



Jose M. Carmena

*Curriculum Vitae**

Current Position

Assistant Professor
Department of Electrical Engineering and Computer Sciences
Helen Wills Neuroscience Institute
Program in Cognitive Science
University of California, Berkeley
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Research Interests

- ❖ **Systems & Cognitive Neuroscience:** brain-machine interfaces; neural basis of sensorimotor learning and control; neural ensemble computation;
- ❖ **Neural Engineering:** neuroprosthetic systems; biomimetic robotics; human-machine systems.

Higher Education and Training

Postdoctoral fellow	Department of Neurobiology Duke University, Durham (NC)	2002-2005
Ph.D.	Robotics University of Edinburgh (UK)	2002
Dip.	Neurobiology Open University (UK)	2001
M.S.	Artificial Intelligence University of Edinburgh (UK)	1998
M.S.	Electrical Engineering University of Valencia (Spain)	1997
B.S.	Electrical Engineering Polytechnic University of Valencia (Spain)	1995

(*) Last updated July 26th 2009.

Positions and Employment

Assistant Professor	Department of Electrical Engineering & Computer Sciences Program in Cognitive Science Helen Wills Neuroscience Institute University of California, Berkeley (CA)	since 07/2005
Postdoctoral Fellow	Department of Neurobiology Center for Neuroengineering Duke University, Durham (NC)	02/02 – 07/05
Lecturer	School of Artificial Intelligence Division of Informatics University of Edinburgh (UK)	9/01–02/02
Teaching Assistant	School of Artificial Intelligence Division of Informatics University of Edinburgh (UK)	10/98–06/01
Visiting researcher	Department of Artificial Intelligence University of Edinburgh (UK)	07–08/96
Research assistant	Robotics Institute University of Valencia (Spain)	10/95–09/97

Honors and Awards

- ❖ Sloan Research Fellow, 2009
- ❖ Senior member IEEE, 2009
- ❖ Lotfi Zadeh Best Paper Award, ICMLC Conference, Baoding, China 2009
- ❖ Distinguished Lecturer, IEEE-SMC 2009-2011
- ❖ Okawa Foundation Research Award, 2007
- ❖ Hellman Family Faculty Fund Award, 2007
- ❖ Christopher Reeve Paralysis Foundation Postdoctoral Fellowship, 2003-2005
- ❖ Best Conference Paper, EUROBOT conference, Lund (Sweden), 9/2001
- ❖ PhD-Scholarship, EU TMR-Network SMART2, 10/98–9/01
- ❖ MSc-Scholarship, Student Awards Agency of Scotland, 10/97–9/98

Memberships

- ❖ Society for Neuroscience
- ❖ The Neural Control of Movement Society
- ❖ IEEE Engineering in Medicine and Biology Society
- ❖ IEEE Robotics and Automation Society
- ❖ IEEE Systems, Man and Cybernetics Society

Publications

Journal Articles

1. Ganguly K. and **Carmena J.M.** (2009) Emergence of a stable cortical map for neuroprosthetic control. **Public Library of Science Biology** 7(7), e1000153.doi:10.1371/journal.pbio.1000153.
2. Venkatraman S. and **Carmena J.M.** (2009) Behavioral modulation of stimulus-evoked oscillations in barrel cortex of alert rats. **Frontiers in Integrative Neuroscience** 3:10. doi:10.3389/neuro.07.010.2009
3. Venkatraman S., Long J.D., Elkabany K., Yao Y. and **Carmena J.M.** A system for neural recording and closed-loop intracortical microstimulation in awake rodents (2009). **IEEE Transactions on Biomedical Engineering** 56(1), pp. 15-22.
4. Kim H.K., **Carmena J.M.**, Biggs S.J., Hanson T.L., Nicolelis M.A.L., and Srinivasan M.A. (2007). The muscle activation method: An approach to impedance control of brain-machine interfaces through a musculoskeletal model of the arm. **IEEE Transactions on Biomedical Engineering** 54(8), pp. 1520-1529.
5. Zacksenhouse M., Lebedev M.A., **Carmena J.M.**, O'Doherty J.E., Henriquez C.S. and Nicolelis M.A.L. (2007). Cortical modulations increase in early sessions with brain-machine interface. **Public Library of Science One** 7, e619.
6. Kim S.-P., Sanchez J.C., Rao Y.N., Erdogmus D., **Carmena J.M.**, Lebedev M.A., Nicolelis M.A.L., and Principe J.C. (2006). A comparison of optimal MIMO linear and nonlinear models for brain-machine interfaces. **Journal of Neural Engineering** 3, pp. 145-161.
7. Kim H.K., Biggs S.J., Schloerb D.W., **Carmena J.M.**, Lebedev M.A., Nicolelis M.A.L., and Srinivasan M.A. (2006). Continuous shared control stabilizes reach and grasping with brain-machine interfaces. **IEEE Transactions on Biomedical Engineering** 53(6), pp. 1164-1173.
8. Gutierrez R., **Carmena J.M.**, Nicolelis M.A.L., and Simon S.A. (2006). Temporal specific ensembles of rat orbitofrontal neurons represent the drinking of liquid rewards. **Journal of Neurophysiology** 95, pp. 119-133.
9. **Carmena J.M.**, Lebedev M.A., Henriquez C.S., and Nicolelis M.A.L. (2005). Stable ensemble performance with single neuron variability during reaching movements in primates. **Journal of Neuroscience** 25(46):10712-10716.
10. Lebedev M.A., **Carmena J.M.**, O'Doherty J.E., Zacksenhouse M., Henriquez C.S., Principe J.C., and Nicolelis M.A.L. (2005). Cortical ensemble adaptation to represent velocity of an artificial actuator controlled by a brain-machine interface. **Journal of Neuroscience** 25(19):4681-4693.
11. **Carmena J.M.** and Hallam J.C.T. (2004). Narrowband tracking using a biomimetic sonarhead. **Robotics and Autonomous Systems** 46(4), pp. 247-259.
12. Patil P.G., **Carmena J.M.**, Nicolelis M.A.L., and Turner D.A. (2004). Ensembles of human subcortical neurons as a source of motor control signals for a brain-machine interface. **Neurosurgery** 55(1), pp. 27-38.

13. Sanchez J.C., **Carmena J.M.**, Lebedev M.A., Nicolelis M.A.L., Harris J.G., and Principe J.C. (2004). Ascertaining the importance of neurons to develop better brain-machine interfaces, **IEEE Transactions on Biomedical Engineering** 51(6), pp. 943-953.
14. Bossetti C.A., **Carmena J.M.**, Nicolelis M.A.L., and Wolf P.D. (2004). Transmission latencies in a telemetry-linked brain-machine interface. **IEEE Transactions on Biomedical Engineering** 51(6), pp. 919-924.
15. **Carmena J.M.** and Hallam J.C.T. (2004). The use of Doppler in Sonar-based mobile robot navigation: inspirations from Biology. **Information Sciences** 161(1-2), pp. 71-94.
16. **Carmena J.M.**, Lebedev M.A., Crist R.E., O'Doherty J.E., Santucci D.M., Dimitrov D.F., Patil P.G., Henriquez C.S. and Nicolelis M.A.L. (2003). Learning to control a brain-machine interface for reaching and grasping by primates. **Public Library of Science Biology** 1(2), pp. 193-208.
17. Nicolelis M.A.L., Dimitrov D., **Carmena J.M.**, Crist R.E., Lehew G., Kralik J., and Wise S.P. (2003). Chronic, multi site, multi electrode recordings in macaque monkeys. **Proceedings of the National Academy of Sciences of the USA**. 100(19), pp. 11041-11046.
18. **Carmena J.M.** and Hallam J.C.T. (2002). Estimating Doppler-shift using Bat-inspired Cochlear Filterbank Models: A Comparison of Methods for Echoes from Single and Multiple Reflectors. **Adaptive Behavior**. 9(3-4), pp.241-261.
19. **Carmena J.M.**, Kämpchen N., Kim D., and Hallam J.C.T. (2001). Artificial ears for a biomimetic sonarhead: from multiple reflectors to surfaces. **Artificial Life**, 7(2), pp.147-169.

Peer-Reviewed Proceedings and Book Chapters

1. Heliot R. and **Carmena J.M.** (2009). A model of motor learning in brain-machine interfaces: predicting neural tuning changes. IEEE Systems, Man and Cybernetics Conference, San Antonio TX. *(to appear)*
2. Jimenez J., Heliot R. and **Carmena J.M.** (2009). Learning to use a brain-machine interface: model, simulation and analysis. Proceedings of EMBC'09, 31st Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Minneapolis, MN. *(to appear)*
3. Venkatraman S., Patten C. and **Carmena J.M.** (2009). Exploiting the 1/f structure of neural signals for the design of integrated neural amplifiers. Proceedings of EMBC'09, 31st Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Minneapolis, MN. *(to appear)*
4. Heliot R., Ganguly K. and **Carmena J.M.** (2009). Modeling and experimental validation of the learning process during closed-loop BMI operation. International Conference on Machine Learning and Cybernetics, Baoding (China).
5. Venkatraman S., Hendricks J., Richardson-Burns S., Jan E., Martin D.C., **Carmena J.M.** (2009). PEDOT coated Microelectrode Arrays for Chronic Neural Recording and Stimulation. 4th International IEEE EMBS Conference on Neural engineering. Antalya (Turkey).
6. Ranade G.V., Ganguly K. and **Carmena J.M.** (2009). LFP beta power predicts cursor stationarity in BMI task. 4th International IEEE EMBS Conference on Neural engineering. Antalya (Turkey).

7. Heliot R., Orsborn A., and **Carmena J.M.** (2008). Stiffness control of 2-DOF exoskeleton for brain-machine interfaces. 2nd IEEE RAS / EMBS International Conference on Biomedical Robotics and Biomechatronics, Scottsdale (AZ).
8. Ganguly K., Torres E.B., Jose J.V. and **Carmena J.M.** (2008). From multiple neural cortical networks to motor mechanical behavior: the importance of inherent learning over separable space-time length scales. 7th Annual Computational Neuroscience Meeting, Portland, OR. BMC Neuroscience **9** (Suppl 1):P70.
9. Venkatraman S., Long J.D., Pister K.S.J., **Carmena J.M.** (2007). Wireless inertial sensors for monitoring animal behavior. Proceedings of EMBC'07, 29th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Lyon (France).
10. Kim S.P., **Carmena J.M.**, Nicoletis M.A.L., and Principe J.C. (2005). Multiresolution representations and data mining of neural spikes for brain-machine interfaces. Proc. of the 2nd International Conference on Neural Engineering, Arlington, VA (USA).
11. Rao Y.N., Kim S.P., Sanchez J.C., Erdogomus D., Principe J.C., **Carmena J.M.**, Lebedev M.A., and Nicoletis M.A.L. (2005). Learning mappings in BMIs with echo state networks. Proc. of the IEEE-ICASSP, Philadelphia, PA (USA).
12. Sanchez J.C., Principe J.C., **Carmena J.M.**, Lebedev M.A., and Nicoletis M.A.L. (2004). Simultaneous predictions of four kinematic variables for a BMI using a single recurrent neural network. 26th Int. Conf. of the IEEE-EMBS, San Francisco, CA (USA).
13. **Carmena J.M.** and Hallam J.C.T. (2002). Narrowband 3D tracking using a biomimetic sonarhead. Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Lausanne (Switzerland).
14. **Carmena J.M.** and Hallam J.C.T. (2001). A comparison of methods for estimating Doppler shift using cochlear filterbank models. European workshop on advanced mobile robots (EUROBOT), pp. 9-16, Lund (Sweden).
15. **Carmena J.M.** and Hallam J.C.T. (2001). Exploiting the physics: Doppler-based navigation with a bat-inspired mobile robot. Proceedings of the 9th Symposium on Intelligent Robotic Systems, pp. 467-476, Toulouse (France).
16. **Carmena J.M.** and Hallam J.C.T. (2001). A Doppler-based motion controller for an echolocating mobile robot, Towards Intelligent Mobile Robots. Technical Report Series, Dept. of Computer Science, Manchester University, Manchester (UK). ISSN 1361 6161.
17. Peremans H., Müller R., **Carmena J.M.** and Hallam J.C.T. (2000). A biomimetic platform to study perception in bats. Proceedings of SPIE: Sensor Fusion and Decentralized Control in Robotics Systems III, Vol 4196, pp. 168-179, Boston, MA (USA).
18. **Carmena J.M.**, Kim D., and Hallam J.C.T. (2000). Designing artificial ears for animal echolocation. From Animals to Animats 6. pp.73-80, J-A. Meyer et al. (Eds.), MIT Press.
19. **Carmena J.M.** and Hallam J.C.T. (2000). Estimating Doppler shift with a coarse cochlear filterbank. Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Vol 1, pp. 221-226, Takamatsu (Japan).
20. Kim D., **Carmena J.M.**, and Hallam J.C.T. (2000). Towards an artificial pinna for a narrow band biomimetic sonarhead. Lecture Notes in Computer Science 1801, pp. 113-122, Miller et al. (Eds.), Springer-Verlag.

21. **Carmena J.M.** and Hallam J.C.T. (1999). Improving performance in a multi-robot task through minimal communication. Proceedings of the 7th Symposium on Intelligent Robotic Systems, pp. 329-337, Coimbra (Portugal).

Review Articles and Book Chapters by Invitation

- **Carmena J.M.** and **Cohen L.G.** Brain-machine interfaces and transcranial stimulation – future implications for spinal injury in humans. **Spinal Cord Injuries: Handbook of Clinical Neurology series**, 3rd edition. M.J. Aminoff et al. editors, Elsevier (in press).
- Heliot R. and **Carmena J.M.** Brain-machine interfaces. **Encyclopedia of Behavioral Neuroscience**, G. Koob, M. Le Moal and R. Thompson editors, Elsevier (in press).
- 1. Micera S. and **Carmena J.M.** (2009) Editorial: Developing the Next Generation of Hybrid Neuroprosthetic Systems. **IEEE Transactions on Biomedical Engineering** 56(1), pp. 3-5.
- 2. **Carmena J.M.** (2008) Cortical control of neuroprosthetic devices. **Wearable robots: biomechatronic exoskeletons**, pp. 115-118. J.L. Pons editor. John Wiley and Sons.
- 3. **Carmena J.M.** and Nicoletis M.A.L. (2005). Advances in Brain-Machine Interfaces. **Motor Cortex in Voluntary Movements**, pp. 349-366, A. Riehle and E. Vaadia (Eds.), CRC Press.
- 4. **Carmena J.M.** (2005). Brain-machine interfaces: a novel paradigm for the study of learning and adaptation. **Artificial Intelligence and Simulation of Behaviour Quarterly**, 122, pp. 3-4, ISSN 0268 4179.
- 5. **Carmena J.M.** (2004). Brain Versus Machine Control. **Public Library of Science Biology** 2(12), pp.5-6, e430.
- 6. **Carmena J.M.** (2001). Report of the IROS 2000 conference. **Artificial Intelligence and Simulation of Behaviour Quarterly**, 105, pp.11-12, ISSN 0268 4179.
- 7. **Carmena J.M.** and Domingo J. (1998). Artificial Intelligence: A panoramic view. **Boletín de Psicología**, 59, pp. 21-47. ISSN 0212 8179.

Edited Proceedings

1. Proceedings of the IWINAC Workshop on Robotics and Neurobiology. A. del Pobil, **J.M. Carmena** and Y. Demiris editors. Las Palmas de G. Canaria (Spain) 2005.
2. Proceedings of the SAB'02-Workshop on Motor Control in Humans and Robots: on the interplay of real brains and artificial devices. **J.M. Carmena** and G. Maistros editors. University of Edinburgh, 2002.
3. Proceedings of the Workshop on Biomimetic Ultrasound. **J.M. Carmena**, R. Müller, H. Peremans and J.C.T. Hallam editors. University of Edinburgh, 2000.

Dissertations

- **Carmena J.M.** (2001). Towards a bionic bat: A biomimetic investigation of active sensing, Doppler-shift estimation, and ear morphology design for mobile robots. **Ph.D. thesis**, University of Edinburgh (Scotland, UK).

- **Carmena J.M.** (1998). Cooperative tasks need versatile inter-robot communication systems? **M.S. thesis**, Dept. of Artificial Intelligence, U. of Edinburgh (Scotland, UK).
- **Carmena J.M.** (1997). Design and implementation of a microcontroller-based communication protocol: Applications to mobile robots. **M.S. thesis**, Department of Electronics Engineering, School of Physics, University of Valencia (Spain).

Featured Articles in the Press

- ❖ **Referenced Article:** Ganguly K. and **Carmena J.M.** PLoS Biology 7(7), e1000153. doi:10.1371/journal.pbio.1000153. **Featured in:** New York Times, IEEE Spectrum, Technology Review, Communications of the ACM, The Scientist, El Mundo, El Pais.
- ❖ **Referenced Article:** Ganguly K. and **Carmena J.M.** (2009). Learning to control a brain-machine interface for reaching and grasping by primates. PLoS Biology 1(2): e42 DOI: 10.1371/journal.pbio.0000042. **Featured in:** Time, The Economist, New York Times, Washington Post, Popular Science, New Scientist, The Times (UK), Independent (UK), The Guardian (UK), Associated Press.
- ❖ **Referenced Article:** **Carmena J.M.**, Kim D. and Hallam J.C.T. (2000). Designing artificial ears for animat echolocation. From Animals to Animats 6. Proceedings 6th Int. Conf. on Simulation of Adaptive Behavior, pp. 73-80, J-A. Meyer *et al.* (Eds.), MIT Press. **Featured in:** New Scientist, The Times (UK), Edinburgh Evening News (UK), Focus (EU).

Invited Talks & Guest Lectures

1. Keynote speaker. International Conference on Machine Learning and Cybernetics, Baoding (China), July 2009.
2. Instituto de Neurociencias, CSIC-Universidad Miguel Hernandez, San Juan, Spain, June 2009.
3. Distinguished lecture. Royal Academy of Medicine and Surgery, Murcia, Spain, June 2009.
4. Keynote speaker. Simposio CEA de Bioingenieria: Tecnicas de BCI. Universidad Miguel Hernandez, Elche, Spain, June 2009.
5. Satellite Workshop. Annual Meeting of the Society for the Neural Control of Movement. Waikoloa (HI), April 2009.
6. McGovern Institute Seminar, Massachusetts Institute of Technology, Cambridge (MA), January 2009.
7. Nanotechnology as an Enabler for Neuroscience, Neuroengineering and Neural Prostheses Workshop. Stanford University, Palo Alto (CA), December 2008.
8. Bio-E* Series. University of California, Berkeley (CA), October 2008.
9. Workshop on Environmental and BioMedical Monitoring Microsystems, BSAC, University of California, Berkeley (CA), September 2008.
10. Neuro-inspired and Neuro-applied Computing Workshop, Gigascale Systems Research Center, Berkeley (CA), August 2008.
11. NIH, National Institute on Alcohol Abuse and Alcoholism, Section on In Vivo Neural Function, Bethesda (MD), June 2008.

12. NIH, National Institute of Neurological Disorders and Stroke, Human Cortical Physiology Section, Bethesda (MD), June 2008.
13. IEEE-ICRA Workshop in wearable robots, Pasadena, CA, June 2008.
14. Catedra de Informatica y Salud. Universidad Politecnica de Valencia, Spain, June 2008.
15. Real-time brain interfacing applications workshop, Columbus (OH), May 2008.
16. 2nd Annual Berkeley Conference on Translational Research, University of California, Berkeley (CA), April 2008.
17. Computer Science and Engineering Department, University of Washington, Seattle (WA), February 2008.
18. Berkeley Wireless Research Center (BWRC) winter retreat, Monterey, CA, January 2008.
19. Keynote speaker. Brain Computer Interface Workshop, The MAIA project. Leuven (Belgium), November 2007.
20. Cognitive Computing, University of California, Berkeley (CA), May 2007.
21. Berkeley Initiative in Soft Computing (BISC) group, University of California, Berkeley (CA), February 2007.
22. Keynote speaker. Brain Computer Interface Workshop, The MAIA project. Rome (Italy), November 2006.
23. Pierce Community College, Los Angeles (CA), November 2006.
24. Bay Area Signals, Information and Control Symposium, University of California, Berkeley (CA), June 2006.
25. Grand Rounds, Department of Neurosurgery, University of California, San Francisco (CA), June 2006.
26. Redwood Center for Theoretical Neuroscience, University of California, Berkeley (CA), October 2005.
27. Guest lecture (host Dr. John Canny). Department of Electrical Engineering and Computer Science, University of California, Berkeley (CA), October 2005.
28. Epstein Laboratory, Department of Otolaryngology, University of California, San Francisco (CA), October 2005.
29. Department of Bioengineering, Stanford University, Palo Alto (CA), May 2005.
30. Alfred E. Mann Foundation for Biomedical Engineering, Valencia (CA), May 2005.
31. Department of Biomedical Engineering, University of Southern California, Los Angeles (CA), May 2005.
32. Department of Electrical Engineering and Computer Science, University of California, Berkeley (CA), April 2005.
33. Department of Biomedical Engineering, University of Minnesota, Minneapolis (MN), April 2005.
34. Cosyne Workshop on Emerging Directions in Cortical Brain-Machine Interfaces for Control. Snowbird, Salt Lake City (UT), March 2005.
35. Sensorimotor Program, Rehabilitation Institute of Chicago, Northwestern University Medical School, Chicago (IL), March 2005.
36. Department of Biomedical Engineering, Northwestern University, Evanston (IL), March 2005.
37. School of Biomedical Engineering, Science and Health Systems, Drexel University, Philadelphia (PA), March 2005.
38. Department of Neurobiology and Anatomy, Drexel University, Philadelphia (PA), March 2005.
39. Institute of Cognitive and Brain Sciences, University of California, Berkeley (CA), March 2005.
40. Department of Biomedical Eng., Rutgers University, Piscataway (NJ), Feb. 2005.
41. Guest lecture (host Dr. Craig Henriquez), Department of Biomedical Engineering, Duke University, Durham (NC), USA, November 2004.
42. Department of Biomedical Engineering. Yale University, New Haven, (CT), November 2004.
43. IEEE Eastern NC Section, Robotics and Automation Chapter. Research Triangle Park, (NC), November 2004.
44. Keynote speaker. IASTED International Conference on Artificial Intelligence and Soft Computing, Marbella (Spain), September 2004.
45. Department of Electronic and Electrical Engineering, Imperial College of Science, Technology and Medicine, London (UK), September 2004.
46. Talent Identification Program (TIP), Dept. of Biomedical Engineering, Duke University, Durham (NC), USA, June 2004.

47. Spinal Cord Symposium of the Christopher Reeve Paralysis Foundation, Oak Brook Hills, IL (USA), March 2004.
48. 1st Meeting on Advances in Neuroscience. Neurosciences Institute, University Miguel Hernandez, San Juan de Alicante (Spain), December 2003.
49. Guest lecture (host Dr. Craig Henriquez), Department of Biomedical Engineering, Duke University, Durham (NC), USA, November 2003.
50. Behavioral, Ecological and Sociobiological Topics talk, Department of Biological Anthropology and Anatomy, Duke University, Durham (NC), November 2003.
51. Talent Identification Program (TIP), Dept. of Biomedical Engineering, Duke University, Durham (NC), USA, July 2003.
52. Institute of Perception, Action and Behavior weekly seminar. Division of Informatics. University of Edinburgh, Scotland (UK), June 2000.
53. Signal Processing Group seminar, Department of Electronics, University of Valencia (Spain), December 1999.

Peer-review and Committee Functions

❖ Journal

- PNAS, Journal of Neurophysiology, Journal of Neuroscience Methods, European Journal of Neuroscience, Brain Research Bulletin, IEEE Transactions on Biomedical Engineering, IEEE Transactions on Neural Systems and Rehabilitation Engineering, IEEE Transactions on Neural Networks, Neurocomputing, Frontiers in Neuroprosthetics, Frontiers in Integrative Neuroscience. Associate Editor for IEEE Transactions on Systems, Man, and Cybernetics, parts A & B.

❖ Conferences

- Neural Information Processing Systems (NIPS), IEEE Neural Engineering Conference, IEEE/RAS-EMBS Int. Conf. on Biomedical Robotics & Biomechatronics, IEEE Engineering in Medicine and Biology (EMBC), Simulation of Adaptive Behavior (SAB).

Languages

Spanish	Native tongue
English	Fluent speaking, reading, and writing
Portuguese	Passive language skills only