# CURRICULUM VITAE

# Garrison W. Greenwood

March 2, 2005

## Education

Ph.D in Electrical Engineering, University of Washington (1992)

## Industrial Employment

| | | |
|---|---|---|
| 1. Senior Software Engineer | Space Labs Medical, Inc. (Redmond, WA) | 1992-1993 |
| 2. Senior Engineer | VOICE Computer Corp. (Redmond, WA) | 1990-1992 |
| 3. Principle Engineer | Sundstrand Data Control (Redmond, WA) | 1987-1990 |
| 4. Senior Engineer | Eldec Corp. (Redmond, WA) | 1986-1987 |
| 5. Senior Engineer | Honeywell Corporation (Mukelteo, WA) | 1982-1986 |
| 6. Senior Engineer | Boeing Corporation (Seattle, WA) | 1981-1982 |
| 7. Senior Engineer | Naval Weapons Station (Seal Branch, CA) | 1976-1981 |

## Academic Employment

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|---|---|
| 1. Portland State University | 2000-present |
| 2. Western Michigan University | 1993-2000 |
| 3. University of Washington (Seattle, WA)† | 1990-1993 |
| 4. Seattle University (Seattle, WA)† | 1989 |
| 5. Cogswell College North† | 1982-1989 |
| 6. California State University at Fullerton (Fullerton, CA)† | 1978-1979 |
| 7. California State Polytechnic University (Pomona, CA)† | 1977 |

†Adjunct faculty position

## Refereed Publications

- Journal Papers

1. G. Greenwood, "On the Practicality of Using Intrinsic Reconfiguration for Fault Recovery", *IEEE Transactions on Evolutionary Computation*", (to appear)
2. G. Greenwood, "On the Usefulness of Accessibility Graphs with Combinatorial Optimization Problems", *J. Interdiscip. Mathematics*", (to appear)
3. G. Greenwood, "Intrinsic Evolution of Safe Control Strategies for Autonomous Spacecraft", *IEEE Transactions on Aerospace & Electronic Systems*" Vol. 40, No. 1, 236-246, 2004
4. G. Greenwood and Q. Zhu, "Convergence in Evolutionary Programs with Self-Adaptation", *Evolutionary Computation* Vol. 9, No. 2, 147-158, 2001
5. S. Ahire, G. Greenwood, A. Gupta and M. Terwilliger, "Workforce-constrained preventive maintenance scheduling using evolution strategies", *Decision Sciences Journal* Vol. 31, No. 4, 833-859, 2000
6. G. Greenwood, "Revisiting the complexity of finding globally minimum energy configurations in atomic clusters", *Zeitschrift für Physikalische Chemie*, Vol. 211, 105-114, 1999
7. G. Greenwood and X. Hu, "On the use of random walks to estimate correlation in fitness landscapes", *Computational Statistics & Data Analysis*, Vol 28, No. 2, 131-137, 1998
8. X. Hu and G. Greenwood, "An evolutionary approach to hardware/software partitioning", *IEE Proc. —Computers and Digital Techniques*, Vol. 145, No. 3, 203-209, 1998

9. G. Greenwood, "Efficient construction of self-avoiding walks for protein folding simulations on a torus", *Journal of Chemical Physics*, Vol. 108, No. 18, 7534-7537, 1998
10. G. Greenwood and X. Hu, "Are landscapes for constrained optimization problems statistically isotropic?", *Physica Scripta*, Vol. 57, 321-323, 1998
11. G. Greenwood, "Training multiple layer perceptrons to recognize attractors", *IEEE Transactions on Evolutionary Computation* Vol. 1, No. 4, 244-248, 1997
12. G. W. Greenwood, "Problems with conducting self-avoiding walks on $n$-cubes", *Graph Theory Notes of New York* 33, 44, 1997
13. G. Greenwood, "Characterization of attractors in speech signals", *BioSystems* 44(2), 161-165, 1997
14. G. Greenwood, "Chaotic behavior in evolution strategies", *Physica D* 109 (3-4), 343-350, 1997
15. G. Greenwood, "Training partially recurrent neural networks using evolutionary strategies," *IEEE Transactions on Speech & Audio Proc.*, Vol. 5, No. 2, 192-194, 1997
16. G. Greenwood, "So many algorithms. So little time.", *ACM Software Engineering Notes*, Vol. 22, No. 2, 92-93, 1997
17. A. Gupta and G. Greenwood, "Applications of evolutionary strategies to fine grained task scheduling," *Parallel Proc. Ltrs*, Vol. 6, No. 4, 551-561, 1996
18. A. Gupta and G. Greenwood, "Static task allocation using $(\mu, \lambda)$ evolutionary strategies," *Information Sciences*, Vol. 94, No. 1-4, 141-150, 1996
19. G. Greenwood,"On the equity of mutual exclusion algorithms in distributed systems," *Information Proc. Ltrs*, **56**, 19-22, 1995
20. G. Greenwood, "Designing bandpass IIR filters for use in biomedical applications," *Instrumentation Science & Technology*, Vol. 22, No. 4, 313-322, 1994
21. G. Greenwood, "Predicting the expansion cost of graph embeddings in $n$-cubes," *Graph Theory Notes of New York*, XXVII, 42-45, 1994

- Conference Papers

1. Garrison W. Greenwood, David Hunter and Edward Ramsden, "Fault recovery in linear systems via intrinsic evolution", *Proc. 2004 NASA/DOD Conf. on Evol. Hdwe*, 115-122, 2004
2. Garrison W. Greenwood, "Differing mathematical perspectives of genotype space in combinatorial problems: metric spaces vs pretopological spaces", *Proc. 2004 Congress on Evolutionary Computation*, 258-264, 2004
3. Damon Miller, Rodrigo Arguello and Garrison W. Greenwood, "Evolving artificial neural network structures: experimental results for biologically-inspired adaptive mutations", *Proc. 2004 Congress on Evolutionary Computation*, 2114-2119, 2004
4. Garrison W. Greenwood, "Adapting mutations in genetic algorithms using gene flow principles", *Proc. 2003 Congress on Evolutionary Computation*, 1392-1397, 2003
5. G. Greenwood, E. Ramsden and S. Ahmed, "An empirical comparison of evolutionary algorithms for evolvable hardware with maximum time-to-reconfigure requirements", *Proc. 2003 NASA/DOD Conf. on Evol. Hdwe*, 59-66, 2003
6. M. Chrzanowska-Jeske, B. Wang and G. Greenwood, "Floorplanning with performance-based clustering", *Proc. ISCAS 2003*, 724-727, 2003
7. G. Greenwood and X. Song, "How to evolve safe control strategies", *Proc. 2002 NASA/DOD Conf. on Evol. Hdwe*, 129-130, 2002
8. B. Aktan, G. Greenwood and M. Shor, "Improving Evolutionary Algorithm Performance on Maximizing Functional Test Coverage of ASICs Using Adaptation of the Fitness Criteria", *Proc. Congress Evol. Comput.*, 1825-1829, 2002

9. M. Chrzanowska-Jeske, G. Greenwood and B. Wang, "Combining Evolution Strategies with Lagrangian Relaxation for Constructing Nonslicing VLSI Floorplans with Soft Modules", *Proc. Congress Evol. Comput.*, 1261-1266,2002
10. B. Aktan, G. Greenwood, M. Shor and P. Doyle, "Maximizing Functional Test Coverage in ASICs Using Evolutionary Algorithms", *Proc. Congress Evol. Comput.*, 178-182, 2001
11. G. Greenwood, "Finding Solutions to NP Problems: Philosophical Differences Between Quantum and Evolutionary Search Algorithms", *Proc. Congress Evol. Comput.*, 815-822, 2001
12. G. Fogel, G. Greenwood and K. Chellapilla, "Evolutionary Computation with Extinction: Experiments and Analysis", *Proc. Congress Evol. Comput.*, 1415-1420, 2000
13. X. Hu, G. Greenwood and S. Ravichandran, "Modeling Epistatic Interactions in Fitness Landscapes", *Proc. Congress on Evol. Comput.*, 932-938, 2000
14. D. Miller, G. Greenwood and C. Ide, "On the Use of Biologically-Inspired Adaptive Mutations to Evolve Artificial Network Structures", *Proc. 2000 IEEE Symp. on Combinations of Evol. Comp. and Neural Net.*, 24-32, 2000
15. G. Greenwood, J. Shin, B. Lee and G. Fogel, "A Survey of Recent Work on Evolutionary Approaches to the Protein Folding Problem", *Proc. Cong. on Evol. Comput. 1999*, 488-495, 1999
16. G. Greenwood, G. Fogel and M. Ciobanu, "Emphasizing Extinction in Evolutionary Programming", *Proc. Cong. on Evol. Comput. 1999*, 666-671, 1999
17. G. Quan, X. Hu and G. Greenwood, "Preference Driven Hierarchical Hardware/Software Partitioning," *Proc. ICCD '99*, 652-657, 1999
18. X. Hu, G. Greenwood, S. Ravichandran, and G. Quan, "A Framework for User Assisted Design Space Exploration", *Proc. ACM/IEEE Design Auto. Conf.*, 414-419, 1999
19. G. Greenwood and Y. Liu, "Finding Low Energy Conformations of Atomic Clusters Using Evolution Strategies," *Proc. of Evolutionary Programming VII*, 493-502, 1998
20. J. Brown, D. Chen, G. Greenwood, S. Hu and R. Taylor, "Scheduling for Power Reduction in a Real-time System", *Proc. 1997 Int'l Symp. on Low Power Electronics and Design*, 84-87, 1997
21. G. Greenwood, "Experimental Observation of Chaos in Evolution Strategies", *Proc. of 1997 Int'l Conf. on Genetic Programming*, J. Koza, K. Deb, M. Dorigo, D. Fogel, M. Garzon, H. Iba and R. Riolo (Eds.), 439-444, 1997
22. E. DeDoncker, A. Gupta and G. Greenwood, "Adaptive Integration Using Evolutionary Strategies," *3rd Int'l Conf. on High Performance Computing*, 94-99, 1996
23. X. Hu, G. Greenwood and J. D'Ambrosio, "An Evolutionary Approach to Hardware/Software Partitioning," *Parallel Problem Solving from Nature IV*, Lecture Notes in Computer Science 1141, H.M. Voigt, W. Ebeleing, I. Rechenberg and H.P. Schwefel (Eds.), Springer-Verlag, 900-909, 1996
24. T. Piatkowski, G. Greenwood, X. Hu, J. Grantner and R. Taylor, "A Curriculum Proposal for an Innovative BS/MS Degree in Computer Engineering Emphasizing Real-time Embedded Systems," *Proc. of Workshop on Real-Time Sys. Education*, J. Zalewski (Ed.), 54-62, 1996
25. A. Gupta, G. Greenwood, R. Munnangi, and S. Ahire, "Parallel Implementations of Evolutionary Strategies," *Int'l Conf. on High Performance Computing*, 469-474, 1995
26. G. Greenwood, A. Gupta, and M. Terwilliger, "Scheduling Replicated Critical Tasks in Faulty Networks Using Evolutionary Strategies" *1995 IEEE Int'l Conf. on Evolutionary Computing*, 152-156, 1995
27. G. Greenwood, "Applications of Evolutionary Strategies in Training Partially Recurrent Neural Networks," *Proc. of MENDEL '95*, 53-58, 1995
28. G. Greenwood, C. Lang and S. Hurley, "Scheduling Tasks in Real-Time Systems Using Evolutionary Strategies," $3^{rd}$ *Workshop on Parallel & Dist. Real-Time Sys.*, 195-196, 1995

29. S. Hurley, G. Greenwood and C. Lang, "An Evolutionary Strategy for Scheduling Periodic Tasks in Real-Time Systems," *Proc. Applied Decision Technologies*, Brunel Conference Centre, London, 171-181, 1995
30. G. Greenwood, A. Gupta, and M. Terwilliger, " Task Redistribution in Faulty Networks Using Evolutionary Strategies," *Proc. of 1st Int'l Workshop on Parallel Proc.*, 249-254, 1994
31. G. Greenwood, "The State of Engineering Management: A View From the Trenches," *IEEE Int'l Conf. on Engineering Management*, 388-395, 1994
32. G. Greenwood, A. Gupta, and K. McSweeney, "Scheduling Tasks in Multiprocessor Systems Using Evolutionary Strategies," *Proc. of* $1^{st}$ *IEEE Conf. on Evolutionary Computation*, 345-349, 1994
33. G. Greenwood, A. Gupta, and V. Mahadik, "Multiprocessor Scheduling of High Concurrency Algorithms," *Proc. of Florida AI Research Symp.*, 265-269, 1994
34. G. Greenwood and A. Somani, "A Methodology for Mapping Pipelined Algorithms Onto Hypercube Arrays", *Proc. ICPADS*, 117-124, 1992
35. G. Greenwood, "Practical Considerations for Executing Vision Algorithms on Parallel Arrays", *Proc. 26th Asilomar Conf.*, 1021-1025, 1992

- Book Chapters

1. G. Greenwood and J. Shin, "On the Evolutionary Search for Solutions to the Protein Folding Problem", *Evolutionary Computation in Bioinformatics*, G. Fogel and D. Corne (Eds.), Morgan-Kauffman, 115-136, 2002
2. G. Greenwood, X. Hu and J. D'Ambrosio, "Fitness Functions for Multipleobjective Optimization Problems: Combining Preferences with Pareto Rankings", *Foundations of Genetic Algorithms*, R. Belew and M. Vose (Eds.), Morgan-Kaufmann, San Francisco, CA, 437-455, 1997

- Book Reviews

1. Bio-Inspired Computing Machines: Towards Novel Computational Architectures, D. Mange and M. Tomassini (eds.), review published in *Genetic Prog. and Evolvable Mach.*, Vol 2, No. 1, 75-78, 2001
2. Evolutionary Programming VII: Proceedings of the 7th International Conference EP98, V.W. Porto, N. Saravanan, D. Waagen, and A. E. Eiben (eds.), review published in *IEEE Transactions on Evolutionary Computation* Vol. 3, No. 1, 75-76, 1999

## Funded Research

- Characterizing Genetic Algorithms for Real-Time Adaptive Systems

  Sponsor: NASA
  Award: $13,500 Date: 01/02 - 06/02
  Co-investigator: NONE

- Incorporating Data Envelopment Analysis Into Evolutionary Algorithms

  Sponsor: PSU Faculty Enhancement Program
  Award: $10,000 Date: 6/01 - 8/01
  Co-investigator: Dr. Timothy Anderson (ETM Dept.)

- Donation of Lattice Analog ispPAC Designer System

  Sponsor: Lattice Semiconductor Inc.
  Award: $1,200 (equipment grant) Date: 8/01
  Co-investigator: Dr. Ed Ramsden (Lattice Semiconductor)

  Equipment used for collaborative research project in evolvable hardware.

- Donation of FPGA boards

  Sponsor: Xilinx
  Award: $21,000 (equipment grant of 12 FPGA boards)
  Date: 3/01
  Co-investigator: None

- Design of Effective Search Operators

  Sponsor: U.S. Army Research Office
  Award: $19,659 Date: 9/99 - 12/99
  Co-investigators: Dr. X. Hu (University of Notre Dame)
  Ms. S. Ravichandran (Western Michigan University)

- Determining Side-Chain Conformations in Proteins Using Evolution Strategies

  Sponsor: NSF
  Award: $90,000 Date: 8/98 - 8/99
  Co-investigator: None

  Note: This grant was from the NSF Scholar-in-Residence Program at NIH

- Determining Side-Chain Conformations in Proteins Using Evolution Strategies, funded by National Science Foundation under the NSF Scholar-in-Residence Program at NIH (**EXTENSION**)

  Sponsor: NSF
  Award: $21,000 Date: 7/00 - 8/00
  Co-investigator: None

  Note: This grant was from the NSF Scholar-in-Residence Program at NIH

- Architectural Design for Embedded Systems,

  Sponsor: DARPA
  Award: $167,000 Date: 7/97 - 6/99
  Co-investigator: Dr. X. Hu (University of Notre Dame)

- Hardware/Software Codesign

  Sponsor: Hewlett-Packard Corp.
  Award: $203,850 (cash) + $74,673 (equipment) Date: 5/94 - 4/97
  Co-investigator: Dr. X. Hu (University of Notre Dame)

- Speech Recognition and Lip-Image Display Device

  Sponsor: Michigan State Dept. of Commerce
  Award: $44,000 Date: 9/94 - 8/95
  Co-investigator: None

## Other Research Achievements

Honorarium (Best Paper at International Conference of High Performance Computing)
Award: $700 Date: 12/96
Co-authors: Dr. A. Gupta & Dr. E. DeDoncker

## Community Outreach Achievements

1. have taught review courses for the Fundamentals of Engineering Exam
2. served as judge for Intel’s science fair
3. interviewed for IEEE Spectrum article

## Professionally Related Service

- Editorial Positions
    1. Associate editor for *IEEE Transactions on Evolutionary Computation* (2000-present)
    2. Associate editor for *IEEE Transactions on Neural Networks* (1999)
- Committee Service
    1. Currently serving as Chair of IEEE Computational Intelligence Society Technical Committee on Evolutionary Computation
    2. Serve as the General Chair of the 2004 Congress on Evolutionary Computation
    3. Served as Technical Co-Chair (North America) for the World Congress on Computational Intelligence 2002
    4. Served as Special Sessions Chairman for Congress on Evolutionary Computation 2001
    5. Served as Poster Chairman for Congress on Evolutionary Computation 2000
    6. Served on program committee for Congress on Evolutionary Computation 1999
    7. Served on program committee for Evolutionary Programming '98 conference
    8. Served on International Program Committee for MENDEL '95 conference
- Memberships
    1. Served as faculty advisor for TAU BETA PI engineering honor society (1996-1999)
    2. Currently serving as faculty advisor for ETA KAPPA NU electrical engineering honor society (2000-present)

## Significant Professional Development Activities

- Registered Professional Engineer in State of California (No. 10279)
- Served on NSF IGERT proposal review panel (Washington D.C., 1999)
- Served on NSF Nanosystems proposal review panel (Washington D.C., 1999)

## Memberships in Professional Societies

- senior member of IEEE
- lifetime member of TAU BETA PI (engineering honor society)
- lifetime member of ETA KAPPA NU (electrical engineering honor society)
- member of SIGMA XI

## Military Service

Retired from U.S. Army as a Lieutenant Colonel. Total service included three years active duty and 29 years in U.S. Army Reserve.

Life member Veterans of Foreign Wars. Currently attached to VFW Post 10580.