KONRAD P. KORDING

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EDUCATION

2001	Ph.D, Physics, Federal Institute of Technology, Zurich
1997	Diploma, experimental physics and computational neuroscience

PROFESSIONAL APPOINTMENTS

2016 - present	Courtesy Appointment, Biomedical Engineering, Northwestern University
2015 - present	Full Professor, Physical Medicine and Rehabilitation, Physiology, Northwestern University
2014 - present	CI Chair, Rehabilitation Institute of Chicago
2011 - 2015	Tenured Associate Professor, Physiology, Physical Medicine and Rehabilitation, Northwestern University
since 2008	Courtesy Appointment, Applied Mathematics, Northwestern University
2006 - 2011	Assistant Professor, Physiology, Physical Medicine and Rehabilitation, Northwestern University
2006 - present	Research Scientist, Rehabilitation Institute of Chicago
2004 - 2006	Heisenberg Fellow, Computational Cognitive science and Bayesian statistics, MIT
2002 - 2004	Postdoctoral Fellow, Computational Motor Control, University College, London
2001 - 2002	Postdoctoral Fellow, Collegium Helveticum, Interdisciplinary Colloquium

ONGOING RESEARCH FUNDING

1. U01NS094248 Kording (PI) 9/1/15-8/31/18 total funding FY2015: $681,208 *Massive scale electrical neural recordings in vivo using commercial ROIC chips.* This collaborative brain initiative grant (multi-PI with Schaefer) develops technology to use existing infrared imaging chips to enable very large scale electrical recordings and to develop the techniques to analyze such data.
2. U01MH109100 Kording (PI) 9/1/15-8/31/18 FY2015: $677,177 *Sub-micrometer x-ray tomography for neuroanatomy* This collaborative brain initiative grant (multi-PI with Jacobsen) develops technology to adapt high resolution x-ray tomography methods at Argonne national lab for the use with brain data and to analyze such data.
3. R01MH103910 Kording (PI) 9/27/13-8/31/18 FY2015: $1,801,039 *Recording Neural Activities onto DNA* This collaborative transformative R01 (multi-PI with Boyden, Church) develops technology to record neural activities onto DNA, allowing offline extraction of neural activity information promising super-large scale recordings.
4. R01NS074044 Kording (PI) 7/1/11-4/30/16 FY2015: $326,238 *The Representation of Uncertainty in the Sensorimotor System* This project (mutli-PI with Miller) analyzes how the monkey brain represents uncertainty.

5. R01EY021579 Kording (PI) 4/1/12-3/31/16 FY2015: $376,478 *Neural Mechanisms of Fixation Choice While Search Natural Scenes* The overall goal of these experiments (multi-PI with Segraves) is to understand how the brain controls where we look. To accomplish this, it is important to study brain activity and behavior under conditions that closely approximate those in the real world.
6. R01NS063399 Kording (PI) 9/1/09-4/31/20 FY2015: $339,124 *The Role of Uncertainty in Human Motor Learning and Adaptation* This project analyzes the way human subjects deal with uncertainty during motor learning. A set of basic paradigms introduces perturbations and measures the results.
7. John Templeton Foundation 39147 Kording (PI) 12/1/14-5/31/16 FY2015: $110,000 *Understand biases and variance to improve scientific peer review* Here we propose to use data driven strategies, facilitated by a unique collaboration with Public Library of Science (PLOS), to understand and tune the scientific review process.
8. R01EB019406 Jayaraman (PI) 9/1/14-8/31/18 FY2015: $329,394 *Understanding Real-Life Falls in Amputees using Mobile Phone Technology* This study aims to use a mobile phone-based fall detection system in dysvascular amputees to detect falls, characterize the type of fall, analyze environmental conditions that may have contributed to the fall, and determine the longer-term consequences of each type of fall. Role: Co-I
9. NSF IIS 1427419 Peshkin (PI) 9/1/14-8/31/17 FY2015: $726,699 *NRI: Electrosense imaging for underwater telepresence and manipulation* The research creates electrosense hardware and practical testbeds, for navigation and for manipulation underwater. It investigates methods and software to facilitate human interpretation of electric images, as well as machine interpretation. Role: Co-I
10. NSF IIS-1317379 Hargrove (PI) 9/1/13-8/31/18 FY2015: $11,269 *NRI Small: Computational Motor Control for Better Control of Prosthetic Devices* True biomimetic prostheses, exoskeletons, and humanoid robot control will not be possible until there is a firm understanding of how humans integrate with these co-robots in the face of interacting sources of uncertainty. This computational motor project will provide transformative insight into how humans control movement in the presence of large uncertainty and thus fill a critical gap in the knowledge base of this field. The framework developed in this research will be of great interest to the motor-control research community and may be useful in the restoration of other movement disorders such as spinal cord injury and stroke. Role: Co-I
11. R01DC010014 Gottfried (PI) 5/18/14-4/30/19 FY2015: $212,993 Perceptual Coding and Modulation of *Odor Objects in the Human Brain* The major goal of this grant is to use high-resolution functional magnetic resonance imaging, multivariate analysis, and olfactory psychophysics to characterize odor quality coding in the human brain, and its modulation by learning, context, and experience. Role: Co-I
12. R01MH100482 Mohr (PI) 8/1/13-7/31/18 FY2015: $411,121 *Artificial Intelligence in a Mobile Intervention for Depression* The primary aim of this proposal is to develop and evaluate the use of state of the art machine learning approaches within a mobile intervention application for the treatment of major depressive disorder. Role: Co-I
13. P20MH090318 Mohr (PI) 8/4/11-7/31/16 FY2015: $634,467 *Technology Assisted Intervention for the Treatment and Prevention of Depression* The mission of this Center is to develop and pilot novel systems of care that can provide efficacious, scalable, cost-effective, patient friendly technology assisted behavioral interventions (TABIs) for the treatment and prevention of depression. Role: Co-I
14. NIDRR H133E130019 Rymer (PI) 10/01/13-9/30/18 FY2015: $56,416 *Rehabilitation Strate-*

gies, Techniques, and Interventions Dr. Kording will oversee the computational analysis core. Together with a postdoc he will analyze data from participant labs. He will use the data to calibrate models of multi-timescale learning making predictions of future performance. Role: Co-I

COMPLETED RESEARCH FUNDING

1. NSF 0939963 Perreault (PI) 10/01/09-9/30/14 *CPS Large: Cybernetic Interfaces* Cybernetic interfaces for the restoration of human movement through functional electrical stimulation. The goal of this award is to develop the user interface and feedback control systems for restoring human reaching through functional electrical stimulation. Role: Co-I
2. R01NS063399 Kording (PI) 9/1/09-8/31/14 *The Role of Uncertainty in Human Motor Learning and Adaptation* This project analyzes the way human subjects deal with uncertainty during motor learning. A set of basic paradigms introduces perturbations and measures the results.
3. P01NS044393 Grafton (PI) 9/1/09-8/31/14 *Spatial and Temporal Scales of Motor Sequence Learning* This project develops data analysis techniques for use in the labs of our collaborators on the program project grant: Strick, Turner and Grafton. These methods include but are not limited to: Bayesian response field analysis, functional connectivity methods, the fitting of multi-timescale models. Role: Collaborator
4. R01NS053603 Miller (PI) 1/1/11-2/28/14 *Primate Model of an Intra-Cortically Controlled FES Prosthesis for Grasp* The goal of this project is to develop a primate model of an upper extremity neuromuscular stimulation system controlled by means of intra-cortical recording electrodes. Role: Co-I
5. NSF IIS1010336 Kording (PI) 10/7/10-8/31/13 *Data Sharing: A Joint Database of Experiments and Models of Reaching Movement* This project proposes to develop a database that facilitates reaching scientists collaboration by sharing data and models. This process will be supported by workshops and support in data conversions.
6. R13NS083330 Kording (PI) 9/1/12-5/31/13 *Computational and Translational Motor Control* Dr. Kording will co-organize the logistical and programmatic aspects of the conference. Dr. Kording will select and invite speakers and will advertise the conference on national and international forums.
7. Chicago Biomedical Consortium C2006-00997/C-031 Kording (PI) 1/1/12-12/31/13 *A Molecular Chart Recorder* This project is aimed at shrinking the size of a recording setup by orders of magnitude to produce a molecular tape recorder - that writes time-varying neural activities onto individual DNA molecules.
8. Craig Neilson Foundation Small Thomas (PI) 9/1/08-8/30/10 *Automatic analysis of spasms in human muscles paralyzed by spinal injury* This project automizes the work of analyzing EMG recordings in patients with spinal cord injury.
9. R01 NS057814-01 Shadmehr(PI) 8/1/06 8/1/10 *CRCNS: A Bayesian Framework for Sensorimotor Learning and Control* This grant analyzes how the nervous system deals with statistical problems in the context of motor control.

SOFTWARE AND RESOURCES

Neural data

1. Python generalized linear models: `https://github.com/pavanramkumar/pyglmnet`
2. Spike data analysis python: `https://github.com/KordingLab/spykes`

3. Database of reaching experiments and models (result of a 3 year NSF data sharing project): `crcns.org/data-sets/movements/dream`
4. Connectomics data and analysis: `ericmjonas.github.io/connectodiscovery/`
5. Bayesian tuning curve estimation: `redwood.berkeley.edu/i-stevenson/code.html`

Science of science

1. Automatic reviewer assignment for scientific conferences (used by Cosyne conference): `bit.ly/1TaJmr8`
2. Realtime interest elicitation: `sf.scienceofscience.org`
3. Rocchio algorithm content-based suggestion based on topic distance space using Latent semantic analysis (LSA): `github.com/titipata/science_concierge`
4. Parser for pubmed: `github.com/titipata/pubmed_parser`

Behavior

1. Multi-timescale Kalman Filters for movement modeling: `www.nature.com/neuro/journal/v10/n6/suppinfo/nn1901_S1.html`
2. Virtual Wii fit (Arduino based) to have arbitrary input into a wii fit game: `redwood.berkeley.edu/i-stevenson/code.html`
3. Algorithms for inferring movement chunking: `github.com/daniel-acuna/chunk_inference`
4. Using Wii fit as an input to Matlab: `redwood.berkeley.edu/i-stevenson/code.html`
5. General lab resources: `klab.smpp.northwestern.edu/wiki/index.php5/Resources`

PUBLICATIONS

Peer Reviewed Research Articles

1. Marblestone AH, Wayne G and Kording KP (2016) Toward an Integration of Deep Learning and Neuroscience. *Front. Comput. Neurosci.* 10:94. doi: 10.3389/fncom.2016.00094
2. Dekleva BM, Ramkumar P, Wanda PA, Kording KP, Miller LE, Uncertainty leads to persistent effects on reach representations in dorsal premotor cortex *eLife* 5, e14316
3. Ramkumar P, Dekleva B, Cooler S, Miller L, Kording KP (2016) Premotor and Motor Cortices Encode Reward, *PloS one* 11 (8), e0160851
4. He K, Liang Y, Abdollahi F, Bittmann MF, Kording KP, Wei K (2016) The Statistical Determinants of the Speed of Motor Learning *PLoS Comput Biol* 12 (9), e1005023
5. Johnson RE, Kording KP, Hargrove LJ, Sensinger JW 2016 EMG versus torque control of human-machine systems: equalizing control signal variability does not equalize error or uncertainty *IEEE transactions on neural systems and rehabilitation engineering*
6. Ramkumar P, Acuna DE, Berniker M, Grafton ST, Turner RS, Kording KP (2016) Chunking as an integral strategy for effective motor learning *Nature Communications* in press
7. Chen Y, Zhang B, Kording KP (2016) Speed constancy or only slowness: What drives the Kappa effect *PLOS One* in press

8. Glaser JI, Wood DK, Lawlor PN, Ramkumar P, Phillips AN, Kording KP, Segraves MA (2016) The role of expected reward in frontal eye field during natural scene search, *Journal of Neurophysiology* in press
9. Berniker M, Jarc A, Kording KP, Tresch M (2016) A Probabilistic Analysis of Muscle Force Uncertainty for Control *IEEE Transactions on Biomedical Engineering* DOI 10.1109/TBME.2016.2531083
10. Chen Y, Kording KP (2016) Speed constancy or only slowness: What drives the Kappa effect. *PLOS One*
11. Saeb S, Zhang M, Karr CJ, Schueller SM, Corden ME, Kording KP, Mohr DC, (2015) Mobile phone sensor correlates of depressive symptom severity in daily-life behavior: an exploratory study *Journal of medical Internet research* 17 (7)
12. Glaser JI, Zamft BM, Church GM, Kording KP (2015) Puzzle Imaging: Using Large-Scale Dimensionality Reduction Algorithms for Localization *PloS one* 10 (7), e0131593
13. Saeb S, Kording KP, Mohr D (2015) Making Activity Recognition Robust against Deceptive Behavior. *PLOS One*
14. Vaidya M, Kording KP, Saleh M, Takahashi K, Hatsopoulos NG (2015) Neural coordination during reach-to-grasp *Journal of neurophysiology*, 114 (3), 1827-1836
15. Jonas, E, Kording KP (2015) Automatic discovery of cell types microcircuitry from neural connectomics. *eLife*, 4: e04250.
16. Ramkumar P, Fernandes H, Kording KP, Segraves (2015) Modeling peripheral visual acuity enables discovery of gaze strategies at multiple time scales during natural scene search. *Journal of Vision*, Vol.15, 19. doi:10.1167/15.3.19
17. Kilteni K, Maselli A, Kording KP, Slater M (2015) Over my fake body: body ownership illusions for studying the multisensory basis of own-body perception. *Frontiers in Human Neuroscience*, 9:141. doi: 10.3389/fnhum.2015.00141
18. Lancichinetti A, Sirer MI, Wang JX, Kording KP, Amaral L (2015) High-reproducibility and high-accuracy method for automated topic classification. *Physical Review X*, 5, 011007
19. Berniker M, Kording KP (2015) Deep networks for motor control functions. *Frontiers in computational neuroscience*, 9
20. Bolandzadeh N, Kording KP, Salowitz N, Davis JC, Hsu L, Chan A, Sharma D, Blohm G, Liu-Ambrose T (2015) Predicting cognitive function from clinical measures of physical function and health status in older adults. *PLoS ONE*, 10.3 e0119075.
21. Acuna DE, Berniker M, Fernandes HL, Kording KP (2015) Using psychophysics to ask if the brain samples or maximizes. *Journal of Vision*, 15(3), 7
22. Cybulski TR, Glaser JI, Marblestone A, Zamft BM, Boyden SE, Church GM, Kording KP (2014) Spatial information in large scale neural recordings. *Frontiers in Computational Neuroscience*, 8
23. Acuna DE, Wymbs NF, Reynolds CA, Picard N, Turner RS, Strick PL, Grafton S, Kording KP. (2014) Multifaceted aspects of chunking enable robust algorithms. *Journal of Neurophysiology*, 112 (8), 1849-1856
24. Sato Y, Kording KP (2014) How much to trust the senses: likelihood learning. *Journal of Vision*, 14(13):13. doi: 10.1167/14.13.13
25. Corbett EA, Kording KP, Perreault EJ (2014) Dealing with target uncertainty in a reaching control interface. *PLoS ONE*, 9 (1), e86811
26. Berniker MB, Franklin DW, Flanagan JR, Wolpert DM, Kording KP (2014) Motor learning of novel dynamics is not represented in a single global coordinate system: evaluation of mixed coordinate representations and local learning. *Journal of Neurophysiology*, 111 (6), 1165-1182

27. Walker B, Kording KP (2013) The Database for Reaching Experiments and Models. *PLoS ONE*, 8 (11), e78747
28. Wei K, Yan X, Kong G, Yin C, Zhang F, Wang Q, Kording KP (2014) Computer Use Changes Generalization of Movement Learning. *Current Biology*, 24 (1), 82-85
29. Fernandes H, Vilares I, Kording KP (in press) The Generalization of Prior Uncertainty during Reaching. *Journal of Neuroscience*, 34 (34), 11470-11484
30. Lawlor P, Rosner M, Rosner R, Kording KP (2014) Conceptualizing Cancer Drugs as Classifiers. *PLoS ONE*, DOI: 10.1371/ journal.pone.0106444
31. Wei K, Glaser J, Deng L, Thompson C, Stevenson IH, Wang Q, Hornby TG, Heckman CJ, Kording KP (2014), Serotonin affects movement gain control in the spinal cord. *Journal of Neuroscience*, 34.38 (2014): 12690-12700
32. Berniker MB, Buini HM, Kording KP (2014) The effects of training breadth on motor generalization. *Journal of Neurophysiology*, 112.11: 2791-2798
33. Johnson RE, Kording KP, Hargrove L, Sensinger JW (2014) Does EMG control lead to distinct motor adaptation? *Frontiers in Neuroscience*, 8, 302
34. Berniker M, Franklin DW, Flanagan JR, Wolpert DM, Kording KP(2013) Motor learning of novel dynamics is not represented in a single global coordinate system: evaluation of mixed coordinate representations and local learning. *Journal of Neurophysiology*, 111.6: 1165-1182
35. Walker B, Kording KP (2013) The Database for Reaching Experiments and Models. *PLoS ONE*, 8(11): e78747. doi:10.1371/journal.pone.0078747
36. Antos SA, Albert MB, Kording KP (2013) Hand, belt, pocket or bag: Practical activity tracking with mobile phones. *Journal of Neuroscience Methods*, 231: 22-30
37. Glaser JI, Zamft BM, Marblestone AH, Moffitt JR, Tyo K, Boyden ES, Church GE, Kording KP (2013) Statistical Analysis of Molecular Signal Recording. *PLOS Computational Biology*, 9(7): e1003145. doi:10.1371/journal.pcbi.1003145
38. Fernandes HL, Stevenson IH, Phillips AN, Segraves MA, Kording KP (2013) Saliency and saccade encoding in the frontal eye field during natural scene search. *Cerebral Cortex*, 24.12: 3232-3245
39. Albert MV, McCarthy C, Valentin J, Herrmann M, Kording KP, Jayaraman J (2013) Monitoring Functional Capability of Individuals with Lower Limb Amputations Using Mobile Phones. *PLoS ONE*, 8(6): e65340. doi:10.1371/journal.pone.0065340
40. Mhatre PV, Vilares I, Stibb SM, Albert MV, Pickering PTL, Marciniak CM, Kording KP, Toledo S (2013) Wii Fit Balance Board Playing Improves Balance and Gait in Parkinson Disease. *PMnR*, 5.9: 769-777
41. Marblestone AH, Zamft BM, Maguire YG, Shapiro MG, Cybulski TR, Glaser JI, Stranges PB, Kalhor R, Dalrymple DA, Seo D, Alon E, Maharbiz MM, Carmena JM, Rabaey JM, Boyden ES, Church GM, Kording KP (2013) Physical Principles for Scalable Neural Recording. *Frontiers in Computational Neuroscience*, 7:137. doi: 10.3389/fncom.2013.00137
42. Yan X., Wang Q., Lu Z., Stevenson IH, Kording KP, Wei K (2013) Generalization of unconstrained reaching with hand weight changes. *Journal of Neurophysiology*, 109(1): 137-146.
43. Berniker MB, O'Brien M, Kording KP, Ahmed A (2013) An examination of the generalizability of motor costs. *PLoS ONE*, 8(1)
44. Dam G, Kording KP, Wei K (2013) Credit Assignment during Movement Reinforcement Learning. *PLoS ONE*, 8(2): e55352. doi:10.1371/journal.pone.0055352 *Journal of Neurophysiology*, 109 (1), 137-146

45. Corbett EA, Perreault EJ, Kording KP. (2012) Decoding with limited neural data: a mixture of time-warped trajectory models for directional reaches. *Journal of Neural Engineering*, 9.3: 036002
46. Avraham G, Nisky I, Fernandes HL, Acuna DE, Kording KP, Loeb GE, Karniel A (2012) Towards Perceiving Robots as Humans Three handshake models face the Turing-like Handshake Test. *IEEE Transactions on Haptics*, 5.3: 196-207
47. Albert MV, Kording KP, Herrmann M, Jayaraman A, Fall classification by machine learning using mobile phones. *PLoS ONE*, 7(5): e36556.
48. Vilares I, Howard JD, Fernandes HL, Gottfried JA, Kording KP (2012) Differential Representations of Prior and Likelihood Uncertainty in the Human Brain. *Current Biology*, 22.18: 1641-1648
49. Fernandes HL, Stevenson IH, Kording KP (2012) Generalization of stochastic visuomotor rotations. *PLoS ONE*, 7(8), e43016
50. Zamft B, Marblestone A, Kording KP, Schmidt D, Martin-Alarcon D, Tyo K, Boyden E, Church GM (2012), Measuring Cation Dependent DNA Polymerase Fidelity Landscapes by Deep Sequencing. *PLoS ONE*, e43876
51. Bowman NE, Kording KP, Gottfried JA (2012) Temporal Integration of Olfactory Perceptual Evidence in Human Orbitofrontal Cortex. *Neuron*,, 75:5, 916-927
52. Yan X, Wang Q, Lu Z, Stevenson IH, Kording KP, Wei K (2012) Generalization of unconstrained reaching with hand weight changes. *J. Neurophys*, 109(1), 137-146
53. Ding Q, Stevenson IH, Wang N, Li W, Sun Y, Wang Q, Kording KP, Wei K (2012) Motion games improve balance control in stroke survivors: a preliminary study based on the principle of constraint-induced movement therapy. *Displays*, 34(2), 125-131
54. Stevenson IH, London BM, Oby ER, Sachs NA, Reimer J, et al. (2012), Functional Connectivity and Tuning Curves in Populations of Simultaneously Recorded Neurons. *PLOS Computational Biology*, 8(11): e1002775. doi:10.1371/journal.pcbi.1002775
55. Albert MV, Toledo S, Shapiro M, Kording KP (2012), Using mobile phones for activity recognition in Parkinson's patients. *Frontiers in Neurology*, 3:158. doi: 10.3389/fneur.2012.00158
56. Albert MV, Catz N, Thier P, Kording KP (2012), Saccadic gain adaptation is predicted by the statistics of natural fluctuations in oculomotor function. *Frontiers in Computational Neuroscience*, 6:96. doi: 10.3389/fncom.2012.00096
57. Wei K, Wert D, Kording KP (2011) The nervous system uses nonspecific motor learning in response to unpredictable perturbations. *Journal of Neurophysiology*, 104:3053-3063.
58. Fernandes HL, Albert MV, Kording KP (2011) Measuring generalization of visuomotor perturbations in wrist movements using mobile phones *PLoS ONE*, 6(5): e20290
59. Vilares I, Dam G, Kording KP (2011) Trust and Reciprocity: Are effort and money equivalent? *PLoS ONE*, 6(2): e17113.
60. Stevenson IH, Kording KP (2011) How advances in neural recording affect data analysis. *Nature Neuroscience*, 14, 139142.
61. Stevenson IH, Cherian A, London BM, Sachs N, Lindberg E, Reimer J, Slutzky MW, Hatsopoulos NG, Miller LE, Kording KP (2011), Statistical assessment of the stability of neural movement representations. *Journal of Neurophysiology*, 106: 764-774.
62. Berniker MB, Kording KP (2011) Estimating the Relevance of World Disturbances to Explain Savings, Interference and Long-Term Motor Adaptation Effects. *PLoS Computational Biology*, 7(10): e1002210.
63. Wei K, Kording KP (2010) Uncertainty of feedback and state estimation determines the speed of motor adaptation. *Frontiers in Computational Neuroscience*, 4:11. doi:10.3389/fncom.2010.00011
64. Cronin B, Stevenson IH, Sur M, Kording KP (2010) Hierarchical Bayesian modeling and

Markov chain Monte Carlo sampling for tuning curve analysis. *Journal of Neurophysiology*, 103: 591-602 PMID: 19889855

65. Dokka K, Kenyon RV, Keshner EA, Kording KP (2010) Self versus Environment Motion in Postural Control. *PLOS Computational Biology*, 6(2): e1000680. doi:10.1371/journal.pcbi.1000680
66. Stevenson IH, Kording KP (2010) On the Similarity of Functional Connectivity between Neurons Estimated across Timescales. *PLoS ONE*, 5(2): e9206. doi:10.1371/journal.pone.0009206
67. Wei K, Stevenson IH, Kording KP (2010) The uncertainty associated with visual flow fields and their influence on postural sway: Weber's law suffices to explain the nonlinearity of vection. *Journal of Vision*, 10(14): 4.
68. Berniker M, Voss M, Kording KP (2010) Learning Priors for Bayesian Computations in the Nervous System. *PLoS ONE*, 5(9): e12686.
69. Stevenson I, Cronin B, Sur M, Kording KP (2010) Sensory adaptation and short term plasticity as Bayesian correction for a changing brain. *PLoS ONE*, 5(8): e12436.
70. Rebesco JM, Stevenson I, Kording KP, Solla SA, Miller LE (2010) Rewiring neural interactions by micro-stimulation. *Frontiers in Systems Neuroscience*, 4:39
71. Stevenson IH, Fernandes HL, Vilares I, Wei K, Krding KP (2009) Bayesian Integration and Non-Linear Feedback Control in a Full-Body Motor Task. *PLOS Computational Biology*, 5(12): e1000629. doi:10.1371/journal.pcbi.1000629
72. Howard IS, Ingram JN, Kording KP, Wolpert DM (2009) Statistics of natural movements are reflected in motor errors. *Journal of Neurophysiology*, 102:1902-1910.
73. Stevenson IH, Rebesco JM, Hatsopoulos NG, Haga Z, Miller LE, Kording KP (2009), Bayesian inference of functional connectivity and network structure from spikes. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 17, 3: 203-213
74. Dam G, Kording KP (2009) Exploration and exploitation in movement learning. *Cognitive Science*, 33 (3), 530-541
75. Berniker MB, Kording KP (2008) Motor Adaptation: Estimating the sources of errors. *Nature Neuroscience*, 11, 1454 - 1461
76. Wei K, Kording KP (2008), Relevance of error: what drives motor adaptation. *Journal of Neurophysiology*, doi:10.1152/jn.90545.2008
77. Schummers J, Cronin B, Wimmer K, Stimberg M , Martin R, Obermayer K, Kording, KP, Sur M (2008) Dynamics of orientation tuning in cat V1 neurons depend on location within layers and orientation maps. *Frontiers in Neuroscience*, 1,1:145-159. doi:10.3389/neuro.01.1.1.011.2007
78. Ingram J, Howard I, Kording KP, Wolpert DM (2008). The statistics of natural hand movements. *Experimental Brain Research*, 188(2):223-36. PMID: 18369608.
79. Dowman M, Savova V, Griffiths TL, Kording KP, Tenenbaum JB, Purver M (2008). A probabilistic model of meetings that combines words and discourse features. *IEEE Transactions on Audio, Speech, and Language Processing*, 16, 1238-1248.
80. Kording KP, Beierholm U, Ma WJ, Quartz S, Tenenbaum JB, Shams L (2007) Causal inference in multisensory perception. *PLoS ONE*, 2(9): e943. doi:10.1371/journal.pone.0000943
81. Kording KP, Tenenbaum, JB, Shadmehr R (2007) The dynamics of memory are the consequence of optimal adaptation to a changing body. *Nature Neuroscience*, 10, 779
82. Kording KP, Ku SP, Wolpert D (2004) Bayesian Integration in force estimation. *Journal of Neurophysiology*, 92(5):3161-5
83. Hafner VV, Fend M , Konig P, Kording KP (2004) Predicting Properties of the Rat Somatosensory System by Sparse Coding. *Neural Information Processing Letters and Reviews*, 4(1): 11-18
84. Kording KP, Fukunaga I, Howard IS, Ingram J, Wolpert DM (2004) A neuroeconomics

approach to measuring human loss functions. *PLOS Biology*, 2(10): e330 doi: 10.1371/journal.pbio.0020330

85. Kording KP, Wolpert D. (2004) The loss function of sensorimotor learning. *Proceedings of the National Academy of Sciences*, 101:9839-42
86. Kording KP, Wolpert D. (2004) Bayesian Integration in Sensorimotor Learning. *Nature*, 427:244-247
87. Kording KP, Kayser C, Einhauser W, Konig P (2004) How are complex cell properties adapted to the statistics of natural scenes? *Journal of Neurophysiology*, 91(1):206-212
88. Klein DJ, Konig P, Kording KP (2003) Sparse spectrotemporal coding of sound. *EURASIP Journal on Applied Signal Processing*, 7, 659667
89. Betsch, B, Einhauser W, Kording KP, Konig P (2003) The world from a cat's perspective. *Biological Cybernetics*, in 90(1):41-50
90. Einhauser W, Kayser C, Kording KP, Konig P (2003) Learning distinct and complementary feature-selectivities from natural colour videos. *Reviews in the Neurosciences*, 14, p. 43-52, 2003.
91. Kording KP, Kayser C, Konig P (2003) On the choice of a sparse prior. *Reviews in the Neurosciences*, 14, p. 53-62, 2003
92. Kayser C, Kording KP, Konig P. (2003). Learning the nonlinearity of neurons from natural visual stimuli. *Neural Computation*, 15(8) 1751-1759.
93. Einhauser W, Kayser C , Konig P, Kording KP (2002) Learning the invariance properties of complex cells from natural stimuli. *European Journal of Neuroscience*, 15(3):475-86
94. Kording KP, Kayser C, Betsch B, Konig P (2001) Non contact eye-tracking on cats. *Journal of Neuroscience Methods*, 110:103-111
95. Kording KP, Konig P (2001) A spike based learning rule for the generation of invariant representations. *Journal of Physiology, Paris*, 94:539-548
96. Kording KP, Konig P (2001) Neurons with two sites of synaptic integration learn invariant representations. *Neural Computation*, 13:2823-2849
97. Kording KP, Konig P. (2001) Supervised and unsupervised learning with two sites of synaptic integration. *Journal of Computational Neuroscience*, 11:207-215
98. Siegel M, Kording KP, Konig P (2000) Integrating top-down and bottom-up sensory processing by somato-dendritic interactions. *Journal of Computational Neuroscience*, 8:161-173
99. Kording KP, Konig P (2000) A learning rule for local decorrelation and dynamic recruitement. *Neural Networks*, 13:1-9
100. Kording KP, Konig, P (2000) Learning with two sites of synaptic integration. *Network: Computation in Neural Systems*, 11:25-39

Reviewed Editorials, Reviews, Chapters, Books, and Commentaries

1. Ma W, Goldreich D, Kording KP, Bayesian Modeling of perception and action, text book, under contract. *Oxford University Press*
2. Sternad D, Kording KP (2015) Carrot or stick in motor learning. *Nature neuroscience*, 18.4 : 480-481.
3. Corbett E, Ethier C, Oby ER, Kording KP, Perreault EJ, Miller LE (2012) Advanced User Interfaces for Upper Limb FES, Book chapter in *Introduction to neural engineering for motor rehabilitation*, eds. Farina, D, Jensen, W, Akay, M.
4. Kording KP (2014) Bayesian statistics: relevant for the brain? *Current opinion in neurobiology*, 25, 130-133
5. Acuna DE, Allesina S, Kording KP (2012) Future impact: Predicting scientific success.

Nature, 489:7415, 201-202
6. Sober SJ, Kording KP (2012) What silly postures tell us about the brain. *Frontiers in Neuroscience*, 6:154. doi: 10.3389/fnins.2012.00154
7. Fernandes H, Kording KP (2011) In praise of false models and rich datasets. *Journal of Motor Behavior*, 42: 343-349.
8. Shapiro M, Kording KP (2011) Looking for synergies between the equilibrium point hypothesis and internal models, Commentary on Latash: Equilibrium Point Hypothesis
9. Trommershauser J, Kording KP, Landy M (eds) (2011) book: Sensory Cue Integration. *Oxford University Press*, edited
10. Wei K, Kording KP (2011) Causal inference in sensorimotor learning and control. In: Trommershauser, J., Kording, K., and Landy, M.S. (eds) Cue combination
11. Vilares I, Kording KP (2011) Bayesian models: the structure of the world, uncertainty, behavior, and the brain. *Annals of the New York Academy of Sciences*, 1224: 2239.
12. Kording KP (2011) Of toasters and molecular ticker tapes. *PLoS Computational Biology*, 7(12): e1002291. doi:10.1371/journal.pcbi.1002291
13. Berniker MB, Kording KP (2010) Bayesian Approaches to Sensory Integration for Motor Control, Chapter. *WIREs Cognitive Science*,
14. Berniker MB, Wei K, Kording KP (2010) Bayesian approaches to modeling action selection, in *CUP book: Modeling natural action selection*, Anil Seth, editor
15. Stevenson IH, Rebesco, JM, Miller LE, Kording KP (2009) Inferring the functional connections between neurons. *Current opinion in neurobiology*, 18: 582-588
16. Kording KP (2009) Bayesian Statistics (with Particular Focus on the Motor System), in *encyclopedia of neuroscience*, Part 2, 355-359
17. Kording KP (2007) Decision theory: what should the nervous system do? , Review. *Science*, 318: 606-610
18. Kording KP, Wolpert D (2006) Probabilistic mechanisms in sensorimotor control. *Novartis Foundation symposium*, 270:191-8
19. Kording, Wolpert D. (2006) Bayesian decision theory in sensorimotor control. *Trends in Cognitive Sciences*, 10(7) 320-326
20. Kayser C, Kording KP, Konig P (2004) Processing of complex stimuli and natural scenes in the visual cortex. *Current opinion in Neurobiology*, 14(4), 468-473
21. Kording KP, Wolpert DM (2004) Bayesian Statistics and Utility Functions in Sensorimotor Control. In *Bayesian Brain*, Doya K, Ishii S, Pouget A, Rao RPN (eds), MIT Press

Peer Reviewed Conference Papers

1. Corbett E, Perreault E, Kording KP (2011) Mixture of time-warped trajectory models for movement decoding. *Advances in Neural Information Processing Systems*, 22
2. Berniker MB, Kording KP (2011) Discrete-time local dynamic programming. *American Control Conference*, pp. 618-625
3. Stevenson IH, Kording KP (2011) Inferring spike-timing-dependent plasticity from spike train data. *Advances in Neural Information Processing Systems*, 24
4. Stevenson IH, Kording KP (2010) Causal Inference for Depth Perception. *Advances in Neural Information Processing Systems*, 21
5. Beierholm U, Kording KP, Shams L, Ma WJ (2009). Comparing Bayesian models for multisensory cue combination without mandatory integration. *Advances in Neural Information Processing Systems*, 20, 81-88. MIT Press, Cambridge, MA
6. Purver M, Kording KP, Dowman M, Savova V, Griffiths TL, Kording KP, Tenenbaum JB, Purver M (2008). A probabilistic model of meetings that combines words and discourse

features. *IEEE Transactions on Audio, Speech, and Language Processing*, 16, 1238-1248.

7. Kording KP, Tenenbaum JB, Shadmehr R (2006) Multiple timescales and uncertainty in motor adaptation. *Advances in Neural Information Processing Systems*, 19, eds. Scholkopf, B, Platt, J and Hoffman, T, p 745-752.
8. Kording KP, Tenenbaum JB (2006) Causal inference in sensorimotor integration. *Advances in Neural Information Processing Systems*, 19, eds. Scholkopf B, Platt J, Hoffman T, p 737-744.
9. Kording KP, Wolpert DM (2003) Probabilistic inference in human sensorimotor processing, *Advances in Neural Information Processing Systems*, 16, ed S.Thrun, L. Saul, B. Scholkopf. MIT Press
10. Hafner VV, Fend M, Lungarella M, Pfeifer R, Konig P and Kording KP (2003) Optimal coding for naturally occurring whisker deflections. *Lecture notes in Computer Science*
11. Einhauser W, Kayser C, Kording KP, Konig (2002) Learning Multiple Feature Representations from Natural Image Sequences. *Artificial Neural Networks*, Springer Verlag Berlin Heidelberg New York.
12. Kording KP, Konig P, Klein DJ (2002) Learning of sparse auditory receptive fields. *International Joint Conference on Neural Networks*
13. Kayser C, Einhauser W, Dummer O, Konig P, Kording KP (2001) Extracting slow subspaces from natural videos leads to complex cells. *International conference on artificial Neural Networks*
14. Kording KP, Konig P (2000) Two sites of synaptic integration: Relevant for learning. *International Joint Conference on Neural Networks*

HONORS AND AWARDS

2015	General Chair, Cosyne conference
2014	Program Chair, Cosyne conference
2013	Transformative R01 to record neural activities onto DNA
2012 - present	Senior editor (deputy) for PLOS Computational Biology
2010 - 2014	Selected into the Faculty of 1000 - Post Publication Peer Review
2009	Elected to co-lead the annual Advances In Computational Motor Control meeting
2005	Heisenberg stipend by the German Science Foundation, to explore links between cognitive science and neuroscience.
1997-2001	Graduate Support: Boehringer Ingelheim Fonds
1993-1997	Undergraduate Support: Studienstiftung des Deutschen Volkes

KEYNOTE AND INVITED PRESENTATIONS

2015	University of Pennsylvania
2015	Johns Hopkins University
2015	University of Chicago
2015	NICE symposium, Albuquerque
2015	Janelia Farm
2015	DARPA brain meeting

2015	Columbia university
2015	Neural control of movement
2014	Kavli Futures NTC Symposium
2014	Rochester
2014	NSF workshop: scaling of neural recording technologies
2014	NETI meeting, Austin, Statistics of natural movements
2014	Beijing University, Bayesian modeling of movement
2014	Cosyne conference, Large amounts of neural data: why it is coming and why it is important
2014	Northwestern Physiology talk, Recording all neurons
2013	NIPS workshop, Acquiring and Analyzing the Activity of Large Neural Ensembles
2013	Purdue, A unifying computational view on motor control
2013	Janelia Farm, structure discovery in big neural data
2013	Harvard/MIT, DNA recording
2013	Leuven neurotechnology meeting
2013	Ann Arbor Wisdom symposium
2013	Germany Osnabrueck meeting
2013	Cosyne workshop, recording large datasets
2013	CBC meeting on cancer, An new view on cancer drugs
2012	Edinborough meeting, Motor control
2012	Rauischholzhausen meeting on decision making
2012	Baylor visit
2012	Cosyne workshop, Motor control
2012	Pittsburgh talk
2011	NIPS
2011	Germany osnabrueck
2011	Philadelphia talk
2011	Cosmo summer school
2011	Osnabrueck
2011	Rehabilitation Institute of Chicago, Parkinsons course, organized by Halper, Toledo, Kording and others The wii fit as a training device
2011	New York Academy of Sciences, Workshop Critical function of the orbitofrontal cortex for behavior The representation of priors and likelihoods
2010	University of Chicago, Computational Neuroscience series Reverse engineering how neurons interact
2010	University of Chicago, MacLean lab, Bayesian inference of neuronal interactions from spikes
2010	Frankfurt Institute of Advanced Studies, Germany, Departmental meeting The future of experimental neuroscience
2010	RIC Parkinsons Disease day The use of the Wii Fit as a rehabilitation device
2010	University of Minnesota, Psychology department - Uncertainty, its relevance for movement and its neural representation
2010	Sapporo, Japan, Workshop, Mechanism of Brain and Mind - Causal inference in motor control and perception
2010	Machine Learning Summer school, organized by Schoelkopf, Griffiths, Tenenbaum and others, Sardinia, Italy - Bayesian modeling of action and perception

2010 Machine Learning Summer school, organized by Schoelkopf, Griffiths, Tenenbaum and others, Sardinia, Italy - Neuroscience, cognitive science and machine learning

2010 Computations, Decisions and Movement workshop, Rauischolzhausen, Germany Nonlinear Bayesian approaches

2010 Computational and Systems Neuroscience workshop: The doom of models of optimality Its not the end of the road

2010 Computational and Systems Neuroscience workshop: High level perception as Bayesian Inference - Structure inference for depth perception

2009 Gulbenkian, Portugal, Departmental talk - Normative Models of Brain function

2009 NIPS workshop: Uncertainty and optimal control - Estimating the Sources of Motor Errors

2009 Notre Dame, AME Department Bayesian approaches to understand the brain

2009 Johns Hopkins, special workshop on skill acquisition Coordinate frames

2009 Computational Vision workshop, Germany - Economics of movements

2009 Neural Control of Movement, Naples FL Tutorial: Bayesian Methods

2009 Israel Motor Days, Beer Sheva, Causes of Motor Errors: Why We Adapt the Way We Do

2008 Cue combination, unifying perceptual theory, Germany Causal inference in cue combination

2008 Caltech, Brain Mind Society Seminar - A normative view on Learning

2008 Symposium Computational Neuroscience BCCN, Germany Normative approaches to understand brain function

2008 Dutch Neuroscience Meeting Endo-Neuro-Psycho, Doorwerth, - Why do people adapt the way they do?

2008 Rotterdam, Estimating the sources of errors in reaching

2008 Amsterdam, Causal inference for reaching

2008 Gulbenkian, Portugal, Department series Causal inference in movement

2008 Vision Sciences Society meeting, Naples, FL, Symposium on Bayesian methods The role of causal inference in perception

2008 University of Pennsylvania, ITMAT Symposium, Decision theory in human behavior

2008 Columbia University, Neurotheory Seminar Series, Optimal adaptation for movement and neural computations

2008 National Academy of Sciences panel for the Army The use of decision theory

2008 Computational and Systems Neuroscience Workshop Normative Models

2008 Marquette, Biomedical Engineering - Estimating the sources of movement errors

2007 Autumn school, Vision and Movement, Wildbad Kreuth Normative Models

2007 University of California, Los Angeles, Institute of Pure and Applied Mathematics workshop - Using Decision Theory to understand Motor Control

2007 Tuebingen, Germany Modeling saccadic gain adaptation

2007 Workshop Delmenhorst, Germany - Normative Models in Neuroscience

2007 Shanghai, Normative models of motor Control: why do we move the way we do?

2007 Cosyne workshop, Asking why, Normative models in neuroscience Introduction and Discussion

2006 New York University, Neuroeconomics group Bayesian approaches to motor control

2006	Giessen, Germany
2006	Cornell University
2006	Yale University
2006	Brown
2006	Okinawa Computational Neuroscience meeting
2005	Paris, Math and Brain workshop: Bayesian statistics in the brain
2005	University of Chicago, Computational Neuroscience series
2005	Johns Hopkins University
2005	Computational and Systems Neuroscience Workshop
2005	Harvard
2005	Zurich, Switzerland
2005	University of California, Berkeley
2004	UCL London

TEACHING EXPERIENCE

Northwestern University

2012 - present	Quantitative methods and experimental design, with CJ Heckman and others
2009-present	Bayesian Brain, co-directed and co-developed with Sara Solla
2008	directed Great Experiments in cognitive and computational neuroscience
2007, 2009, 2010	Participation in Great Experiments course
2009	Neuroscience Fundamentals, participation

Invited lecturer for many national and international intensive courses, including:

2016	SFN course data science and data skills for neuroscientists
2012-2013,2015	Computational and Systems Motor control summer school
2011	Computational Cognitive Science Summer School, Osnabrueck, Germany
2011	Motor control summer school, Kingston, Canada
2010	Machine Learning Summer school, organized by Schoelkopf, Griffiths, Tenenbaum and others, Sardinia, Italy
2009	Gulbenkian Institute, Lisbon, Portugal
2008	Gulbenkian Institute, Lisbon, Portugal
2007	Autumn school, Vision and Movement, Wildbad Kreuth
2007	University of California, Los Angeles, Institute of Pure and Applied Mathematics workshop
2007	Delmenhorst, tutorial on normative approaches
2007	International Spring School on Computational Neurobiology, Shanghai China
2006	Okinawa Computational Neuroscience Course

PROFESSIONAL SERVICE

Peer Review

Senior Editor for PLOS Computational Biology.
Referee for *Behavioral and Brain Sciences, Cognitive Science Conference, Cognitive Science, Current Biology, Experimental Brain Research, Human Movement Science, Journal of Motor Behavior, Journal of Neurophysiology, Journal of Neuroscience, Journal of Vision, Nature, Nature Neuroscience, Neural Computation, Neuron, the Neural Information Processing Systems Conference, Proceedings of the National Academy of the USA, Physics Letters A, PLOS Computational Biology, PLOS One, Rheumatology, Science, Social Neuroscience, Transactions in Biomedical Engineering, Trends in Cognitive Science, Visual Neuroscience*

University and Departmental Service

2015	Physiology department faculty search, 2015
2014	Joint Physiology faculty search for a systems/cellular neuroscientist
2012	RIC planning committee for the brain subsection
2010-2013	Physiology faculty search for a systems neuroscientist
2008-2009	Physiology faculty search for a systems neuroscientist at a junior rank
2009	RIC/NU search for a leader of the sensorimotor performance program with appointment at Northwestern University
2009-2009	Northwestern University Interdepartmental Institute of Neuroscience (NUIN) Curriculum committee

PROFESSIONAL AFFILIATIONS

2016	Northwestern Institute on COmplex systems (NICO)
2014	Knowledge Lab
2014	Northwester Center for Behavioral Intervention Therapies (CBITS)
2008	American Association of Physiology
2006	Neural Control of Movement Society
2002	German Neuroscience Foundation
2002	Society for Neuroscience

LANGUAGES

English:	fluent reading, writing, speaking.
German:	native reading, writing, speaking.
French:	fluent reading, writing, speaking.