

Curriculum Vitae

General Information

Name: Keith Linn Downing
Birthdate: July 1, 1961
Nationality: United States Citizen
Occupation: Professor of Computer Science
Address: Department of Computer and Information Sciences
The Norwegian University of Science and Technology (NTNU)
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Education

- Computer Science Ph.D. - The University of Oregon (1990)
- Mathematics B.A. (summa cum laude) - Bucknell University (1983)

Previous Computer Science Positions

- SINTEF - IKU Environmental Modelling (Trondheim, Norway, 1993- 1995) - Research scientist.
- SINTEF Automatic Control (Trondheim, Norway, 1992-93) - Research scientist.
- Linkoping University (Linkoping, Sweden, 1990-92) - Postdoctoral researcher.
- The University of Oregon (Eugene, Oregon, 1983-90) - Graduate teaching and research assistant.
- Xerox PARC (Palo Alto, California, 1987) - Summer intern.
- Hewlett Packard (Cupertino, California, 1984) - Summer intern

Teaching Experience

- Evolutionary Computation and Neural Networks (NTNU, 1997-present)
- Functional programming in LISP (NTNU, 1997-2008; Univ. of Oregon, 1989)
- Artificial Intelligence Programming (NTNU, 2009-present)
- Introductory Artificial Intelligence (NTNU, 2001, present)
- Advanced Artificial Intelligence (Østersund, Sweden, 2004-2007)
- Software Project (NTNU, 1998-2000)
- Doctoral Seminar in Computer Science Research Methods (NTNU, 1998-2003)
- Introduction to Computer Programming (NTNU, 1996)
- Qualitative Modelling and Simulation (Linkoping, 1991-2)

Visiting Research Positions

- Dept. of Neuroscience (Oberlin College, 2011-12)
- Computer Science (University of Oregon, Autumn 2005)
- Cognitive Neuroscience Summer School (Dartmouth College, Summer 2005)
- Dept. of Computer Science (Ohio State University, Autumn 2002)
- Dept. of Computer Science (Kent State Univ., Summer 1999)
- Program for the Study of Complex Systems (Univ. of Michigan, Summer 1997)
- Complex Systems Summer School (Santa Fe Institute, Summer 1996)

Main Fields of Competence

- Artificial life
- Evolutionary computation
- Artificial intelligence
- Computational neuroscience
- Modelling and simulation of natural systems

Invited Lectures (since 2000)

- Evolving Artificial Intelligence. The 2nd International Conference on Bio-Inspired Cognitive Architectures, Washington D.C. (Nov. 2011)
- Exploring Neural Mechanisms for Prediction, 5th Workshop on the Anticipatory Behavior in Adaptive Learning Systems (ABiALS), Beilefeld, Germany (Feb. 2011)
- Predictive Models in the Brain. The 16th Symposium on Cognitive Science and Information Technology (KVIT-2007). Linköping, Sweden, 2007.
- Scenic Views along the Low Road to Intelligence. *The 13th Symposium on Cognitive Science and Information Technology (KVIT-2004)*. Linköping, Sweden, 2004.
- Essential Supplies along the Low Road to Artificial Intelligence. *The 8th Scandinavian Conference on Artificial Intelligence* Bergen, Norway, 2003.
- Combinations of Evolution and Learning in Artificial Adaptive Systems. *The Annual Conference of the Swedish Artificial Intelligence Society*. Skövde, Sweden, 2001.
- Applying Artificial Life Techniques to Gaia Research. *The 2nd Chapman Conference on the Gaia Hypothesis*. Organized by the American Geophysical Union in Valencia, Spain, 2000.

Main Publications

Refereed Journals (First Author)

- Downing, K. (2012). Neural Predictive Mechanisms and Their Role in Cognitive Incrementalism. *New Ideas in Psychology* (in press)
- Downing, K. (2009). Predictive Models in the Brain. *Connection Science*, 21(1), pp. 39-74.
- Downing, K. (2007). Neuroscientific Implications for Situated and Embodied Artificial Intelligence. *Connection Science*, 19(1), pp. 75-104.
- Downing, K. (2005). Tantrix: A Minute to Learn, 100 (Genetic Algorithm) Generations to Master. *Genetic Programming and Evolvable Machines*, 6(4), pp. 381-406.
- Downing, K. (2004) Development and the Baldwin effect. *Artificial Life*. 10(1), pp. 36-64.
- Downing, K. (2002). The simulated emergence of distributed environmental control in evolving microcosms. *Artificial Life* , 6(2), pp. 123-153.
- Downing, K. (2001). Reinforced genetic programming. *Genetic Programming & Evolvable Machines*, 2(3), pp. 259-288.
- Downing, K. and P. Zvirinsky (1999). The simulated evolution of biochemical guilds: Reconciling gaia theory and natural selection. *Artificial Life*. Vol. 5(4), pp. 291-318.
- Downing, K. (1998). Using evolutionary computational techniques in environmental modelling. *Environmental Modelling and Software*, vol. 13, Elsevier Publishers, pp. 519-528.
- Downing, K. (1997). EUZONE: Simulating the Evolution of Aquatic Ecosystems. *Artificial Life*. Vol. 3(4), pp. 307-333.
- Downing, K. and M. Reed (1996) Object-oriented migration modelling for biological impact assessment. *Ecological Modelling*, Elsevier Publishers, vol 93, pp. 203-219.
- Downing, K. (1993) Physiological applications of consistency-based diagnosis. *Artificial Intelligence in Medicine Journal*. vol 5, pp. 65-82.
- Downing, K. (1990) The qualitative criticism of circulatory models via bipartite teleological analysis. *Artificial Intelligence in Medicine Journal*, vol. 2, pp. 149-171.
- Downing, K. and J. Shrager (1988) Causes to clauses: managing assumptions in qualitative medical diagnosis. *International Journal of AI in Engineering*, vol. 3(4), pp. 192-199.

Refereed Journals (Contributing Author)

- Slagstad, D., Downing, K., Carlotti, F. and Hirche, H. (1999). Modelling the carbon export and air-sea flux of CO₂ in the Greenland Sea. *Deep Sea Research II*, Pergamon Press.

Refereed Conferences & Workshops (First author)

Downing, K. (2012). Heterochronous Neural Baldwinism. Proceedings of the 13th International Conference on the Simulation and Synthesis of Living Systems (ALife 13), East Lansing, Michigan, pp. 37-44.

Downing, K. (2010). The Baldwin Effect in Developing Neural Networks. *Proceedings of the 12th Genetic and Evolutionary Computation Conference (GECCO-2010)*, Portland, Oregon, pp. 555-562 (Best paper nomination).

Downing, K. (2007). Supplementing Evolutionary Developmental Systems with Abstract Models of Neurogenesis. *Proceedings of the 9th Genetic and Evolutionary Computation Conference (GECCO-2007)*, London, England, pp. 990-996.

Downing, K. (2005). The Predictive Basis of Situated and Embodied Artificial Intelligence. *Proceedings of the 7th Genetic and Evolutionary Computation Conference (GECCO-2005)*, Washington, D.C., pp. 43-50.

Downing, K. (2004). Artificial Life and Natural Intelligence. *Proceedings of the 6th Genetic and Evolutionary Computation Conference (GECCO-2004)*, , Seattle, WA., pp. 81-92.

Downing, K. (2003). Developmental Models for Emergent Computation. *Proceedings of the 5th International Conference on Evolvable Systems: From Biology to Hardware*, Trondheim, Norway, pp. 105-116.

Downing, K. (2001) Modular Designer Chemistries for Artificial Life. *Proceedings of the 3rd Genetic and Evolutionary Computation Conference (GECCO-2001)* , San Francisco, California, pp. 845-852.

Downing, K. (2001) Adaptive Genetic Programs via Reinforcement Learning. *Proceedings of the 3rd Genetic and Evolutionary Computation Conference (GECCO-2001)* , San Francisco, California. pp. 19-26.

Downing, K. (2000). Exploring Gaia Theory: Artificial Life on a Planetary Scale. *Proceedings of the 7th International Conference on Artificial Life*, Portland, Oregon.

Downing, K. (1998). Combining genetic programming and genetic algorithms for ecological simulation. *Proceedings of the 3rd International Conference on Genetic Programming*, Madison, Wisconsin. pp. 48 - 53.

Downing, K. (1997) The emergence of insect protandry: a "natural" evolutionary computation application. *Proceedings of the 4th IEEE International Conference on Evolutionary Computation*, Indianapolis, Indiana, pp. 325-330.

Downing, K. (1997) The emergence of emergence distributions: using genetic algorithms to test biological theories. *Proceedings of the 7th International Conference on Genetic Algorithms*, East Lansing, Michigan.

Downing, K. (1996) . A data-driven, object-oriented approach to migration modelling. *Pacific Symposium on Biocomputing*, Kohala Coast, Hawaii.

Downing, K. (1992). Analyzing genetic regulatory systems via focused envisionment. *Proceedings of the 6th Annual Qualitative Reasoning Workshop*, Edinburgh, Scotland.

Downing, K. (1992). Consistency-based diagnosis in physiological domains. *Proceedings of the 10th National Conference on Artificial Intelligence*, pp. 558-563.

Downing, K. (1987). Diagnostic improvement through qualitative sensitivity analysis and aggregation. *Proceedings of the 6th National Conference on Artificial Intelligence*, pp. 789-793.

Book Chapters (First author)

Downing, K. (2004). Gaia in the Machine: Artificial Life Approaches. *Scientists Debate Gaia: The Next Century*, MIT Press. pp. 267-280.

Downing, K. (1999). Applications of genetic algorithms to the classic job-shop scheduling problem: an introduction and survey of recent research. *Intelligent design, manufacturing and management: Nordic-Baltic Summer School '98 Lecture Notes* (eds. K. Wang and J. Grundspenkis). Riga University of Technology Publishers, Riga, Latvia.

Downing, K. (1992) A qualitative teleological approach to cardiovascular physiology. *Recent Advances in Qualitative Physics*, (eds. P. Struss and B. Faltings), MIT Press.

Downing, K. Fickas, S. (1991) A qualitative modeling tool for specification criticism. *Conceptual Modelling, Databases, and CASE: An integrated view of information systems development*. (ed. Peri Loucopoulos), Ablex Publishers.

Phd Dissertation

Downing, K. (1990). The Use of Teleology in the Qualitative Evaluation and Explanation of Circulatory Systems. CIS-TR-90-13. The University of Oregon.