Curriculum Vitae
Friedrich T. Sommer

Current Address:
Redwood Center for Theoretical Neuroscience
University of California, Berkeley
132 Barker
Berkeley, CA 94720-3190, USA
Phone: +1 510 643 1472; FAX : +1 510 643 4952
Email: fsommer@berkeley.edu

Current Position:

2005-present Adjunct Associate Professor, Redwood Center for Theoretical Neuroscience & Helen Wills Neuroscience Institute, University of California, Berkeley

2002-present Faculty member (Privatdozent), Computer Science Department, University of Ulm

Education:

Degrees

2002 Habilitation, Computer Science, University of Ulm

1993 Ph.D., Physics, University of Düsseldorf

1987 Diploma in Physics, University of Tübingen

Postdoctoral Fellowships

1994-1995 Section of Experimental Magnetic Resonance of the Central Nervous System, University of Tübingen

1993-1994 Department of Neural Information Processing, University of Ulm

Professional Experience:

2002-2005 Principal Investigator, Redwood Neuroscience Institute, Menlo Park, CA, USA

2004-2005 Visiting Scholar, Helen Wills Neuroscience Institute, University of Berkeley, USA

1996-2002 Assistant Professor, Computer Science Department, University of Ulm, Germany

1999 Visiting scholar, Brain & Cognitive Science Department, MIT, Boston, USA

1995-1996 Staff Scientist, Institute of Medical Psychology & Department of Neuroradiology, University of Tübingen, Germany

1993-1995 Research Associate, Computer Science Department, University of Ulm, Germany

1988-1993 Research Assistant, Vogt-Institute of Brain Research and Neuroanatomy, University of Düsseldorf, Germany

Funding Support:

Intramural Awards

1999-2001 Ph.D. student salary, University of Ulm

1997-1998 Ph.D. student salary, University of Tübingen

Extramural Awards

1999-2002 German governmental research award (funds 1 PI and 1 Postdoc position) Principal Investigator

1999-2000 Ph.D. student salary, German Society of Endomitriosis

1996-1999 Habilitation-Fellowship of the German Research Foundation (DFG)

Teaching Experience:

Lecture Courses

2005 *Computational Neuroscience* (*MCB262/PSYCH290P),* University of California Berkeley, One of 6 Lecturers

2005 *Statistics of natural stimuli, a potential key to brain function* (University of Ulm), Lecturer

2003 *Computational Neuroscience* (*MCB262/PSYCH290P),* University of California Berkeley, One of 4 Lecturers

2002 *Information Retrieval and Associative Memories,* University of Ulm, Lecturer

2001 *Computational Neuroscience,* University of Ulm, Lecturer

2000 *Theoretical Methods for the Interpretation of Medical Functional Imaging Data* University of Ulm, Lecturer

1998 & 2000 *Information Retrieval,* University of Ulm, Lecturer

1997 & 1998 *Associative Memories: Conventional and Neural,* University of Ulm, Lecturer

1997 *Neural Cell Assemblies,* University of Ulm, One of 2 Lecturers

Teaching Assistance

1988 – 1993 *Graduate courses "Theory of Neural Networks",* University of Düsseldorf

1986 *Undergraduate course "Theoretical Thermodynamics",* University of Tübingen

1985 *Undergraduate course "Theoretical Electrodynamics",* University of Tübingen

Ph.D. Students (co-adviser)

2004-2005 Vishal Vaingankar, doctoral candidate, University of Southern California

2003-2005 Martin Rehn, doctoral candidate, Royal Institute of Technology, Stockholm

2003-2005 Xin Wang, doctoral candidate, University of Southern California

1999-2004 Andreas Knoblauch, Ph. D. 2004, University of Ulm

1997-2002 Axel Baune, Ph. D. 2002, University of Ulm

1994-1997 Wolfgang Kopold, Ph. D. 1997, University of Ulm

Diploma/Master Students in Computer Science (advisor)

2000-2002 Volker Schmitt, Diploma Thesis 2002, University of Ulm

1997-1999 Urs Vollmer, Diploma Thesis 1999, University of Ulm

1997-1999 Thomas Gunsch, Diploma Thesis 1999, University of Ulm

Post Graduate Fellows

2003-2005 Kilian Koepsell, Ph. D. Redwood Neuroscience Institute

1999-2003 Andrzej Wichert, Ph.D., University of Ulm

University and Public Service:

Doctoral Committees

2005 Christopher Tengrove, University of Technology, Sydney, Australia

2004 Dr. Andreas Knoblauch, University of Ulm, Germany

2004 Dr. Anders Sandberg, Royal Institute of Technology, Stockholm, Sweden

2001 Dr. Usha Sreedevi Sridar, University of Sydney, Australia

2000 Dr. Gracia Del Rosario, Saybrook Research Center, San Francisco, USA

Miscellaneous

2000 Imaging Center Development, University of Ulm, Planning Committee

1996-1999 Interdisciplinary seminar series on Theoretical Neuroscience at the Universities of Tübingen and Ulm, Organizer

1994 Exhibit of neural hardware for information retrieval, CeBit, Hannover, Germany, Presenter

1989-1991 Interdisciplinary seminar series on "Brain and Mind", University of Düsseldorf, Organizer

Other Professional Activities:

Journal Reviews

Biological Cybernetics

Human Brain Mapping

International Journal of Neural Systems

Journal of Theoretical Medicine

Neural Networks

Neural Computation

Neurocomputing

NeuroImage

NMR in Biomedicine

Physics Letters A

Physiological Measurement (IOP)

Public Library of Science – Biology

IEEE Signal Processing Letters

IEEE Transactions on Neural Networks

IT-Information Technology

Theory in Biosciences

Membership in Academic Societies

1986 - German Physical Society (DPG)

2003 - Society for Neuroscience

Conferences

2005 International conference *Neural Information Processing (NIPS)*, Program Chair

2003 Workshop *Inference and Prediction in Neocortical Circuits*, Palo Alto, CA, sponsored by AIM, NSF and RNI, Planning Committee

2002 European Conference on Artificial Intelligence (ECAI), Lyon, France, Reviewer

2001 Annual Conference of the Cognitive Science Society, Edinburgh, UK, Reviewer

2000 International Joint Conference on Neural Networks (IJCNN), Como, Italy, Reviewer

1999 Fest-Symposium for Guenther Palm, University of Ulm, Germany, Organizer

1998 "Local and global information processing in the cortex" Schloss Reisensburg, Guenzburg, Germany, Planning Committee

Workshops

2005 Redwood Center Inaugural Symposium, University of California, Berkeley, Chair and Planning Committee

2003 Inference and prediction in neocortical circuits, American Institute of Mathematics, Palo Alto, Planning Committee

2002 Neural assemblies: development in theory and experiment, Computational Neuroscience Conference (CNS), Chicago, IL, 2002 (Proceedings published in Theory in Biosciences), Workshop Organizer

2000 Explorative analysis and data modeling in functional neuroimaging. Neural Infromation Processing Conference (NIPS), (Proceedings published by the MIT Press), Workshop Organizer

National and International Lectures

Theoretical approaches for understanding neural representation and memory in the brain. CBB Seminar, University of California, Berkeley, USA 9/2005

Testing cell assemblies with fMRI. Computational Neuroimaging Workshop, Organizers: B. Wandell and K. Grill-Spector, Stanford University, Palo Alto, USA, 7/2004

Cortical inference with sparse associative memories. Workshop of the Canadian Institute of Advanced Research, Organizer: Geoffrey Hinton, Vancouver, Canada, 12/2003

Associative memory with spiking neurons. Workshop "Inference and prediction in the cortex" American Institute of Mathematics, Palo Alto, USA, 9/2003

Cell assemblies and associative memories. Department of Biomedical Engineering, University of Southern California, Los Angeles, USA, 11/2002

Associative memory in neuronal networks: spatial and temporal coding. Workshop at the Computational Neuroscience Conference. Chicago, IL, USA, 7/2002

Exploratory data analysis in event-related fMRI: Application on working memory. Department of Diagnostic Radiology and Applied Physics, Yale University, New Heaven, CT, USA 7/2001

Exploratory data analysis in functional neuroimaging. (Invited Lecture) 3rd Tutorial on Neuro-fMRI, Tuebingen, Germany 3/2001

Dynamical cluster analysis for fMRI. Workshop at the Neural Information Processing Systems (NIPS) Conference, Denver, CO, USA 12/2000

Analysis and Bayesian foundation of associative memory models. Max Planck Institute of Mathematics in the Sciences, Leipzig, Germany 7/2000

Activation processes and information processing in the brain. University of Aachen, Germany, 5/1999

Adaptive cluster analysis of functional magnetic resonance data. University of Düsseldorf , Germany 3/1999

Improved retrieval in associative memories. Division of System & Circuit Technology, Heinz Nixdorf Institute, University of Paderborn, Germany 11/1998

Cell assemblies and associative memory. Department of Brain and Cognitive Science, MIT, Boston, MA, USA 5/1998

Neural associative memories: Models derived from probabilistic reasoning. Center for Biological and Computational Learning, MIT, Boston, MA, USA 3/1998

Simulation of a cortical network using anatomical data. (Invited Talk) Workshop on Information Processing in Cells and Tissues, IPCAT96, Düsseldorf, Germany 10/1996

Cell assemblies, associative memory and back. Max Planck Institute of Psychological Research, Munich, Germany, 3/1996

Neural information processing with local synaptic learning rules. Department of Psychology, University of Tübingen, Germany 11/1995

Iterative retrieval in associative memory. Computer Science Faculty, Technical University Munich, Germany, 11/1994

Neural associative memories as modules for information processing systems. Workshop "Neuronales Lernen", CoWAN '94, Technical University Cottbus, Germany, 10/1994

Iterative Retrieval of Sparsely Coded Associative Memory Patterns. NeuroNet '93 Conference, Prague, Chech Republic, 9/1993

Definitions and results of information capacity for associative memories. Symposium on Physics of Neural Networks, Bad Honnef, Germany, 2/1992

Publications:

Books

1. Sommer F. T., Wichert A., Editors (2003) Exploratory analysis and data modeling in functional neuroimaging. MIT Press, Cambridge, MA, ISBN 0-262-19481-3

2. Sommer F. T. (1994) Theorie neuronaler Assoziativspeicher – Lokales Lernen und iteratives Retrieval von Information. Hänsel-Hohenhausen, Egelsbach, ISBN 3-89349-901-6

Journal Articles

1. Rehn, M., Sommer, F. T. (2006) A network that uses few active neurones to code visual input predicts the diverse shapes of cortical receptive fields. *submitted*

2. Rehn, M., Sommer, F. T. (2006) Storing and restoring visual input with collaborative rank coding and associative memory *Neurocomputing (in the press)*

3. Sommer, F. T., Kanerva, P. (2006) Can neural models of cognition benefit from the advantages of connectionism? *Behavioral and Brain Sciences (in the press)*

4. Sommer, F. T., Wennekers T. (2005) Synfire chains with conductance-based neurons: internal timing and coordination with timed input. *Neurocomputing* 65-66:449-454

5. George, D., Sommer, F. T. (2005) Computing with inter-spike inverval codes in networks of integrate and fire neurons. *Neurocomputing* 65-66:414-420

6. Martinez, J. M., Wang, Q., Reid, R. C., Pillai, C., Alonso, J.-M., Sommer F. T., Hirsch, J.A. (2005) Receptive field structure varies with layer in the primary visual cortex. *Nature Neuroscience* 8: 372 - 379

7. Knoblauch A., Sommer F. T. (2004) Spike-timing dependent plasticity can form "zero-lag" links for cortical oscillations. *Neurocomputing* 58-60:185-190

8. Glatting, G., Mottaghy, F. M., Karitzky, J., Baune, A., Sommer, F. T., Landwehrmeyer, G. B., Reske, S. N. (2004) Improving binding potential analysis in [11C]raclopide PET studies using cluster analysis. *Medical Physics* 31: 902-906

9. Hirsch, J.A., Martinez, J.M., Pillai, C., Alonso, J.-M., Wang, Q., Sommer F. T. (2003) Functionally distinct inhibitory neurons at the first stage of visual cortical processing. *Nature Neuroscience* 6 : 1300-1308

10. Knoblauch A., Sommer F. T. (2003) Synaptic plasticity, conduction delays and inter-areal phase relations of spike activity in a model of reciprocally connected areas. *Neurocomputing* 52-54:301-306

11. Sommer F. T., Wennekers T. (2003) Models of distributed associative memory networks in the brain *Theory in Biosciences* 122: 70-86

12. Knoblauch A., Wennekers T., Sommer F. T. (2002) Is voltage dependent synaptic transmission in NMDA receptors a robust mechanism for working memory? *Neurocomputing* 44-46:19-24

13. Sommer F. T., Wennekers T. (2001) Associative memory in networks of spiking neurons. *Neural Networks* 14: 825-834

14. Vollmer U., Sommer F. T. (2000) Coexistence of short and long term memory in a network of realistic neurons. *Neurocomputing* 38-40: 1031-1036

15. Sommer F. T., Wennekers T. (2000a) Modeling studies on the computational function of fast temporal structure in cortical circuit activity. *Journal of Physiology, Paris* 94: 473-488

16. Sommer F. T., Wennekers T. (2000b) Associative memory in a pair of cortical groups with reciprocal connections. *Neurocomputing* 38-40: 1575-1580

17. Sommer F. T. (2000) On cell assemblies in a cortical column. *Neurocomputing* 32-33: 517-522

18. Kötter R., Sommer F. T. (2000) Global relationship between anatomical connectivity and activity propagation in the cerebral cortex. *Philosophical Transactions of the Royal Society: Biological Sciences* 355: 127-134

19. Wennekers T., Sommer F. T. (1999) Gamma-oscillations support optimal retrieval in associative memories of Pinsky-Rinzel neurons. *Neurocomputing* 26-27: 573-578

20. Baune A., Sommer F. T., Erb M., Wildgruber D., Kardatzki B., Palm G., Grodd W. (1999) Dynamical cluster analysis of cortical fMRI activation. *NeuroImage* 6: 477-489

21. Sommer F. T., Palm G. (1999) Improved bidirectional retrieval of sparse patterns stored by Hebbian learning. *Neural Networks* 12: 281-297

22. Sommer F. T., Dayan P. (1998) Bayesian retrieval in associative memories with storage errors. *IEEE Trans. Neural Networks* 9: 705-713

23. Schwenker F., Sommer F. T., Palm G. (1996) Iterative retrieval of sparsely coded associative memory patterns. *Neural Networks* 9: 445-455

24. Palm G., Sommer F. T. (1992) Information capacity in recurrent McCulloch-Pitts networks with sparsely coded memory states. *Network* 3: 177-186

25. Frodl P., Sommer F. T., Hau K., Wahl F. (1990) On the effective interaction of two hydrogen centres in niobium. *Z. f. Naturforsch*. 43a: 857-866

26. Hau K., Frodl P., Gnirß M., Sommer F. T., Wahl F. (1989) A microscopic theory of a α-phase hydrogen in niobium. *Z. f. physikalische Chemie* 163: 549-554

27. Hau K., Frodl, P. Sommer F. T., Wahl F. (1988) A microscopic theory of a single hydrogen centre in niobium. *Z. f. Naturforsch*. 43a: 914-922

28. Sommer, F. T., Hau, K., Wahl F. (1988) Calculation of the excitation energies of a hydrogen impurity in niobium. *Z. f. Naturforsch*. 43a: 923-929

Book Chapters

1. Sommer F. T., Hirsch, J.A., Wichert A. (2003) Theories, data analysis, and simulation models in neuroimaging—An overview. To appear in *Exploratory analysis and data modeling in functional neuroimaging*, Eds. F. T. Sommer, A. Wichert, MIT Press, Cambridge, MA

2. Wichert A., Walter H., Grothe, J., Abler, B., Sommer F. T. (2003) Detection of task-related activity during working memory using event-related fMRI. To appear in *Exploratory analysis and data modeling in functional neuroimaging*, Eds. F. T. Sommer, A. Wichert, MIT Press, Cambridge, MA

3. Kötter R., Nielsen, P., Dyhrfjeld, J., Sommer, F.T., Northoff, G. (2002) Multi-level integration of quantitative neuroanatimical data. *Computational Neuroanatomy: Principles and Methods*. Ed.: G. Ascoli, Humana Press Inc., Totowa, NJ

4. Baune, A., Wichert, A., Glatting, G., Sommer, F.T. (2001) Dynamical cluster analysis for the detection of microglia activation. *Artificial Neural Nets and Genetic Algorithms*. Eds. V. Kurkova, N. C. Stelle, R. Neruda, M. Karny. Springer, Wien 442 - 445

5. Wichert A., Baune A. Grothe J., Grön G., Walter H., Sommer F. T. (2001a) Interpretation of event-related fMRI using cluster analysis. *Artificial Neural Nets and Genetic Algorithms*. Eds. V. Kurkova, N. C. Stelle, R. Neruda, M. Karny. Springer, Wien 446 - 448

6. Wichert, A., Kestler, H., Walter, H., Groen, G., Baune, A., Grothe, J., Wunderlich, A., Sommer, F.T. (2001b) Explorative detection of delay activity during a working memory task. *Proceedings 4th International Conference on Neural Networks and Expert Systems in Healthcare*. Ed. G. M. Papadourakis. Technological Educational Institute of Crete, Heraklion 266 - 271

7. Sommer F. T., Wennekers T., Palm G. (1998) Bidirectional completion of cell assemblies in the cortex. In *Computational Neuroscience: Trends in Research* 1998, Plenum Press, New York

8. Sommer F. T., Palm G. (1998) Bidirectional retrieval from associative memory. In *Advances in Neural Information Processing Systems* 10, MIT Press, Cambridge, MA, USA, pp. 675 - 681

9. Sommer F. T., Kötter R. (1997) Simulating a network of cortical areas using anatomical connection data in the cat. In *Computational Neuroscience: Trends in Research* 1997, Plenum Press, NewYork, pp. 511-517

10. Palm G., Schwenker F., Sommer F. T., Strey A. (1997) Neural associative memory. In *Associative Processing and Processors*, Eds. A. Krikelis, C. C. Weems. IEEE CS Press, Los Alamitos, CA, USA, pp. 307-326

11. Sommer F. T., Schwenker F., Palm G.(1995) Assoziative Speicher als Module in informationsverarbeitenden Systemen. In *Contributions to the workshop Aspekte Neuronalen Lernens*, Eds. L. Cromme, J. Wille, T. Kolb. TU Cottbus Press, 109-122

12. Wennekers T., Sommer, F. T., Palm G. (1995) Iterative retrieval in associative memories by threshold control of different neural models. In *Supercomputers in Brain Research: From Tomography to Neural Networks*, Eds. H. J. Herrmann, D. E. Wolff, E. Pöppel. World Scientific, Singapore, pp. 301-319

13. Palm G., Sommer F. T. (1995) Associative data storage and retrieval in neural nets. In *Models of Neural Networks III*, Eds. E. Domany, J. L. van Hemmen, K. Schulten. Springer, New York, pp. 79-118

14. Palm G., Sommer F. T. (1994) Associative memory and sparse similarity preserving codes. In *From Statistics to Neural Networks: Theory and Pattern Recognition Applications*, Ed. V. Cherkassky. Springer NATO ASI Series F, New York, pp. 282-302

15. Palm G., Sommer F. T. (1991) Information and pattern capacities in neural associative memories with feedback for sparse memory patterns. In *Neural Network Dynamics*, Eds. J. G. Taylor, E. R. Caianello, R. M. J. Cotterill, J. W. Clark. Springer, New York, pp. 3-18

Selected Recent Abstracts

Koepsell, K., Wei, Y., Wang, Q., Wang, X., Vaingankar, V., Hirsch, J. A., Sommer F.T. (2005) Ongoing retinal activity explains variability of thalamic responses. Soc. Neurosci. Abstr.

Wang, X., Wei, Y., Wang, Q., Vaingankar, V., Koepsell, K., Sommer F.T. Hirsch, J. A. (2005) Supression from the center of the thalamic receptive field preceeds bursts of action potentials evoked by natural movies. Soc. Neurosci. Abstr.

Koepsell, K., Wei, Y., Wang, Q., Wang, X., Hirsch, J. A., Sommer F.T. (2004) Spike timing in thalamic relay cells during natural stimuli. Soc. Neurosci. Abstr.

Wang, X., Wang, Q., Wei, Y., Koepsell, K., Sommer F.T. Hirsch, J. A. (2004) Retinal and local constributions to the thalamic receptive field. Soc. Neurosci. Abstr.

Wichert, A., Walter, H., Groen, G., Baune, A., Grothe, J., Wunderlich, A., Sommer F.T. (2001d) Interpretation of event-related fMRI using cluster analysis. Neuroimage (13) (2001) 282

Ruckgaber, J., Glatting, G., Karitzky, J., Baune, A., Sommer, F.T., Neumaier, B., Reske, S.N. (2001) Clusteranalyse in der Positronen-Emissions-Tomographie des Hirns mit C-11-PK11195. Nuklearmedizin (40) (2001) A95

Baune, A., Erb, M., Sommer, F.T., Wildgruber, D., Klose, U., Grodd, W. (1997) Evaluation of fast fMRI measurments in motorcortex: comparing a new cluster analysis with z-mapping. Experimental Brain Research, Vol. 117, Suppl. 50