Bio

Short Bio

Prof. Christian Cipriani is the Director of the BioRobotics Institute of the Scuola Superiore Sant'Anna and Head of the Artificial Hands Area. His field of research is (bio)mechatronics applied to the area of upper limb prosthetics.

From 2014 to 2016 he was an Associate Professor of Bioengineering at the BioRobotics Institute of SSSA also serving as Deputy Director (2014-2017). In 2012 he has been a Visiting Scientist with the Biomechatronics Development Lab at University of Colorado Denver | Anschutz Medical Campus, with a Fulbright Scholarship. He received the Ph.D. in Biorobotics Science and Engineering from a joint program between IMT Institute for Advanced Studies, Lucca and Scuola Superiore Sant'Anna in 2008, and the Laurea degree in Electronic Engineering (MSc) with full marks from the University of Pisa, Italy in 2004.

He has coordinated several national and international research projects and authored 150+ peer reviewed scientific papers, 80+ of which on international journals. His current research is sponsored by the Italian Workers' Compensation Authority (INAIL), the Italian Ministry of University and Research (MIUR), the European Commission (EC), and the European Research Council (ERC).

He is the founder of Prensilia S.r.l., a spin-off company of SSSA that develops and commercializes robotic hands.

Awards and Honours

IX) National Scientific Habilitation (*Abilitazione Scientifica Nazionale*) (2017) as Professor of Bioengineering 09/G2. Call 2016.

VIII) ERC Starting Grant awarded to Christian Cipriani with the project MYKI: "A Bidirectional MyoKinetic Implanted Interface for Natural Control of Artificial Limbs" (ERC # 679820), for the period 2016-2021. **Read the News** (in Italian). ERC grants are the most prestigious grants in Europe. This was the first ERC grant awarded to Scuola Sant'Anna as the Host Institution.

VII) Research section of the **Premio Capitani dell'Anno 2015** awarded to the MyHAND project. **Read the News** (in Italian).

VI) National Scientific Habilitation (*Abilitazione Scientifica Nazionale*) (2014) as Associate Professor of Bioengineering 09/G2. Call 2012.

V) Senior Member (2012) of the IEEE Robotics and Automation Society (M'06) and of the Engineering in Medicine and Biology Society (M'09).

IV) FIRB 2010 under 32 early-career Grant by MiUR, the Italian Ministry of Education and Research to Christian Cipriani with the project: "Myoelectric-Hand prosthesis with Afferent Non-invasive feedback Delivery: MY-HAND" (grant no. RBFR10VCLD), for the period 2012-2014. **Read the News** (in Italian).

III) 2011 **Fulbright Research Scholarship** to spend a six month research period in 2012 at the Department of Bioengineering of the University of Colorado – Denver, at Dr. Richard Weir's laboratory, for evaluating the effectiveness of sensory feedback and parallel control on myoelectrically controlled dexterous hand prostheses. **Read the News** (in Italian).

II) Innovation section of the **2009 Vespucci Award** awarded to Prensilia Srl (Company founder and associate) with the project named: *"e-grasp, trans-radial prosthesis"*. The prize is held by the Tuscany regional Government, and awards the most brilliant and innovative entrepreneurship project based on innovative solutions not yet industrially exploited. **Read the News** (in Italian).

I) 2009 Antonio d'Auria Award (open to european citizens) for projects and prototypes of innovative robotic devices to aid the motor disabled from the Italian Robotics and Automation Association (SIRI) with the SmartHand transradial-prosthesis prototype developed. **Read the News** (in Italian).

Education and Professional Experience

Scuola Superiore Sant'Anna, Pisa, Italy. Assistant (2011), Associate (2014), Full Professor (2016).

University of Colorado Denver | Anschutz Medical Campus, USA. Visiting Scientist - Fulbright Scholar, 2012.

Scuola Superiore Sant'Anna, Pisa, Italy. Post-Doctoral Research Fellow, 2008-2010.

IMT Lucca and Scuola Superiore Sant'Anna, Pisa, Italy. Ph.D. Biorobotics Science and Engineering, 2008.

University of Pisa, Italy. B.Sc. and M.Sc. Electronic Engineering, 2002 and 2004.

Pubblicazioni

Peer Reviewed Journal papers (ISI | Scopus)

J93) M. Gherardini, A. Sturma, A. Boesendorfer, V. Ianniciello, A. Mannini, C. Cipriani, "Feasibility Study On Disentangling Muscle Movements in TMR Patients Through a Myokinetic Control Interface for the Control of Artificial Hands," *IEEE Robotics and Automation Letters*, vol. 7, no. 3, pp. 7240-7246, 2022. Download

J92) M.Montero, Z.C. Thumser, F. Masiero, D. Beckler, F. Clemente, P.D. Marasco, C. Cipriani, "The myokinetic stimulation interface: activation of proprioceptive neural responses with remotely

actuated magnets implanted in rodent forelimb muscle," *Journal of Neural Engineering*, vol. 19, no. 2, 2022. Download

J91) S.P. Mendez, M. Gherardini, G.V. de Paula Santos, D.M. Muñoz, H.V.H. Ayala, C. Cipriani "Data-Driven Real-Time Magnetic Tracking Applied to Myokinetic Interfaces," *IEEE Transactions on Biomedical Circuits and Systems*, vol. 16, no. 2, pp. 266-274, 2022. Download

J90) N. Malesevic, A. Björkman, G.S. Andersson, C. Cipriani, C. Antfolk, **"**Evaluation of Simple Algorithms for Proportional Control of Prosthetic Hands Using Intramuscular Electromyography," *Sensors*, vol. 22(13), no. 5054, 2022. Download

J89) A. Zangrandi, M. D'Alonzo, C. Cipriani, G. Di Pino, "Neurophysiology of slip sensation and grip reaction: insights for hand prosthesis control of slippage," *Journal of Neurophysiology*, vol. 126, no. 2, pp. 477-492, 2021. Download

J88) J. Montero, F. Clemente, C. Cipriani, "Feasibility of generating 90 Hz vibrations in remote implanted magnets," *Scientific Reports*, vol. 11, no. 1, pp. 1-14, 2021. Download

J87) L.F. Engels, L. Cappello, A. Fischer, C. Cipriani, "Testing silicone digit extensions as a way to suppress natural sensation to evaluate supplementary tactile feedback," *PloS One*, vol. 16, no. 9, e0256753, 2021. Download

J86) F. Masiero, E. Sinibaldi, F. Clemente, C. Cipriani, "Effects of sensor resolution and localization rate on the performance of a Myokinetic Control Interface," *IEEE Sensors Journal*, vol. 21, no. 20, pp. 22603-22611, 2021. Download

J85) M. Gherardini, A. Mannini, C. Cipriani, "Optimal Spatial Sensor Design for Magnetic Tracking in a Myokinetic Control Interface," *Computer Methods and Programs in Biomedicine*, vol. 211, no. 106407, 2021. Download

J84) M. Gherardini, F. Clemente, S. Milici, C. Cipriani, "Localization accuracy of multiple magnets in a myokinetic control interface," *Scientific Reports*, vol. 11, no. 4850, 2021. Download

J83) F. Ferrari, C. E. Shell, Z. C. Thumser, F. Clemente, E. B. Plow, C. Cipriani, P. D. Marasco, "Proprioceptive augmentation with illusory kinaesthetic sensation in stroke patients improves movement quality in an active upper limb reach-and-point task," *Frontiers in Neurorobotics*, vol. 15, no. 610673, 2021. Download

J82) V. Iacovacci, I. Naselli, A. R. Salgarella, F. Clemente, L. Ricotti, C. Cipriani, "Stability and in vivo safety of gold, titanium nitride and parylene C coatings on NdFeB magnets implanted in muscles towards a new generation of myokinentic prosthetic limbs," *RSC Advances*, vol. 11, no. 12, pp. 6766-6775, 2021. Download

J81) N. Malesevic, A. Olsson, P. Sager, E. Andersson, C. Cipriani, M. Controzzi, A. Björkman, C. Antfolk, "A database of high-density surface electromyogram signals comprising 65 isometric hand gestures," *Scientific Data*, vol. 8, no. 63, 2021. Download

J80) S. Milici, M. Gherardini, F. Clemente, F. Masiero, P. Sassu, C. Cipriani, "The myokinetic control interface: how many magnets can be implanted in an amputated forearm? Evidence from a simulated environment," *IEEE Trans. on Neural Systems and Rehabilitation Engineering*, vol. 28, no. 11, pp. 2451-2458, 2020. Download

J79) I. J. Rodríguez-Martínez, A. Mannini, F. Clemente, C. Cipriani, “Online Grasp Force Estimation from the Transient EMG,” *IEEE Trans. on Neural Systems and Rehabilitation Engineering*, vol. 28, no. 10, pp. 2333-2341, 2020. Download

J78) L. Cappello, W. Alghilan, M. Gabardi, D. Leonardis, M. Barsotti, A. Frisoli, C. Cipriani, “Continuous supplementary tactile feedback can be applied (and then removed) to enhance precision manipulation,” *Journal of NeuroEngineering and Rehabilitation*, vol. 17, no. 120, 2020. Download

J77) M. Pinardi, F. Ferrari, M. D'Alonzo, F. Clemente, L. Raiano, C. Cipriani, G. Di Pino, “Doublecheck: A sensory confirmation is required to own a robotic hand, sending a command to feel in charge of it,” vol. 11, no. 4, pp. 216-228, 2020.Download

J76) E. Mastinu, L. F. Engels, F. Clemente, M. Dione, P. Sassu, O. Aszmann, R. Brånemark, B. Håkansson, M. Controzzi, J. Wessberg, C. Cipriani, and M. Ortiz-Catalan, “Neural feedback strategies to improve grasping coordination in neuromusculoskeletal prostheses,” *Scientific Reports*, vol. 10, no. 11793, 2020. Download

J75) I. J. Rodriguez Martinez, A. Mannini, F. Clemente, A. M. Sabatini, C. Cipriani, “Grasp force estimation from the transient EMG using high-density surface recordings,” *Journal of Neural Engineering*, vol. 17, no. 016052, 2020. Download

J74) N. Malesevic, A. Björkman, G. Andersson, A. Matran-Fernandez, L. Citi, C. Cipriani, and C. Antfolk, “A database of multi-channel intramuscular electromyogram signals during isometric hand muscles contractions,” *Scientific Data*, vol. 7, no. 10, 2020. Download

J73) A. Matran-Fernandez, I. J. Rodriguez-Martinez, R. Poli, C. Cipriani, L. Citi, "SEEDS, simultaneous recordings of high-density EMG and finger joint angles during multiple hand movements," *Scientific Data*, vol. 6, no. 186, 2019. Download

J72) S. Tarantino, F. Clemente, A. De Simone, C. Cipriani, "Feasibility of tracking multiple implanted magnets with a myokinetic control interface: simulation and experimental evidence based on the point dipole model," *IEEE Trans. on Biomedical Engineering*, vol. 67, no. 5, pp. 1282-1292, 2020. Download

J71) F. Clemente, V. Ianniciello, M. Gherardini, C. Cipriani, “Development of an Embedded Myokinetic Prosthetic Hand Controller,” *Sensors 2019*, vol. 19(14), no. 3137, 2019. **Special issue on integrated magnetic sensors.** Download

J70) L. F. Engels, A. W. Shehata, E. J. Scheme, J. W. Sensinger, C. Cipriani, “When Less is More—Discrete Tactile Feedback Dominates Continuous Audio Biofeedback in the Integrated Percept while Controlling a Myoelectric Prosthetic Hand,” *Frontiers in Neuroscience*, vol. 13, no. 578, 2019. Download

J69) E. Mastinu, F. Clemente, P. Sassu, O. Aszmann, R. Brånemark, B. Håkansson, M. Controzzi, C. Cipriani, M. Ortiz-Catalan, “Grip control and motor coordination with implanted and surface electrodes while grasping with an osseointegrated prosthetic hand,” *Journal of NeuroEngineering and Rehabilitation*, vol. 16, no. 49, 2019. Download

J68) N. Malesevic, G. Andersson , A. Björkman, M. Controzzi, C. Cipriani, C. Antfolk, “Instrumented platform for assessment of isometric hand muscles contractions," *Measurement Science and Technology*, vol. 30(6), no. 065701, 2019. Download

J67) F. Clemente, G. Valle, M. Controzzi, I. Strauss, F. Iberite, T. Stieglitz, G. Granata, P. M. Rossini, F. Petrini, S. Micera, C. Cipriani, “Intraneural sensory feedback restores grip force control and motor coordination while using a prosthetic hand," *Journal of Neural Engineering*, vol. 16(2), no. 026034, 2019. Download

J66) E. D’Anna, G. Valle, A Mazzoni, I. Strauss, F. Iberite, J. Patton, F. Petrini, S. Raspopovic, G. Granata, R. Di Iorio, M. Controzzi, C. Cipriani, T. Stieglitz, P.M. Rossini, S. Micera, “A closed-loop hand prosthesis with simultaneous intraneural tactile and position feedback,” *Science Robotics*, vol. 4(27), no. eaau8892, 2019. Download

J65) G. Valle, F. M. Petrini, I. Strauss, F. Iberite, E. D’Anna, G. Granata, M. Controzzi, C. Cipriani, T. Stieglitz, P.M. Rossini, A. Mazzoni, S. Raspopovic, S. Micera, "Comparison of linear frequency and amplitude modulation for intraneural sensory feedback in bidirectional hand prostheses," *Scientific Reports*, vol. 8, no. 16666, 2018. Download

J64) F.M. Petrini, G. Valle, I.Strauss, G. Granata, R. Di Iorio, E. D’Anna, P. Čvančara, M. Mueller, J. Carpaneto, F. Clemente, M. Controzzi, L. Bisoni, C. Carboni, M. Barbaro, F. Iodice, D. Andreu, A. Hiairrassary, J.L. Divoux, C. Cipriani, D. Guiraud, L. Raffo, E. Fernandez, T. Stieglitz, S. Raspopovic, P.M. Rossini, S. Micera, "Six-month assessment of a hand prosthesis with intraneural tactile feedback," *Annals of Neurology*, vol. 85, no. 1, pp.137-154, 2019 (online version 2018). Download

J63) F. Ferrari, F. Clemente, C. Cipriani, "The preload force affects the perception threshold of muscle vibration-induced movement illusions," *Experimental Brain Research*, *Experimental Brain Research*, vol. 237, no. 1, pp. 111-120, 2018. Download

J62) M. Controzzi, H. Singh, F. Cini, T. Cecchini, A. Wing, C. Cipriani, "Humans adjust their grip force when passing an object according to the observed speed of the partner’s reaching out movement," *Experimental Brain Research*, vol. 236, no. 12, pp. 3363–3377, 2018. Download

J61) G. Valle, A. Mazzoni, F. Iberite, E. D’Anna,I. Strauss, G. Granata, M. Controzzi, F. Clemente, G. Rognini, C. Cipriani, T. Stieglitz, F. M. Petrini, P. M. Rossini, S. Micera, "Biomimetic Intraneural Sensory Feedback Enhances Sensation Naturalness, Tactile Sensitivity, and Manual Dexterity in a Bidirectional Prosthesis," *Neuron*, vol. 100, no. 1, pp. 37-45, 2018. Download

J60) G. Kanitz, C. Cipriani, B. Edin, "Classification of transient myoelectric signals for the control of multi-grasp hand prostheses," *IEEE Trans. on Neural Systems and Rehabilitation Engineering*, vol. 26, no. 9, pp. 1756-1764, 2018. Download

J59) A. W. Shehata, L. F. Engels, M. Controzzi, C. Cipriani, E. J. Scheme, J. W. Sensinger, "Improving Internal Model Strength and Performance of Prosthetic Hands Using Augmented Feedback," *Journal of NeuroEngineering and Rehabilitation*, vol. 15, no. 70, 2018. Download

J58) M. Aboseria, F. Clemente, L. F. Engels, C. Cipriani, "Discrete vibro-tactile feedback prevents object slippage in hand prostheses more intuitively than other modalities," *IEEE Trans. on Neural Systems and Rehabilitation Engineering*, vol. 26, no. 8, pp. 1577-1584, 2018. Download

J57) G. Kanitz, F. Montagnani, M. Controzzi, C. Cipriani, "Compliant prosthetic wrists entail more natural use than stiff wrists during reaching, not (necessarily) during manipulation," *IEEE Trans. on Neural Systems and Rehabilitation Engineering*, vol. 26, no. 7, pp. 1407-1413, 2018.Download

J56) I. Imbinto, F. Montagnani, M. Bacchereti, C. Cipriani, A. Davalli, R. Sacchetti, E. Gruppioni, S. Castellano, M. Controzzi, "The S-Finger: a synergetic externally powered digit with tactile sensing and feedback," *IEEE Trans. on Neural Systems and Rehabilitation Engineering*, vol. 26, no. 6, pp. 1264-1271, 2018. Download

J55) N. Maleševic, D. Markovic, G. Kanitz, M. Controzzi, C. Cipriani, C. Antfolk, "Vector Autoregressive Hierarchical Hidden Markov Models for Extracting Finger Movements Using Multichannel Surface EMG Signals," *Complexity*, vol. 2018, no. 9728264, 2018. Download

J54) L. Ferrari, S. Sudha, S. Tarantino, R. Esposti, F. Bolzoni, P. Cavallari, C. Cipriani, V. Mattoli, F. Greco, "Ultraconformable Temporary Tattoo Electrodes for Electrophysiology," *Advanced Science*, vol. 5(3), no. 1700771, 2018. Download

J53) S. Tarantino, F. Clemente, D. Barone, M. Controzzi, C. Cipriani, "The myokinetic control interface: tracking implanted magnets as a means for prosthetic control," *Scientific Reports*, vol. 7, no. 17149, 2017. Download

J52) M. D'Alonzo, L. F. Engels, M. Controzzi, C. Cipriani, "Electro-cutaneous stimulation on the palm elicits referred sensations on intact but not on amputated digits," *Journal of Neural Engineering*, vol. 15, no. 1, 2017. Download

J51) F. Clemente, B. Håkansson, C. Cipriani, J. Wessberg, K. Kulbacka-Ortiz, R. Brånemark, K. Fredén Jansson, M. Ortiz-Catalan, "Touch and Hearing Mediate Osseoperception," *Scientific Reports*, vol. 7, no. 45363, 2017. Download

J50) F. Montagnani, M. Controzzi, C. Cipriani, "Independent Long Fingers are not Essential for a Grasping Hand," *Scientific Reports*, vol. 6, no. 35545, 2016. Download

J49) F. Clemente, S. Dosen, L. Lonini, M. Markovic, D. Farina, C. Cipriani, "Humans can Integrate Augmented Reality Feedback in their Sensorimotor Control of a Robotic Hand," *IEEE Transactions on Human-Machine Systems*, vol. 47, no. 4, pp. 583-589, 2017. Download

J48) M. Controzzi, F. Clemente, D. Barone, A. Ghionzoli, C. Cipriani, "The SSSA-MyHand: a dexterous lightweight myoelectric hand prosthesis," *IEEE Trans. on Neural Systems and Rehabilitation Engineering*, vol. 25, no. 5, pp. 459-468, 2017. Download

J47) I. Strazzulla, M. Nowak, M. Controzzi, C. Cipriani, C. Castellini, "Online Bimanual Manipulation Using Surface Electromyography and Incremental Learning," *IEEE Trans. on Neural Systems and Rehabilitation Engineering*, vol. 25, no. 3, pp. 227-234, 2017. Download

J46) H. Al-Angari, G. Kanitz, S. Tarantino, C. Cipriani, "Distance and Mutual Information Methods for EMG Feature and Channel Subset Selection for Classification of Hand Movements," *Biomedical Signal Processing and Control*, vol. 27, pp. 24-31, 2016. Download

J45) D. Johansen, C. Cipriani, D. B. Popovic, L. N. S. A. Struijk, "Control of a robotic hand using a tongue control system – a prosthesis application," *IEEE Trans. on Biomedical Engineering*, vol. 63, no. 7, pp. 1368-1376, 2016. Download

J44) I. Imbinto, C. Peccia, M. Controzzi, A. G. Cutti, A. Davalli, R. Sacchetti and C. Cipriani, "Treatment of the Partial Hand Amputation: An Engineering Perspective," *IEEE Reviews in Biomedical Engineering*, vol. 9, pp. 32-48, 2016. Download

J43) F. Clemente, M. D'Alonzo, M. Controzzi, B. Edin, C. Cipriani, "Non-invasive, temporally discrete feedback of object contact and release improves grasp control of closed-loop myoelectric transradial prostheses," *IEEE Trans. on Neural Systems and Rehabilitation Engineering*, vol.24, no. 12, pp. 1314-1421, 2016. Download

J42) S. Crea, M. D'Alonzo, N. Vitiello, C. Cipriani, "The rubber foot illusion," *Journal of NeuroEngineering and Rehabilitation*, vol. 12, no. 77, 2015. Download

J41) A. Zucca, C. Cipriani, S. Sudha, S. Tarantino, D. Ricci, V. Mattoli, F. Greco, "Tattoo Conductive Polymer Nanosheets for Skin-contact Applications," *Advanced Healthcare Materials*, vol. 4, no. 7, pp. 983-990, 2015. **Front cover article.** Download

J40) F. Montagnani, M. Controzzi, C. Cipriani, "Is it Finger or Wrist Dexterity That is Missing in Current Hand Prostheses?" *IEEE Trans. on Neural Systems and Rehabilitation Engineering*, vol. 23, no.4, pp. 600-609, 2015. Download

J39) L. Orlando Russo, G. Airò Farulla, D. Pianu, A. R. Salgarella, M. Controzzi, C. Cipriani, C. M. Oddo, C. Geraci, S. Rosa, and M. Indaco, "PARLOMA – A Novel Human-Robot Interaction System for Deaf-blind Remote Communication," *International Journal of Advanced Robotic Systems*, vol. 12, no. 57, 2015. Download

J38) F. Montagnani, M. Controzzi, C. Cipriani, "Non-Back-Drivable Rotary Mechanism with Intrinsic Compliance for Robotic Thumb Abduction/Adduction," *Advanced Robotics*, vol. 29, no. 8, pp. 561-571, 2015. Download

J37) S. Crea, C. Cipriani, M. Donati, M. C. Carrozza, N. Vitiello, "Providing time-discrete gait information by wearable feedback apparatus for lower-limb amputees: usability and functional validation," *IEEE Trans. on Neural Systems and Rehabilitation Engineering*, vol. 23, no. 2, pp.250-257, 2015. Download

J36) Y. Hao, Q. Zhang, M. Controzzi, C. Cipriani, Y. Li, J. Li, S. Zhang, Y. Wang, W. Chen, M. C. Carrozza, and X. Zheng, "Distinct neural patterns enable grasp types decoding in monkey dorsal premotor cortex," *Journal of Neural Engineering*, vol. 11(6), no. 066011, 2014. Download

J35) J.L. Segil, M. Controzzi, R.F. Weir, C. Cipriani, "Comparative study of state-of-the-art myoelectric controllers for multigrasp prosthetic hands," *Journal of Rehabilitation Research & Development*, vol. 51, no.9, pp. 1439-1454, 2014. Download

J34) M. D'Alonzo, F. Clemente, C. Cipriani, "Vibrotactile stimulation promotes embodiment of an alien hand in amputees with phantom sensations," *IEEE Trans. on Neural Systems and Rehabilitation Engineering*, vol. 23, no. 3, pp. 450-457, 2015. Download **Featured article:** link

J33) C. Cipriani, J. Segil, F. Clemente, R. Weir, B. Edin, "Humans can integrate feedback of discrete events in their sensorimotor control of a robotic hand," *Experimental Brain Research*, vol. 232, no. 11, pp. 3421-3429, 2014. Download

J32) M. Controzzi, M. D'Alonzo, C. Peccia, C. M. Oddo, M. C. Carrozza, C. Cipriani, "Bioinspired fingertip for anthropomorphic robotic hands," *Applied Bionics and Biomechanics*, vol. 1, no. 864573 pp. 25-38, 2014. Download

J31) M. Markovic, S. Dosen, C. Cipriani, D. Popovic, D. Farina, "Stereovision and augmented reality for closed loop control of grasping in hand prostheses," *Journal of Neural Engineering*, vol. 11, no. 4, ID 046001, 2014. Download

J30) S. Raspopovic, M. Capogrosso, F. Petrini, M. Bonizzato, J. Rigosa, G. Di Pino, J. Carpaneto, M. Controzzi, T. Boretius, E. Fernandez, G. Granata, C. M. Oddo, L. Citi, A.L. Ciancio, C. Cipriani, M.C. Carrozza, W. Jensen, E. Guglielmelli, T. Stieglitz, P.M. Rossini, S. Micera, "Restoring natural sensory feedback in real-time bidirectional hand prostheses," *Science Translational Medicine*, vol. 6, no. 222, pp. 222ra19, 2014. Download

J29) C. Cipriani, J. Segil, A. Birdwell, R. Weir, "Dexterous control of a prosthetic hand using fine-wire intramuscular electrodes in targeted extrinsic muscles," *IEEE Trans. on Neural Systems and Rehabilitation Engineering*, vol. 22, no. 4, pp. 828-836, 2014. Video. **Special issue on advances in control of multi-functional powered upper-limb prostheses.** Download. **Featured article:** link

J28) M. D'Alonzo, S. Dosen, C. Cipriani, D. Farina, "HyVE – Hybrid Vibro-Electrotactile Stimulation – is an Efficient Approach to Multi-Channel Sensory Feedback," *IEEE Transactions on Haptics*, vol. 7, no. 2, pp. 181-190, 2014. Download

J27) T. Pistohl, C. Cipriani, A. Jackson, K. Nazarpour, "Abstract and Proportional Myoelectric Control for Multi-Fingered Hand Prostheses," *Annals of Biomedical Engineering*, vol. 41, no. 12, pp. 2687-2689, 2013. Download

J26) M. D'Alonzo, S. Došen, C. Cipriani, D. Farina, "HyVE: Hybrid Vibro-Electrotactile Stimulation for Sensory Feedback and Substitution in Rehabilitation," *IEEE Trans. on Neural Systems and Rehabilitation Engineering*, vol. 22, no. 2, pp. 290-301, 2014 (online version 2013). Download

J25) P. Rogério de Almeida Ribeiro, F. Lima Brasil, M. Witkowski, F. Shiman, C. Cipriani, N. Vitiello, M. C. Carrozza, S. R. Soekadar, "Controlling assistive machines in paralysis using brain waves and other biosignals," *Advances in Human-Computer Interaction*, vol. 13, 2013. **Special issue on using brain waves to control computer and machines.** Download**. Featured article:** link

J24) Y. Hao, M. Controzzi, C. Cipriani, D. B. Popovic, X. Yang, W. Chen, X. Zheng, M.C. Carrozza,"Controlling Hand-Assistive Devices: Utilizing Electrooculography as a Substitute for Vision," *IEEE Robotics and Automation Magazine*, vol. 20, no. 1, pp. 40-52, 2013. **Special issue on Assistive robotics.** Download

J23) C. Antfolk, M. D'Alonzo, M. Controzzi, G. Lundborg, B. Rosén, F. Sebelius, C. Cipriani, "Artificial redirection of sensation from prosthetic fingers to the phantom hand map on transradial amputees: vibrotactile vs mechanotactile sensory feedback" *IEEE Trans. on Neural Systems and Rehabilitation Engineering*, vol. 21, no. 1, pp. 112-120, 2013. Download

J22) C. Antfolk, M. D'Alonzo, B. Rosén, G. Lundborg, F. Sebelius, C. Cipriani, "Sensory feedback in upper limb prosthetics," *Expert Review of Medical Devices*, vol. 10, no.1, pp. 45-54, 2013. Download

J21) M. D'Alonzo and C. Cipriani, "Vibrotactile sensory substitution elicits feeling of ownership of an alien hand," *PLOS ONE*, vol. 7, no. 11, 2012. Download

J20) C. Antfolk, C. Cipriani, M. C. Carrozza, C. Balkenius, A. Björkman, G. Lundborg, B. Rosen, F. Sebelius, "Transfer of tactile input from an artificial hand to the forearm: experiments in amputees and healthy volunteers," *Disability and Rehabilitation: Assistive Technology*, vol. 8, no. 3, pp. 249-254, 2012. Download

J19) L. Pape, C. M. Oddo, M. Controzzi, C. Cipriani, A. Förster, M. C. Carrozza, J. Schmidhuber, "Learning tactile skills through curious exploration," *Frontiers in Neurorobotics*, vol. 6, no. 6, 2012. Download

J18) G. C. Matrone*, C. Cipriani*, M. C. Carrozza and G. Magenes, "Real-time myoelectric control of a multi-fingered hand prosthesis using principal components analysis," *Journal of NeuroEngineering and Rehabilitation*, vol. 9, no. 40, 2012. **Highly accessed article.** Download

J17) C. Cipriani, M. Controzzi, G. Kanitz, R. Sassu "The effects of weight and inertia of the prosthesis on the Sensitivity of EMG pattern recognition in relax state," *Journal of Prosthetics & Orthotics*, vol. 24, no. 2, pp. 86-92, 2012. **Selected from MEC '11.** Download

J16) C. Cipriani, M. D'Alonzo, M. C. Carrozza, "A Miniature Vibrotactile Sensory Substitution Device for Multi-fingered Hand Prosthetics," *IEEE Trans. Biomedical Engineering*, vol. 59, no. 2, pp. 400-408, 2012. Download

J15) S. Micera, P.M. Rossini, J. Rigosa, L. Citi, J. Carpaneto, S. Raspopovic, M. Tombini, C. Cipriani, G. Assenza, M. C. Carrozza, K-P. Hoffmann, K. Yoshida, X. Navarro, P. Dario, "Decoding of grasping information from neural signals recorded using peripheral intrafascicular interfaces," *Journal of NeuroEngineering and Rehabilitation*, vol. 8, no. 53, 2011. Download

J14) C. Cipriani, C. Antfolk, M. Controzzi, G. Lundborg, B. Rosén, M. C. Carrozza, F. Sebelius, "Online Myoelectric Control of a Dexterous Hand Prosthesis by Transradial Amputees," *IEEE Trans. on Neural Systems and Rehabilitation Engineering*, vol. 19, no. 3, pp. 260-270, 2011. Download **Front cover article**: link

J13) C. Cipriani, M. Controzzi, M. C. Carrozza, "The SmartHand Transradial Prosthesis," *Journal of NeuroEngineering and Rehabilitation*, vol. 8, no. 29, 2011.**Highly accessed article**. Download

J12) C. M. Oddo, M. Controzzi, L. Beccai, C. Cipriani, M. C. Carrozza, "Roughness Encoding for Discrimination of Surfaces in Artificial Active Touch," *IEEE Transactions on Robotics*, vol. 27, no. 3, pp. 522-533, 2011. **Special issue on Robotic sense of touch.** Download

J11) M. L. Blefari, C. Cipriani, M. C. Carrozza, "A Novel Method for Assessing Sense of Body-Ownership Using Electroencephalography," *IEEE Trans. Biomedical Engineering*, vol. 58, no. 1, pp. 12-15, 2011. Download

J10) S. Došen, C. Cipriani, M. Kostić, M. Controzzi, M. C. Carrozza, D. B. Popović, "Cognitive Vision System for Control of Dexterous Prosthetic Hands: Experimental Evaluation," *Journal of NeuroEngineering and Rehabilitation*, vol. 7, no. 42, 2010. Download

J9) M. Controzzi, C. Cipriani, M. C. Carrozza, "Miniaturized non-back-drivable mechanism for robotic applications," *Mechanism and Machine Theory*, vol. 45, no. 10, pp. 1395-1406, 2010. Download

J8) G. Matrone, C. Cipriani, E. L. Secco, G. Magenes, M. C. Carrozza, "Principal Components Analysis based control of a multi-DoF underactuated prosthetic hand," *Journal of NeuroEngineering and Rehabilitation*, vol. 7, no. 16, 2010. Download

J7) C. Antfolk, C. Cipriani, M. Controzzi, M. C. Carrozza, G. Lundborg, B. Rosén, F. Sebelius, "Using EMG for Real-time Prediction of Joint Angles to Control a Prosthetic Hand Equipped with a Sensory Feedback System," *Journal of Medical and Biological Engineering*, vol. 30, no.6, pp.399-406, 2010. Download

J6) P.M. Rossini, S. Micera, A. Benvenuto, J. Carpaneto, G. Cavallo, L. Citi, C. Cipriani, L. Denaro, V. Denaro, G. Di Pino, F. Ferreri, E. Guglielmelli, K-P. Hoffmann, S. Raspopovic, J. Rigosa, L. Rossini, M. Tombini, and P. Dario, "Double Nerve Intraneural Interface Implant on a Human Amputee for Robotic Hand Control," *Clinical Neurophysiology*, vol. 121, no. 5, pp. 777-783, May 2010. Download

J5) C. Cipriani, M. Controzzi, M. C. Carrozza, "Objectives, Criteria and Methods for the Design of the SmartHand Transradial Prosthesis," *Robotica*, vol. 28, no. 6, pp. 919-927, 2010. (Online publication Dec. 2009). Download

J4) C. Cipriani, C. Antfolk, C. Balkenius, B. Rosén, G. Lundborg, M.C. Carrozza, F. Sebelius, "A Novel Concept for a Prosthetic Hand with a Bidirectional Interface: a Feasibility Study," *IEEE Trans. Biomedical Engineering*, vol. 56, no. 11, part 2, pp. 2739-2743, 2009. Download

J3) B. Rosén, H. Ehrsson, C. Antfolk, C. Cipriani, F. Sebelius, G. Lundborg, "Referral of Sensation to an Advanced Humanoid Robotic Hand Prosthesis," *Scandinavian Journal of Plastic and Reconstructive Surgery and Hand Surgery*, vol. 43, no. 5, pp. 260-266, 2009. Download

J2) C. Cipriani, F. Zaccone, S. Micera, M.C. Carrozza, "On the shared control of an EMG controlled prosthetic hand: analysis of user-prosthesis interaction," *IEEE Transactions on Robotics*, vol. 24, no. 1, pp. 170-184, 2008. **Special issue on Biorobotics.** Download

J1) M.C. Carrozza, G. Cappiello, S. Micera, B.B. Edin, L. Beccai, C. Cipriani, "Design of a cybernetic hand for perception and action," *Biological Cybernetics*, vol. 95, no. 6, pp. 629-644, 2006. Download

Brevetti

Patents

P8) F. Sorgini, R. Calio, C. Cipriani, M. C. Carrozza, C. M. Oddo, C. Galassi, "Trasduttore integrabile per applicazioni aptiche," Italian national patent pending no. 102016000002346, Holder: Scuola Superiore Sant'Anna, January 2016.

P7) L. Bassi Luciani, M. Controzzi, F. Montagnani, C. Cipriani, "Giunto meccanico a cedevolezza variabile," Italian national patent pending no. 102015000081936, Holder: Scuola Superiore Sant'Anna, December 2015.

P6) L. Bassi Luciani, M. Controzzi, F. Montagnani, C. Cipriani, "Giunto a modalità di trasmissione selezionabile," Italian national patent pending no. 102015000081958, Holder: Scuola Superiore Sant'Anna, December 2015.

P5) P. Prinetto, M. Indaco, G. Airò Farulla, C. Pintor, L. Orlando Russo, A. Salgarella, G. Micotti, C. M. Oddo, C. Cipriani, M. Controzzi, "Sistema per la comunicazione di simboli appartenenti ad una lingua dei segni tattile, e relativo metodo," Italian national patent pending no. TO2014A000982, Holder: Scuola Superiore Sant'Anna and Politecnico di Torino, November 2014.

P4) F. Clemente, M. D'Alonzo, B. Edin, C. Cipriani, "Dispositivo per il ritorno sensoriale," Italian national patent pending no. PI2014A000045, Holder: Scuola Superiore Sant'Anna and Uminova Holding AB, July 2014.

P3) M. Controzzi, F. Clemente, C. Cipriani, M.C. Carrozza, "Self-contained multifunctional hand prosthesis," European patent pending no. 13164114.4, Holder: Prensilia SRL, Apr. 2013.

P2) M. Controzzi, F. Clemente, C. Cipriani, M.C. Carrozza, "Self-contained multifunctional hand prosthesis," Italian national patent pending no. PI2012A000049, Holder: Prensilia SRL, Apr. 2012.

P1) C. Cipriani, M. Controzzi, M.C. Carrozza, "Interface device between an individual and a machine and interfacing method thereof," Italian national patent no. LU2010A000008, Holder: Prensilia SRL, Aug. 2010.

Ricerca

Research Interests

Prof. Cipriani is the Head of the Artificial Hands Area of the BioRobotics Institute. His research interests are focused on mechatronic features and controllability issues of advanced robotic hands to be used as thought-controlled prostheses. In particular: the design of mechatronic components for artificial hands; the design of control architectures and intuitive control strategies; the use of biological signals for the physiological control of prehension; the development and clinical experimentation of bi-directional non-invasive interfaces; the investigation and comparison of shared-control strategies between user and the prosthesis. Most of his activities are strongly related to the development of hardware with the goal of building reliable, robust and durable stand-alone mechatronic hands.

Research Projects (funding)

Prof. Cipriani is currently the **Coordinator/PI** of four large national/international research projects on upper limb prosthetics: an **ERC Starting Grant** (#679820), dubbed MYKI, funded by the European Research Council (ERC), the DeTOP Project (H2020-ICT-687905) funded by the European Commission (2011-2015), of the CECA2020 Project funded by the Italian Workers' Compensation (INAIL) and of the ARLEM Project funded by the Italian Ministry of Research (2018-2022).

Prior to this he has been working at ARTS Lab since 2005 in the framework of many national and international research projects on upper limb prosthetics and robotic hands under the supervision of Dr. M. C. Carrozza. In particular, he has collaborated as **Research Engineer** in the IST FET CYBERHAND Project, the Revolutionizing Prosthetic Program 2007, the IST ROBOTCUB, and

the IST FET NEUROBOTICS projects. Lately he has been the SSSA **Team Leader** for SAFFEHAND (2007-2008: PRIN 2006 national project), SMARTHAND (2006-2010: EU, NMP programme) and NANOBIOTOUCH (during 2010: EU, NMP) and the **Project Manager** of OPENHAND (2010-2012: PRIN 2008) projects. Recently he was the **Coordinator** and PI of the FIRB 2010 (early career grant) MY-HAND Project funded by the Italian Ministry of Research (2012-2015), of the WAY Project (Wearable interfaces for hAnd function recovery - EU-FP7-ICT-288551) funded by the European Commission (2011-2015) and of the PPR3 Project funded by the Italian Workers' Compensation (INAIL).

Corsi

Courses

Artificial Limbs - Fall 2020-2021 (MSc Bionics Engineering - UNIPI-SSSA)

Materials - Lessons - **Subscribe to exam**

Embedded Control Systems Spring 2019-2020 (Allievi)

Materials and Lessons

Courses and exams calendar

Older courses

Artificial Limbs (MSc Bionics Engineering - UNIPI-SSSA)

Fall 2019-2020: Materials - Lessons

Fall 2018-2019: Materials - Lessons

Fall 2017-2018: Materials - Lessons

Spring 2016-2017: Materials - Lessons

Embedded control systems (Allievi or PhD)

Spring 2018-2019 Materials and Lessons

Spring 2017-2018: Abstract - Materials

Fall 2016-2017: Abstract - Materials

Spring 2016: Abstract - Materials

Fall 2016 (October 2016): Lessons (Spring) - Lessons (Fall)

Spring 2015; Fall 2015 (October 2015): Abstract - Materials - Lessons

Electrical control systems (for biomedical robots) and electrical measurements (PhD)

Spring 2013 (May-June 2013): Abstract - Materials - Lessons