

Dirk V. Arnold

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Employment

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| Associate Professor Dalhousie University, Faculty of Computer Science | since 2008 |
| Assistant Professor Dalhousie University, Faculty of Computer Science | 2003-2008 |
| Research Associate Universität Dortmund, Informatik XI | 1999-2003 |
| Sessional Instructor Simon Fraser University, School of Computing Science | 1998 |
| Research Assistant Simon Fraser University, School of Computing Science | 1996-1998 |
| Teaching Assistant Simon Fraser University, School of Computing Science | 1994-1997 |
| Research Assistant Universität Dortmund, Informatik I | 1992-1993 |

Education

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|---|------|
| Dr. rer. nat., Computer Science <i>with distinction</i> Universität Dortmund, Germany | 2001 |
| M.Sc., Computing Science Simon Fraser University, Canada | 1997 |
| Diplom, Computer Science <i>with distinction</i> Universität Dortmund, Germany | 1995 |

Fellowships and Awards

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| Best Paper Award, ES/EP Track, Genetic and Evolutionary Computation Conference | 2010 |
| Best Paper Award, Conference on Parallel Problem Solving from Nature | 2006 |
| Best Paper Award, ES/EP Track, Genetic and Evolutionary Computation Conference | 2003 |

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| Doctoral Prize in Computer Science, Universität Dortmund | 2002 |
| Simon Fraser University Graduate Fellowship | 1998 |
| Simon Fraser University Faculty of Applied Sciences Graduate Fellowship | 1996 |

Courses Taught

At Dalhousie University:

CSCI 2132: Software Development

CSCI 3161: Computer Animation

CSCI 3162: Digital Media

CSCI 4113: Design and Analysis of Algorithms II

CSCI 4167/6608: Advanced Computer Animation

CSCI 6514: Strategies for Search and Optimization

CSCI 6604: Advanced Computer Graphics

At Simon Fraser University:

CMPT 361: Introduction to Computer Graphics

Publications

Book:

- [1] D. V. Arnold, *Noisy Optimization with Evolution Strategies*, Genetic Algorithms and Evolutionary Computation Series, (Kluwer Academic Publishers, 2002).

Journal Papers:

- [2] D. V. Arnold and H.-G. Beyer, "On the behaviour of evolution strategies optimising cigar functions", *Evolutionary Computation*, 18(4), to appear, (2010).
- [3] T. Burrell, D. Arnold, and S. Brooks, "Advectioned river textures", *Computer Animation and Virtual Worlds*, 20(2-3):163-173, (2009).
- [4] D. V. Arnold and H.-G. Beyer, "Evolution strategies with cumulative step length adaptation on the noisy parabolic ridge", *Natural Computing*, 7(4):555-587, (2008).
- [5] D. V. Arnold and A. MacLeod, "Step length adaptation on ridge functions", *Evolutionary Computation*, 16(2):151-184, (2008).
- [6] D. V. Arnold and R. Salomon, "Evolutionary gradient search revisited", *IEEE Transactions on Evolutionary Computation*, 11(4):480-495, (2007).

- [7] D. V. Arnold, “Weighted multirecombination evolution strategies”, *Theoretical Computer Science*, 361(1):18-37, (2006).
- [8] D. V. Arnold and H.-G. Beyer, “Optimum tracking with evolution strategies”, *Evolutionary Computation*, 14(3):291-308, (2006).
- [9] D. V. Arnold and H.-G. Beyer, “A general noise model and its effects on evolution strategy performance”, *IEEE Transactions on Evolutionary Computation*, 10(4):380-391, (2006).
- [10] D. V. Arnold and H.-G. Beyer, “Expected sample moments of concomitants of selected order statistics”, *Statistics and Computing*, 15(3):241-250, (2005).
- [11] H.-G. Beyer, D. V. Arnold, and S. Meyer-Nieberg, “A new approach for predicting the final outcome of evolution strategy optimization under noise”, *Genetic Programming and Evolvable Machines*, 6(1):7-24, (2005).
- [12] D. V. Arnold and H.-G. Beyer, “Performance analysis of evolutionary optimization with cumulative step length adaptation”, *IEEE Transactions on Automatic Control*, 49(4):617-622, (2004).
- [13] D. V. Arnold and H.-G. Beyer, “On the benefits of populations for noisy optimization”, *Evolutionary Computation*, 11(2):111-127, (2003).
- [14] D. V. Arnold and H.-G. Beyer, “A comparison of evolution strategies with other direct search methods in the presence of noise”, *Computational Optimization and Applications*, 24(1):135-159, (2003).
- [15] H.-G. Beyer and D. V. Arnold, “Qualms regarding the optimality of cumulative path length control in CSA/CMA-evolution strategies”, *Evolutionary Computation*, 11(1):19-28, (2003).
- [16] D. V. Arnold and H.-G. Beyer, “Performance analysis of evolution strategies with multi-recombination in high-dimensional \mathbb{R}^N -search spaces disturbed by noise”, *Theoretical Computer Science*, 289(1):629-647, (2002).
- [17] D. V. Arnold and H.-G. Beyer, “Local performance of the $(1 + 1)$ -ES in a noisy environment”, *IEEE Transactions on Evolutionary Computation*, 6(1):30-41, (2002).
- [18] R. F. Hadley, A. Rotaru-Varga, D. V. Arnold, and V. C. Cardei, “Syntactic systematicity arising from semantic predictions in a Hebbian-competitive network”, *Connection Science*, 13(1):73-94, (2001).
- [19] D. V. Arnold, “Information-theoretic analysis of phase transitions”, *Complex Systems*, 10(2):143-155, (1996).

Book Chapters:

- [20] R. Salomon and D. V. Arnold, “The evolutionary-gradient-search procedure in theory and practice”, in R. Chiong (ed.), *Nature-Inspired Algorithms for Optimisation*, pp. 77-101, (Springer Verlag, 2009).
- [21] D. V. Arnold, “Evolution strategies in noisy environments — A survey of existing work”, in L. Kallel et al. (eds.), *Theoretical Aspects of Evolutionary Computing*, pp. 239-249, (Springer Verlag, 2001).
- [22] H.-G. Beyer and D. V. Arnold, “Theory of evolution strategies — A tutorial”, in L. Kallel et al. (eds.), *Theoretical Aspects of Evolutionary Computing*, pp. 109-133, (Springer Verlag, 2001).

Refereed Conference and Workshop Papers:

- [23] D. V. Arnold, “On the behaviour of the $(1, \lambda)$ -ES for a simple constrained problem”, *Foundations of Genetic Algorithms — FOGA 2011*, to appear, (ACM Press, 2011).
- [24] D. Brockhoff, A. Auger, N. Hansen, D. V. Arnold, and T. Hohm, “Mirrored sampling and sequential selection for evolution strategies”, in R. Schaefer et al. (eds.), *Parallel Problem Solving from Nature — PPSN XI*, pp. 11-21, (Springer Verlag, 2010).
- [25] D. V. Arnold and N. Hansen, “Active covariance matrix adaptation for the $(1 + 1)$ -CMA-ES”, in J. Branke et al. (eds.), *Proceedings of the 2010 Genetic and Evolutionary Computation Conference — GECCO 2010*, pp. 385-392, (ACM Press, 2010).
- [26] D. V. Arnold, H.-G. Beyer, and A. Melkozerov, “On the behaviour of weighted multi-recombination evolution strategies optimising noisy cigar functions”, in G. Raidl et al. (eds.), *Proceedings of the 2009 Genetic and Evolutionary Computation Conference — GECCO 2009*, pp. 483-490, (ACM Press, 2009).
- [27] D. V. Arnold and A. S. Castellarin, “A novel approach to adaptive isolation in evolution strategies”, in G. Raidl et al. (eds.), *Proceedings of the 2009 Genetic and Evolutionary Computation Conference — GECCO 2009*, pp. 491-498, (ACM Press, 2009).
- [28] S. B. Chisholm, D. V. Arnold, and S. Brooks, “Tone mapping by interactive evolution”, in G. Raidl et al. (eds.), *Proceedings of the 2009 Genetic and Evolutionary Computation Conference — GECCO 2009*, pp. 515-522, (ACM Press, 2009).
- [29] D. V. Arnold and D. Brauer, “On the behaviour of the $(1 + 1)$ -ES for a simple constrained problem”, in G. Rudolph et al. (eds.), *Parallel Problem Solving from Nature — PPSN X*, pp. 1-10, (Springer Verlag, 2008).
- [30] D. V. Arnold and D. C. S. Van Wart, “Cumulative step length adaptation for evolution strategies using negative recombination weights”, in M. Giacobini et al. (eds.), *EvoWorkshops 2008*, pp. 545-554, (Springer Verlag, 2008).
- [31] D. V. Arnold, “On the use of evolution strategies for optimising certain positive definite quadratic forms”, in D. Thierens et al. (eds.), *Proceedings of the 2007 Genetic and Evolutionary Computation Conference — GECCO 2007*, pp. 634-641, (ACM Press, 2007).
- [32] D. V. Arnold, “Cumulative step length adaptation on ridge functions”, in T. P. Runarsson et al. (eds.), *Parallel Problem Solving from Nature — PPSN IX*, pp. 11-20, (Springer Verlag, 2006).
- [33] D. V. Arnold and A. MacLeod, “Hierarchically organised evolution strategies on the parabolic ridge”, in M. Keijzer et al. (eds.), *Proceedings of the 2006 Genetic and Evolutionary Computation Conference — GECCO 2006*, pp. 437-444, (ACM Press, 2006).
- [34] D. V. Arnold and D. MacDonald, “Weighted recombination evolution strategies on the parabolic ridge”, in *Proceedings of the 2006 IEEE World Congress on Computational Intelligence*, pp. 411-418, (IEEE Press, 2006).

- [35] G. A. Jastrebski and D. V. Arnold, “Improving evolution strategies through active covariance matrix adaptation”, in *Proceedings of the 2006 IEEE World Congress on Computational Intelligence*, pp. 9719-9726, (IEEE Press, 2006).
- [36] D. V. Arnold, “Evolution strategies with adaptively rescaled mutation vectors”, in *Proceedings of the 2005 IEEE Congress on Evolutionary Computation*, pp. 2592-2599, (IEEE Press, 2005).
- [37] D. V. Arnold, “Optimal weighted recombination”, in A. H. Wright et al. (eds.), *Foundations of Genetic Algorithms 8*, pp. 215-237, (Springer Verlag, 2005).
- [38] D. V. Arnold, “An analysis of evolutionary gradient search”, in *Proceedings of the 2004 IEEE Congress on Evolutionary Computation*, pp. 47-54, (IEEE Press, 2004).
- [39] H.-G. Beyer and D. V. Arnold, “The steady state behavior of $(\mu/\mu_I, \lambda)$ -ES on ellipsoidal fitness models disturbed by noise”, in E. Cantú-Paz et al. (eds.), *Proceedings of the 2003 Genetic and Evolutionary Computation Conference — GECCO 2003*, pp. 525-536, (Springer Verlag, 2003).
- [40] D. V. Arnold and H.-G. Beyer, “On the effects of outliers on evolutionary optimization”, in J. Liu et al. (eds.), *Intelligent Data Engineering and Automated Learning — IDEAL 2003*, pp. 151-160, (Springer Verlag, 2003).
- [41] D. V. Arnold and H.-G. Beyer, “Random dynamics optimum tracking with evolution strategies”, in J. J. Merelo et al. (eds.), *Parallel Problem Solving from Nature — PPSN VII*, pp. 3-12, (Springer Verlag, 2002).
- [42] D. V. Arnold and H.-G. Beyer, “Investigation of the (μ, λ) -ES in the presence of noise”, in *Proceedings of the 2001 IEEE Congress on Evolutionary Computation*, pp. 332-339, (IEEE Press, 2001).
- [43] S. Markon, D. V. Arnold, T. Bäck, T. Beielstein, and H.-G. Beyer, “Thresholding — A selection operator for noisy ES”, in *Proceedings of the 2001 IEEE Congress on Evolutionary Computation*, pp. 465-472, (IEEE Press, 2001).
- [44] D. V. Arnold and H.-G. Beyer, “Local performance of the $(\mu/\mu_I, \lambda)$ -ES in a noisy environment”, in W. N. Martin and W. M. Spears (eds.), *Foundations of Genetic Algorithms 6*, pp. 127-141, (Morgan Kaufmann Publishers, 2001).
- [45] D. V. Arnold and H.-G. Beyer, “Efficiency and self-adaptation of the $(\mu/\mu_I, \lambda)$ -ES in a noisy environment”, in M. Schoenauer et al. (eds.), *Parallel Problem Solving from Nature — PPSN VI*, pp. 39-48, (Springer Verlag, 2000).
- [46] H.-G. Beyer and D. V. Arnold, “Fitness noise and localization errors of the optimum in general quadratic fitness models”, in W. Banzhaf et al. (eds.), *Proceedings of the 1999 Genetic and Evolutionary Computation Conference — GECCO 1999*, pp. 817-824, (Morgan Kaufmann Publishers, 1999).
- [47] R. F. Hadley, D. Arnold, and V. Cardei, “Syntactic systematicity arising from semantic predictions in a Hebbian-competitive network”, in M. A. Gernsbacher and S. J. Derry (eds.), *Proceedings of the Twentieth Annual Conference of the Cognitive Science Society*, (Lawrence Erlbaum Publishers, 1998).

Research Funding

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| NSERC Discovery Grant (\$21,000 annually) | 2007-2012 |
| Dalhousie University Faculty of Computer Science Research Endowment (\$6,000) | 2006 |
| CFI New Opportunities Grant (\$620,000 including partner contributions; jointly held with Christian Blouin and Steven Brooks) | 2005 |
| Dalhousie University Faculty of Computer Science Research Endowment (\$6,000) | 2005 |
| NSERC Discovery Grant (\$20,000 annually) | 2004-2007 |
| Dalhousie University Startup Funding (\$10,000) | 2003 |

Professional Activities

Editorship:

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| Associate Editor <i>Evolutionary Computation</i> (MIT Press) | since 2010 |
| Action Editor <i>Computational Intelligence</i> | since 2010 |
| Associate Editor <i>IEEE Transactions on Evolutionary Computation</i> | since 2007 |
| Member of the Editorial Board <i>Journal of Memetic Computing</i> (Springer Verlag) | since 2007 |

Conference, Workshop, and Competition Organisation:

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| ES/EP Track Chair Genetic and Evolutionary Computation Conference — GECCO 2010 Portland, OR | 2010 |
| Coorganiser CAIAC/Precarn Intelligent Systems Challenge | 2009 |
| Coorganiser Dagstuhl Seminar on the Theory of Evolutionary Algorithms Schloss Dagstuhl, Germany | 2008 |
| ES/EP Track Chair Genetic and Evolutionary Computation Conference — GECCO 2006 Seattle, WA | 2006 |
| Coorganiser Dagstuhl Seminar on the Theory of Evolutionary Algorithms Schloss Dagstuhl, Germany | 2006 |
| ES/EP Track Chair Genetic and Evolutionary Computation Conference — GECCO 2005 Washington, DC | 2005 |

Invited Tutorials, Talks, and Participation:

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| Acadia University, Jodrey School of Computer Science Wolfville, Nova Scotia | 2008 |
| IEEE Symposium on Foundations of Computational Intelligence (invited tutorial) Honolulu, Hawaii | 2007 |
| Dagstuhl Seminar on the Theory of Evolutionary Algorithms Schloss Dagstuhl, Germany | 2004 |
| Ruhr-Universität Bochum, Institut für Neuroinformatik Bochum, Germany | 2003 |
| Helsinki University of Technology, Lab for Theoretical Computer Science Helsinki, Finland | 2002 |
| University of Turku, Workshop on “Evolution, Computation, and Landscapes” Turku, Finland | 2002 |
| Dagstuhl Seminar on the Theory of Evolutionary Algorithms Schloss Dagstuhl, Germany | 2002 |
| Seoul National University, Biointelligence Lab Seoul, South Korea | 2001 |
| Dagstuhl Seminar on the Theory of Evolutionary Algorithms Schloss Dagstuhl, Germany | 2000 |
| EvoNet Summer School on Theoretical Aspects of Evolutionary Computing Antwerp, Belgium | 1999 |

Reviewing:

Algorithmica (Springer Verlag)
Applied Mathematics and Computer Science
Applied Soft Computing (Elsevier)
Computational Optimization and Applications (Kluwer Academic Publishers)
European Journal of Operational Research (Elsevier)
Evolutionary Computation (MIT Press)
Genetic Programming and Evolvable Machines (Kluwer Academic Publishers)
IEEE Transactions on Evolutionary Computation (IEEE Press)
IEEE Transactions on Systems, Man and Cybernetics (IEEE Press)
Information Sciences (Elsevier)
Journal of Global Optimization (Springer Verlag)
Journal of Mathematical Modelling and Algorithms (Kluwer Academic Publishers)
Journal of System Architecture (Elsevier)
Machine Learning (Springer Verlag)

Memetic Computing (Springer Verlag)

Optimization and Engineering (Springer Verlag)

Pattern Recognition (Elsevier)

Soft Computing (Springer Verlag)

Statistics and Computing (Springer Verlag)

Theoretical Computer Science (Elsevier)

ASME Computers and Information in Engineering Conference — CIE (2005)

Asia-Pacific Conference on Knowledge Discovery and Data Mining — PAKDD (2006)

Canadian Conference on Artificial Intelligence — AI (2010)

European Workshop on EAs in Stochastic and Dynamic Environments — EvoSTOC (2005, 2006, 2007, 2008, 2009, 2010)

Foundations of Genetic Algorithms Workshop — FOGA (2002, 2009)

Genetic and Evolutionary Computation Conference — GECCO (2000, 2002, 2003, 2007, 2008, 2009)

IEEE Congress on Evolutionary Computation — CEC (2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010)

IEEE Symposium on Foundations of Computational Intelligence — IEEE FOCI (2007)

International Conference on Evolutionary Computation — ICEC (2009)

International Workshop on Hybrid Metaheuristics — HM (2007)

Parallel Problem Solving from Nature — PPSN (2002, 2008, 2010)