

# Dr. Markus Loecher

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- WORK EXPERIENCE
- ◇ **Founder/President** of the consulting company DataInsight (2003). Clients include:
    - *Siemens Corporate Research*
    - *Nonlinear Solutions, Inc.*
    - *Siemens Westinghouse Power Corporation*
  - ◇ **Member of Technical Staff**, Siemens Corporate Research Princeton, NJ (1999 – 2003)
  - ◇ **Research Scientist**, Department of Physics, Georgia Institute of Technology, Atlanta, GA (March 1998 – September 1999)
  - ◇ **Postdoctoral Researcher**, Physics Department, The Ohio State University, Columbus, OH (July 1997 – February 1998)
  - ◇ **Research/Teaching Assistant**, Ohio University, Athens, OH (October 1991 – October 1995)
- EDUCATION
- ◇ **Rutgers University**, Piscataway, NJ.  
Graduate Statistics course work leading to a Masters (GPA: 4).
  - ◇ **Ohio University**, Athens, OH.  
Ph.D. in Physics, 1997 (GPA: 3.95).
  - ◇ **University of Cologne**, Cologne, Germany.  
Bachelor in Physics (minor Mathematics), 1990.
- EXPERTISE
- Mathematical Modeling, Data Mining, Machine learning, Complex Networks, Nonlinear Dynamics
- RESEARCH PROJECTS
- ◇ Predictive Modeling  
Adapted state-of-the-art models such as decision trees, adaptive regression splines, SVMs and random forests to specific industrial needs
  - ◇ Design of Data Collection  
Blocking, Split-Plot Design, Fractional Factorials, Nested Designs
  - ◇ Blind Source Separation  
Independent Component Analysis (ICA), Sparse Algorithms, GLM
  - ◇ Data Quality  
Investigated effects of data ill conditioning on predictive power of statistical models
  - ◇ Lifetime estimation for X-ray tubes  
Development and implementation of a nonlinear regression algorithm in C++:  
resulting lifetime prediction module is standard part of the Siemens CT software
  - ◇ Failure prediction algorithms  
Fusion of traditional statistical survival analysis with anomaly detection algorithms
  - ◇ Signal processing for Siemens–Westinghouse  
Responsible for all data mining and signal processing tasks
  - ◇ Proactive Detection of Software Aging and Intrusion  
Adapted autoassociative networks to novel framework

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- SKILLS      ◇ C, C++, Matlab, Splus/R, SAS, Mathematica, Unix & C, BUGS  
              ◇ Fluent spoken/written English and German
- RECENT TALKS      *Hierarchical Propagation of epidemics in scale-free networks*,  
                          APS March Meeting, Baltimore, 2006.  
                          *Statistics of Complex Networks*,  
                          Statistical Mechanics Meeting, Rutgers University, December 2005.  
                          *Probabilistic models of cumulative damage*,  
                          Maintenance And Reliability CONFERENCE (MARCON 03), Knoxville, TN, May 5, 2003.  
                          *Cumulative effect regression*,  
                          invited talk, Southwest Conference on Industrial and Interdisciplinary Mathematics, Colorado State University, Fort Collins, CO, March 1, 2003.  
                          *Noise Sustained Patterns*,  
                          invited talk, APS Centennial Meeting, Atlanta, GA, March 24, 1999.
- PATENTS      *Markov transition probabilities for predictive maintenance*,  
                          M. Loecher, US patent P 9074.  
                          *Neural network-based virtual age estimation for remaining lifetime prediction*,  
                          C. Darken and M. Loecher, US patent 00 P 9072.  
                          *Polynomial based virtual age estimations for remaining lifetime prediction*,  
                          M. Loecher and C. Darken, US patent 00 P 9073.  
                          *A generic, computer-based approach to the estimation of asset lifetimes*,  
                          C. Darken, W. Hasling, M. Loecher, and A. Mueller, US patent P24463us01.  
                          *Controlled Stochastic Resonance Circuit*, US Patent 6, 285, 249 B1 Sept 4, 2001.
- BOOKS      *Noise Sustained Patterns: Fluctuations and Nonlinearities*,  
                          M. Loecher, World Scientific Lecture Notes in Physics, World Scientific (2003).  
                          *Experimental Control of Chaos in Electronic Circuits*,  
                          G. A. Johnson, M. Löcher and E. R. Hunt, in "Control of Chaos: From Theory to Application", ed. by H. G. Schuster, VCH (1998).
- CONFERENCE PROCEEDINGS      *Concurrent estimation of time-to-failure and effective wear*,  
                          M. Loecher and C. Darken, Maintenance And Reliability CONFERENCE (MARCON 03), Knoxville, TN, May 4-7, 2003.  
                          *Noise Sustained Kink Propagation in Pseudo-Excitable Systems*,  
                          M. Löcher, D. Cigna and E. R. Hunt, Proceedings of the International Conference on Non-linear Dynamics: Integrability and Chaos, Bharathidasan University, Tiruchirapalli, India, February 1998.  
                          *Control of a system with two unstable manifolds*,  
                          M. Löcher, D. Cigna and E. R. Hunt, Proceedings of the 4th Experimental Chaos Conference, Florida Atlantic University, August 1997.
- REFEREED ARTICLES      *Failure Prediction Based on Wear Estimation*,  
                          C. Darken and M. Loecher, submitted to IEEE Transactions on Reliability (2006).  
                          *Theory of controlling stochastic resonance*,  
                          Markus Löcher, Mario Inchiosa, Joseph Neff, Adi Bulsara, K. Wiesenfeld, Luca Gammaitoni, Peter Hänggi, and William Ditto, Phys. Rev. E **62**, 317 (2000).  
                          *Noise sustained propagation: Local versus global noise*,  
                          M. Löcher, N. Chatterjee, F. Marchesoni, W. L. Ditto, E. R. Hunt, Phys. Rev. E **61**, 4954 (2000).

*Controlling Stochastic Resonance,*

Luca Gammaitoni, Markus Löcher, Adi Bulsara, Peter Hänggi, Joseph Neff, Kurt Wiesenfeld and William Ditto, Phys. Rev. Lett. **82**, 4574 (1999).

*Noise enhanced propagation,*

J. F. Lindner, S. Chandramouli, A.R. Bulsara, M. Löcher, and W. L. Ditto, Phys. Rev. Lett. **81**, 5048 (1998).

*Stochastic Resonance in coupled nonlinear dynamic elements,*

M. Löcher, D. Cigna, E. R. Hunt, G. A. Johnson, F. Marchesoni, L. Gammaitoni, A. R. Bulsara and M. E. Inchiosa, CHAOS **8**, 604 (1998).

*Noise sustained propagation of a signal in coupled bistable electronic elements,*

M. Löcher, D. Cigna and E. R. Hunt, Phys. Rev. Lett. **80**, 5212 (1998).

*Control of high-dimensional chaos in systems with symmetry,*

M. Löcher and E. R. Hunt, Phys. Rev. Lett. **79**, 63 (1997).

*Stability Analysis of Fixed Points via Chaos Control,*

M. Löcher, G. A. Johnson and E. R. Hunt, CHAOS **7** (4), 590 (1997).

*Stabilizing Spatiotemporal Patterns in a Convectively Unstable Open Flow System Via Kink-Antikink Pairs,*

M. Löcher, G. A. Johnson and E. R. Hunt, "Chaos, Solitons and Fractals", **8**, 1523 (1997).

*Spatiotemporal Stochastic Resonance in a System of Coupled Diode Resonators,*

M. Löcher, G. A. Johnson and E. R. Hunt, Phys. Rev. Lett. **77**, 4698 (1996).

*Parametric feedback resonance in chaotic systems,*

H. G. Schuster, E. Niebur, E.R. Hunt, G. A. Johnson, M. Löcher, Phys. Rev. Lett. **76**, 400 (1996).

*Stable states and kink dynamics in a system of coupled diode resonators,*

G. A. Johnson, M. Löcher, E. R. Hunt, Physica D **96**, 367-437 (1996).

*Stabilized spatiotemporal waves in convectively unstable open flow systems,*

G. A. Johnson, M. Löcher, E. R. Hunt, Phys. Rev. E **51**, R1625-1628 (1995).

REFERENCES

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