., Electromyography: detection, processing and applications, in: Handbook of biomedical technology and devices, J. E. Moore (ed.), CRC Press, 2003
5. Farina D., Filligoi G.C., Merletti R., Analisi di segnali EMG di superficie per lo studio del controllo motorio. In "Bioingegneria della postura e del movimento" Cappello A., Cappozzo A., di Prampero P.E. (Eds.), Patron Editore (Pub.), pp. 281-306, 2003
6. Merletti R., Medicina del lavoro: valutazioni tramite EMG di superficie. In "Bioingegneria della postura e del movimento" Cappello A., Cappozzo A., di Prampero P.E. (Eds.), Patron Editore (Pub.), pp. 495-510, 2003

7. Merletti R., Marchetti M., Contardo V., Veronica M., Applicazioni dell'EMG di superficie in riabilitazione sportiva, cap. 4.7 del testo "La Spalla e lo Sport", Masson,
8. Merletti R., Parker P.A. (edts.), Electromyography: Physiology, engineering and non invasive applications, IEEE Press / J Wiley, USA, 2004
9. Rainoldi A., Minetto M., Merletti R. (edtrs), Biomedical Engineering in exercise and sports Edizioni Minerva Medica, Torino 2006, Italy
10. Barbero R., Rainoldi A, Merletti R. Atlas of muscle innervation zones: understanding surface EMG and its applications, Springer, Italy 2012
11. Merletti R., Pelvic floor EMG: principles, technique and applications, Ch 7 of “ Childbirth related pelvic floor dysfunctions”, Springer, 2016.
12. Merletti R, Farina D. (edts) Surface Electromyography: physiology, engineering and applications, IEEE Press / J Wiley, USA, May 2016
13. Merletti R., Campanini I., Rymer W.Z., Disselhorst-Klug C., (editors), Surface electromyography: barriers limiting widespread use of sEMG in clinical assessment and neurorehabilitation. Open Access E-book. Frontiers in neurology/Neurorehabilitation, doi: 10.3389/978-2-88966-616-4

### **Main recent publications on peer reviewed international journals (2010-2022).**

1. Vieira T., Windhorst U., Merletti R., Is the stabilization of quiet upright stance in humans driven by synchronized and similar modulations of the activity of medial and lateral gastrocnemius muscles? .J. Appl. Physiol. 2010; 108: 85-97
2. Enck P, Franz H, Davico E, Mastrangelo F, Mesin L, Merletti R., Repeatability of Innervation Zone Identification in the External Anal Sphincter Muscle, NeuroUrol. and Urodynamics, 2010; 29: 449-457.
3. Mesin L., Merlo E., Merletti R., Orizio C., Investigation of motor unit recruitment during stimulated contractions of tibialis anterior muscle, J. Electromyogr. Kinesiol. 2010;20:580-589.
4. Vieira TMM, Merletti R, Mesin L. Automatic segmentation of surface EMG images: Improving the estimation of neuromuscular activity. J. Biomech. 2010;43:2149-2158.
5. Farina D., Holobar A., Merletti R., Enoka R., Decoding the neural drive to muscles from the surface electromyogram, Clinical neurophysiology, 2010 , (doi; 10.1016. 2009.10040, ahead of print).
6. Merletti R. The electrode-skin interface and optimal detection of bioelectric signals. Physiol. Meas. 2010;31:3.

7. Merletti R, Aventaggiato M, Botter A, Holobar A, Marateb HR, Vieira TMM. Advances in surface EMG: recent progress in detection and processing techniques. *Crit. Rev. Biomed. Eng.* 2010;38:305-345.
8. Merletti R, Botter A, Cescon C, Minetto MA, Vieira TMM. Advances in surface EMG: recent progress in clinical research applications. *Crit. Rev. Biomed. Eng.* 2010;38:347-379.
9. Barbero M, Gatti R, Lo Conte L, Macmillan F, Coutts F, Merletti R. Reliability of surface EMG matrix in locating the innervation zone of upper trapezius muscle. *J. Electromyogr. Kinesiol.* 2011;21:827-833.
10. Cescon C, Mesin L, Nowakowski M, Merletti R. Geometry assessment of anal sphincter muscle based on monopolar multichannel surface EMG signals. *J. Electromyogr. Kinesiol.* 2011;21:394-401.
11. Gallina A, Merletti R, Vieira TMM. Are the myoelectric manifestations of fatigue distributed regionally in the human medial gastrocnemius muscle? *J. Electromyogr. Kinesiol.* 2011;21:929-938.
12. Marateb HR, McGill KC, Holobar A, Lateva ZC, Mansourian M, Merletti R. Accuracy assessment of CKC high-density surface EMG decomposition in biceps femoris muscle. *J. Neural Eng.* 2011;8:066002.
13. Marateb HR, Muceli S, McGill KC, Merletti R, Farina D. Robust decomposition of single-channel intramuscular EMG signals at low force levels. *J. Neural Eng.* 2011;8:066015.
14. Merletti R, Botter A, Lanfranco F, Minetto MA. Spinal involvement and muscle cramps in electrically elicited muscle contractions. *Artif. Organs.* 2011;35:221-225.
15. Mesin L, Merletti R, Vieira TMM. Insights gained into the interpretation of surface electromyograms from the gastrocnemius muscles: A simulation study. *J. Biomech.* 2011;44:1096-1103.
16. Vieira TMM, Loram ID, Muceli S, Merletti R, Farina D. Postural activation of the human medial gastrocnemius muscle: are the muscle units spatially localised? *J. Physiol.* 2011;589:431-443.
17. Piitulainen H, Botter A, Merletti R, Avela J. Muscle fiber conduction velocity is more affected after eccentric than concentric exercise. *Eur. J. Appl. Physiol.* 2011;111:261-273.
18. Vieira TMM, Loram ID, Muceli S, Merletti R, Farina D. Recruitment of motor units in the medial gastrocnemius muscle during human quiet standing: is recruitment intermittent? What triggers recruitment? *J. Neurophysiol.* 2012;107:666-676.
19. Marateb HR, Rojas-Martínez M, Mansourian M, Merletti R, Villanueva MA. Outlier detection in high-density surface electromyographic signals. *Med. Biol. Eng. Comput.* 2012;50:79-89.

20. Watanabe K, Kouzaki M, Merletti R, Fujibayashi M, Moritani T. Spatial EMG potential distribution pattern of vastus lateralis muscle during isometric knee extension in young and elderly men. *J. Electromyogr. Kinesiol.* 2012;22:74-9.
21. Bonfiglioli R, Botter A, Calabrese M, Mussoni P, Violante FS, Merletti R. Surface electromyography features in manual workers affected by carpal tunnel syndrome. *Muscle Nerve.* 2012;45:873-82.
22. Barone U, Merletti R. Design of a portable, intrinsically safe multichannel acquisition system for high-resolution, real-time processing HD-sEMG. *IEEE Trans Biomed Eng.* 2013;60:2242-52.
23. Baudry S, Lanfranco F, Merletti R, Duchateau J, Minetto MA. Effects of Short-Term Dexamethasone Administration on Corticospinal Excitability. *Med Sci Sports Exerc.* 2013 Sep 18. [Epub ahead of print]
24. Botter A, Vieira TM, Loram ID, Merletti R, Hodson-Tole EF. A novel system of electrodes transparent to ultrasound for simultaneous detection of myoelectric activity and B-mode ultrasound images of skeletal muscles. *J Appl Physiol.* 2013;115:1203-14.
25. Gallina A, Merletti R, Gazzoni M. Uneven spatial distribution of surface EMG: what does it mean? *Eur J Appl Physiol.* 2013;113:887-94.
26. Gallina A, Ritzel CH, Merletti R, Vieira TM. Do surface electromyograms provide physiological estimates of conduction velocity from the medial gastrocnemius muscle? *J Electromyogr Kinesiol.* 2013;23:319-25.
27. Piitulainen H, Botter A, Merletti R, Avela J. Multi-channel electromyography during maximal isometric and dynamic contractions. *J Electromyogr Kinesiol.* 2013;23:302-10.
28. Rojas-Martínez M, Mañanas MA, Alonso JF, Merletti R. Identification of isometric contractions based on High Density EMG maps. *J Electromyogr Kinesiol.* 2013 ;23:33-42.
29. Watanabe K, Gazzoni M, Holobar A, Miyamoto T, Fukuda K, Merletti R, Moritani T. Motor unit firing pattern of vastus lateralis muscle in type 2 diabetes mellitus patients. *Muscle Nerve.* 2013;48:806-13.
30. C. Cescon, E. E. Raimondi, V. Začest, K. Drusany-Starič, K. Martsidis, R. Merletti Characterization of the motor units of the external anal sphincter in pregnant women with multichannel surface EMG, *Int. Urogynecol. Journ.* 2014; 25:1097–1103
31. C. Cescon, D. Riva, V. Začesta, K. Drusany-Starič, K. Martsidis, O. Protsepko, K. Baessler, R. Merletti, Effect of vaginal delivery on the external anal sphincter muscle innervation pattern evaluated by multichannel surface EMG: results of the multicentre study TASI-2, *Int. Urogynecol Journ.* 2014; 25:1491–1499
32. Farina D, Merletti R, Enoka RM. The extraction of neural strategies from the surface EMG: an update. *J Appl Physiol* (1985). 2014 Dec 1;117(11):1215-1230.
33. Piervirgili G, Petracca F, Merletti R. A new method to assess skin treatments for lowering the

- impedance and noise of individual gelled Ag-AgCl electrodes. *Physiol. Meas.* 2014;35:2101-2118.
34. Ullah K, Cescon C, Afsharipour B, Merletti R. Automatic detection of motor unit innervation zones of the external anal sphincter by multichannel surface EMG. *J Electromyogr Kinesiol.* 2014;6:860-867.
  35. Li X, Holobar A, Gazzoni M, Merletti R, Rymer W, Zhou P. Examination of Post-stroke Alteration in Motor Unit Firing Behavior Using High Density Surface EMG Decomposition. *IEEE Trans Biomed Eng.* 2015;62:1242-1252.
  36. Afsharipour B., Ullah K., Merletti R., Amplitude indicators and spatial aliasing in high density surface electromyography recordings, *Biomed. Signal Proc. and Control*, 2015; 22: 170-179.
  37. Afsharipour B, Petracca F, Gasparini M, Merletti R. Spatial distribution of surface EMG on trapezius and lumbar muscles of violin and cello players in single note playing. *J Electromyogr Kinesiol.* 2016; 31: 144-153. 10.1016/j.jelekin.2016.10.003.
  38. Cattarello P., Merletti R., Petracca F., Analysis of High Density Surface EMG and finger pressure in the left forearm of violin players. *Medical Problems of Performing Artists (MPPA)* Sept. 2017, doi.org/10.21091/mppa.2017.3023
  39. Cattarello P., Vinelli S., D'Emanuele S., Gazzoni M., Merletti R., Comparison of chairs based on HDsEMG of back muscles, biomechanical and comfort indices, for violin and viola players: A short term study. *J Electromyogr Kinesiol.* 2018; 42: 92-103.
  40. Afsharipour B., Soedirdjo S., R. Merletti, Two-dimensional surface EMG: The effects of electrode size, interelectrode distance and image truncation. *Biomedical Signal Processing and Control* (2019) 49, 298–307
  41. Besomi M., Hodges A., Van Dieën J., Carson RG., Clancy E., Disselhorst-Klug C., Holobar A. Hug F., Kiernank M., Lowery M., McGill K., Merletti R., Perreault E., Sogaard K., Tucker K., Besiert T., Enoka R., Falla D., Farina D., Gandevia S., Rothwell JC., Vicenzino B., Wrigley T. Consensus for experimental design in electromyography (CEDE) project: electrode selection matrix. *Journal of Electromyography and Kinesiology*, 2019; 48: 128–144. <https://doi.org/10.1016/j.jelekin.2019.07.008>
  42. Merletti R., Muceli S., Tutorial. Surface EMG detection in space and time: best practices. *Journ. of Electromyography and Kinesiology*, 2019; 49: doi.org/10.1016/j.jelekin.2019.102363
  43. Russo A., Aranceta-Garza A., D'Emanuele S., Serafino F., Merletti R., HDsEMG activity of the lumbar erector spinae in violin players: comparison of two chairs. *Medical Probl. of Perform. Artists*, 2019; 34(4): 205-214, doi: 10.21091/mppa.2019.4034
  44. Besomi M, Hodges PW, Clancy EA, Van Dieën J, Hug F, Lowery M, Merletti R, et al. Consensus for experimental design in electromyography (CEDE) project: Amplitude normalization matrix. *Jour. Electromyogr. Kinesiol.* 2020;53:102438. doi: 10.1016/j.jelekin.2020.102438.
  45. Merletti R., Cerone G.L., Tutorial. Surface EMG detection, conditioning and pre-processing: best practices, *Journ. of Electromyogr. and Kinesiol.*, 2020; 54 102440, doi:10.1016/j.jelekin.2020.102440

46. Campanini I., Disselhorst-Klug C., Rymer W.Z., Merletti R., Surface EMG in Clinical Assessment and Neurorehabilitation: Barriers Limiting Its Use., *Frontiers in Neurology/Neurorehab.* 2020; doi.org/10.3389/fneur.2020.00934
47. McManus L., Lowery M., Merletti R. et al., Consensus for experimental design in electromyography (CEDE) project: Terminology matrix. *Journ. Electromyogr Kinesiol.* 2021;59 , 102565, doi: 10.1016/j.jelekin.2021.102565.
48. Korrami Chokami A., Gasparini M. Merletti R., Identification of periodic bursts in surface EMG: application to the erector spinae muscles of sitting violin players. *Biomed. Signal Process. and Control*, 2021; 65, 102369, doi.org/10.1016/j.bspc.2020.102369.
49. Aranceta-Garza A. , Russo A., D'Emanuele S., Serafino F., Merletti R., High density surface electromyographic activity of the lumbar erector spinae muscles and confort/discomfort assessment in piano players: comparison of two chairs. *Frontiers in Physiology* 12:743730, doi: 10.3389/fphys.2021.743730
50. Merlo A., Montecchi M.G., Lombardi, F., Vata, X., Musi A., Lusuardi M., Merletti, R., Campanini I. Monitoring involuntary muscle activity in acute patients with upper motor neuron lesion by wearable sensors. A feasibility study. *Sensors*, 202;21(9):3120. doi: 10.3390/s21093120.
51. Merletti R., Campanini I., Rymer W.Z., Disselhorst-Klug C., Editorial: Surface Electromyography: Barriers Limiting Widespread Use of sEMG in Clinical Assessment and Neurorehabilitation, *Front. Neurol./Neurorehab.* 2021, <https://doi.org/10.3389/fneur.2021.642257>
52. Gallina A, Disselhorst-Klug C, Farina D, Merletti R, et al.. Consensus for experimental design in electromyography (CEDE) project: High-density surface electromyography matrix. *Journ. Electromyogr. Kinesiol.* 2022;64:102656. doi: 10.1016/j.jelekin.2022.102656.
53. Barbero G., Evangelista L. R., Merletti R. Half-cell and noise voltages at a metal-electrode and dilute solution interface, *Journ. Statistical Mechanics: Theory and Experiment*, 2022; doi.org/10.1088/1742-5468/ac827e
54. Campanini, I., Merlo, A., Disselhorst-Klug, C., Mesin, L., Muceli, S., Merletti, R. ,Fundamental Concepts of Bipolar and High-Density Surface EMG Understanding and Teaching for Clinical, Occupational, and Sport Applications: Origin, Detection, and Main Errors. *Sensors* 2022, 22, 4150. <https://doi.org/10.3390/s22114150>
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