

## *CURRICULUM VITAE*

### **Jianjun Hu, Ph.D.**

**University of Southern California**  
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### **EDUCATION & TRAINING**

- 2005.8 - Present **Postdoc Research Fellow, University of Southern California, CA**  
Molecular and Computational Biology Section  
Research: Integrative Microarray Analysis, Gene Function Prediction
- 2004.8 – 2005.8 **Postdoc Research Fellow, Purdue University, IN**  
Department of Computer/Biological Sciences  
Research: DNA Motif Discovery, Protein Function Prediction
- 2000.8 – 2004.7 **Ph.D., Computer Science, Michigan State University, MI**  
Thesis: Sustainable Evolutionary Algorithms and Scalable Evolutionary  
Synthesis of Dynamic Systems. Advisor: Erik. D. Goodman  
Research: Genetic Algorithms/Programming and Machine Learning
- 1995.9 – 1998.4 **M.S., Wuhan University of Technology, China**  
Major: Mechanical Engineering, Computer-Aided Design
- 1991.9 – 1995.7 **B.S., Wuhan University of Technology, China**  
Major: Mechanical Engineering, Mechatronics

### **RESEARCH INTERESTS**

- **Bioinformatics and Computational Biology:** Integrative genomics, integrative microarray analysis, network analysis for function prediction, protein function prediction, motif discovery; integrative approach to gene and pathway detection in cancer and human diseases; protein docking
- **Data Mining in Biological Networks and Structural Databases:** Algorithms for indexing, querying and retrieval of structural databases, structural motif discovery, comparative network analysis for function prediction
- **Open-ended Knowledge Discovery and Computational Modeling:** Open-ended knowledge discovery by genetic programming and its application in bioinformatics; open-ended evolutionary modeling for systems biology
- **Evolutionary Computation, Machine Learning, and Computational Intelligence:** Genetic programming and genetic algorithms, machine learning, multi-objective optimization, neural networks, and human-competitive computational synthesis

## RESEARCH & WORK EXPERIENCE

- 2005.9 – present **Postdoc Fellow, University of Southern California, CA**  
*Primary Research:* development of integrative missing valuation estimation algorithm for microarray data imputation; motif analysis for DNA methylation in colorectal cancers; integrative genomics approach for phenotype prediction
- 2004.9 – 2005.8 **Postdoc Fellow, Purdue University, IN**  
*Primary Research:* evaluation of motif discovery algorithms to identify their limitation and potentials and to provide guidelines for practical motif analysis; development of the first ensemble/consensus motif discovery algorithm EMD
- 2000.9 – 2004.8 **Research Assistant, Michigan State University, MI**  
Genetic Algorithms Research & Applications Group (GARAGe)  
Department of Computer Science and Engineering  
*Primary Research:* Automated Design of Mechatronic Systems Using Bond Graphs and Genetic Programming, NSF Project DMI-0084934. Developed packages for dynamic system simulation and genetic programming engine for bond graph-based automated synthesis of mechatronic systems; proposed a novel sustainable evolutionary computation model (HFC); proposed techniques for scalable evolutionary synthesis.
- 2002.5 – 2002.9 **Research Intern, NOAA Great Lakes Environmental Research Laboratory (GLERL), MI**  
*Primary Research:* Investigation of Evolution of Plasticity by Simulated Digital Organisms. Collaborators: John Holland & Rick Riolo from University of Michigan; Scott Peacor; Erik Goodman from Michigan State University; Participated in the development of a genetic algorithm-based plasticity evolution model and developed the prototype system
- 1998.11 – 2000.3 **Research Associate, Beijing Uni. of Aeronautics & Astronautics, China**  
*Primary Research:* Application of genetic programming and neural networks in intelligent manufacturing
- 1998.4 – 1998.11 **Senior Software Engineer, Zhuhai Powerbridge Tech. Co., China**
- 1995.9 – 1998.3 **Research Assistant, Wuhan University of Technology, China**

## GRANTS & HONARS

- China National Natural Science Foundation Grant 50575047: Genetic Programming based Automated Design Innovation. 2006-2009. (Co-PI)
- Significant Contribution to NSF Grant DMI0084934: *Automated Design of Mechatronic Systems Using Bond Graphs and Genetic Programming*, 2000-2003. PI: Erik Goodman, Ronald Rosenberg, and Kisung Seo, Michigan State University.
- Dissertation Fellowship, Graduate School, Michigan State University, 2004.
- Student Travel Grant, American Control Conference (ACC), 2004
- Student Travel Grant, Congress on Evolutionary Computation (CEC), 2004.
- Student Travel Grant, Genetic and Evolutionary Computation Conference, 2004
- Student Travel Grant, College of Engineering, Michigan State University, 2004.
- IEEE Student Travel Grant, World Congress on Computational Intelligence, 2002
- Devlieg/Dean/Engr/Fellowship. College of Eng., Michigan State University, 2000
- Significant Contribution to NNSF Grant (China), 1997: Study of Intelligent

Development Tools for automatic design system of technique process. PI: Shuchun Wang, Beijing University of Aeronautics & Astronautics, Beijing, China.

- Fellowship of Huawei Corporation, Wuhan University of Technology, 1996

## ACADEMIC SERVICES

**Reviewer** of the following journals:

*IEEE Transaction on Systems, Man, and Cybernetics*

*International Journal of Computational Intelligence and Applications*

*Genetic Programming and Evolvable Machines*

*European Journal of Operational Research*

*IEEE Periodical Computational Intelligence*

*Journal of Computer Aided Design*

**Reviewer** of the following conferences:

*IEEE Symposium on Computational Intelligence in Bioinformatics and Computational Biology, 2005*

*IEEE Control Systems Society Conference (ACC 2005) Boston*

*Genetic and Evolutionary Computation Conference 2005 (GECCO2005)*

*Genetic and Evolutionary Computation Conference (GECCO-2004, Seattle)*

*Genetic and Evolutionary Computation Conference (GECCO-2003, Chicago, USA)*

**Program Committee**

*Genetic and Evolutionary Computation Conference (GECCO2005, Washington D. C)*

*Genetic and Evolutionary Computation Conference (GECCO-2004, Seattle)*

*Genetic and Evolutionary Computation Conference (GECCO-2003, Chicago)*

**Member of ISGEC** (Int. Society for Genetic and Evolutionary Computation)

*IEEE* (Computational Intelligence Society)

*ACM* (Association of Computing Machinery)

## PUBLICATIONS (<http://www-rcf.usc.edu/~jianjunh/publication.htm>)

### Journal Articles:

1. **J. Hu**, Haifeng Li, Michael S Waterman, and Xianghong Jasmine Zhou. Integrative missing value estimation for microarray data. *BMC Bioinformatics*. 7: 449., 2006
2. **J. Hu**, Yifeng David Yang and Daisuke Kihara, "EMD: an Ensemble Algorithm for discovering regulatory motifs in DNA sequences", *BMC Bioinformatics*, 7:342. 2006
3. **J. Hu**, Bin Li, and Daisuke Kihara, "Limitations and Potentials of Current Motif Discovery Algorithms", *Nucleic Acid Research*, 33: 4899-4913, 2005
4. Fei Pan, Kiran Kamath, Kangyu Zhang, Sudip Pulapura, Avinash Achar, Juan Nunez-Iglesias, Yu Huang, Xifeng Yan, Jiawei Han, Haiyan Hu, Min Xu, **J. Hu**, Xianghong Jasmine Zhou. K. Kamath et. al. Integrative Array Analyzer: a software package for analysis of cross-platform and cross-species microarray data. *Bioinformatics*, 22: 1665-1667, 2006.
5. S. Li, X. Chen and **J. Hu**. Study on Sustainable Evolutionary Algorithm Based on Hierarchical Search. *China Mechanical Engineering* (Chinese), 7(11), 2006.
6. **J. Hu**, E. D. Goodman, and R. C. Rosenberg, " Automated Synthesis of Mechanical

- Vibration Absorbers Using Genetic Programming", *Computer-Aided Design* , Special Issue on human-competitive evolutionary design, 2005 (accepted)
7. **J. Hu**, E. Goodman, R. Rosenberg, "Topologically Open-Ended Synthesis of Dynamic Systems with High Robustness Using Genetic Programming: a Case Study of Analog Filter Synthesis", *IEEE Transaction on Evolutionary Computation*, IEEE Press, 2005. (accepted)
  8. **J. Hu**, E. Goodman, K.Seo, Z. Fan, R. Rosenberg, "The Hierarchical Fair Competition (HFC) Framework for Sustainable Evolutionary Algorithms", *Evolutionary Computation*, 13 (2), MIT Press, 2005.
  9. Z. Fan, K. Seo, **J. Hu**, E. Goodman, R. Rosenberg, "A Novel Evolutionary Engineering Design Approach for Mixed-Domain Systems," *Journal of Engineering Optimization*, Volume 36, Number 2, 2004.
  10. K. Seo, Z. Fan, **J. Hu**, E. D. Goodman, and R. C. Rosenberg, "Toward an Automated Design Method for Multi-Domain Dynamic Systems Using Bond Graphs and Genetic Programming," *Mechatronics* , 13, (8-9), pp. 851-885, 2003.
  11. S. Li, **J. Hu**, Q. Xie and H. Zhang. Automated Design of Mechtronic Systems based on Genetic Programming and Bond Graphs. *Journal of System Simulation (Chinese)*, 14 (11): 1513-1516, 2002
  12. K. Seo, **J. Hu**, Z. Fan, E. D. Goodman, and R. C. Rosenberg. Automated Design Approaches for Multi-Domain Dynamic Systems Using Bond Graphs and Genetic Programming," *The International Journal of Computers, Systems and Signals*, vol.3, no.1, pp.55-70, 2002.
  13. **J. Hu**, L. Wu, Z. Zhang, Y. Guo. Survey and Prospect of Study on Plane-Generated Double Enveloping Worm Pairs. *Machinery*, No. 1, 2001
  14. **J. Hu**, Shuchun Wang, "An Overview of Computational Intelligence Solutions to Intelligent Manufacturing Problems", *Journal of China Mechanical Engineering (Chinese)*. No.1., 1999.
  15. **J. Hu**, Zhongfu. Zhang, "Weight Inducement and Hierarchical Training Algorithm of BP Neural Network", *Journal of Computer Science (Chinese)*, No. 1, 1998.

### **Thesis**

16. **J. Hu**. Sustainable Evolutionary Algorithms and Scalable Evolutionary Synthesis of Dynamic Systems. PhD thesis, Department of Computer Science and Engineering, Michigan State University, East Lansing, Michigan, 48823, USA, 2004.
17. **J. Hu**. Three Dimensional CAD Modeling and its Application of Plane-Generated Double Enveloping Worm Pairs. Master thesis. Wuhan University of Technology, Wuhan, China 1998.

### **Book Chapters**

18. **J. Hu**, Z. Fan, J. Wang, X. Peng, K. Seo, J. Terpenney, and E. Goodman. GPBG: A Framework for Evolutionary Synthesis of Multi-domain Engineering Systems. (Eds.) Kalyanmoy Deb, (accepted), 2006
19. **J. Hu**, S. Li and E. Goodman. Evolutionary Robust Design of Analog Filters using Genetic Programming. In *Evolutionary Computation in Dynamic and Uncertain Environments*, *Springer Series on Studies in Computational Intelligence*. 2006. (in press)

20. **J. Hu**, E. Goodman, "Domain Specificity of Genetic Programming based Automated Synthesis: a Case Study with Synthesis of Mechanical Vibration Absorbers", in *Genetic Programming Theory and Practice*. Rick Riolo and Bill Worzel (eds.). Kluwer Publishers, Boston, MA. 2005.
21. **J. Hu**, E. Goodman. Evolving robust dynamic systems with genetic programming. In *Genetic Programming Theory and Practice*. Rick Riolo and Bill Worzel (eds.). Kluwer Publishers, Boston, MA. 2004.
22. **J. Hu**, K. Seo, E. Goodman, R. Rosenberg. Toward efficient topological synthesis of dynamic systems using bond graphs and genetic programming. Nadia Nedjah. (eds). *Evolutionary Machine Design: Methodology and Applications*. Nova Science Publishers, NY, USA, 2004.
23. **J. Hu**, E. Goodman and K. Seo. Continuous Hierarchical Fair Competition Model for Sustainable Innovation in Genetic programming. In *Genetic Programming Theory and Practice*. Rick Riolo and Bill Worzel (eds.). Kluwer Publishers, Boston, MA. 2003.

### Articles in Peer-Reviewed Conference Proceedings

24. **J. Hu**, X. Zhong, E. Goodman, "Open-ended Robust Design of Analog filters Using Genetic Programming", *Proc. Genetic and Evolutionary Computation Conference*. (Best paper nominee), 2005
25. **J. Hu**, E. Goodman, "Robust and Efficient Genetic Algorithms with Hierarchical Niching and Sustainable Evolutionary Computation Model", *Proc. Genetic and Evolutionary Computation Conference*. 2004
26. **J. Hu**, E. Goodman, "Wireless Access Point Configuration by Genetic Programming", *Proc. IEEE Congress on Evolutionary Computation (CEC)* 2004.
27. **J. Hu**, E. Goodman, and R. Rosenberg, "Topological search in automated mechatronic system synthesis using bond graphs and genetic programming", *Proc. of American Control Conference (ACC)*, 2004.
28. **J. Hu**, K. Seo, Z. Fan, R. Rosenberg, and E. Goodman, "HEMO: A Sustainable Multi-Objective Evolutionary Optimization Framework", *Proc. 2003 Genetic and Evolutionary Computation Conference*, Chicago, Springer, Lecture Notes in Computer Science, July, pp. 1029-1040, 2003
29. Z. Fan, K. Seo, **J. Hu**, R. Rosenberg, and E. Goodman, "System-Level Synthesis of MEMS via Genetic Programming and Bond Graphs", *Proc. 2003 Genetic and Evolutionary Computation Conference*, Chicago, Springer, Lecture Notes in Computer Science, July, pp. 2058-2071, 2003.
30. K. Seo, Z. Fan, **J. Hu**, E. Goodman, and R. Rosenberg, "Dense and Switched Modular Primitives for Bond Graph Model Design," *Proc. 2003 Genetic and Evolutionary Computation Conference*, Chicago, Springer, Lecture Notes in Computer Science, July, pp. 1764-1775., 2003
31. **J. Hu**, E. D. Goodman, K. Seo, M. Pei, "Adaptive Hierarchical Fair Competition (AHFC) Model for Parallel Evolutionary Algorithms," *Proceedings of the Genetic and Evolutionary Computation Conference*, GECCO-2002, New York, July, pp. 772-779., 2002.
32. **J. Hu**, K. Seo, S. Li, Z. Fan, R. C. Rosenberg, E. D. Goodman, "Structure Fitness Sharing (SFS) for Evolutionary Design by Genetic Programming," *Proceedings of the*

- Genetic and Evolutionary Computation Conference*, GECCO-2002, New York, pp. 780-787. , 2002.
33. Z. Fan, K. Seo, R. C. Rosenberg, **J. Hu**, E. D. Goodman, "Exploring Multiple Design Topologies using Genetic Programming and Bond Graphs", *Proceedings of the Genetic and Evolutionary Computation Conference*, GECCO-2002, New York, July, pp. 1073-1080, 2002
  34. **J. Hu**, E. D. Goodman, "Hierarchical Fair Competition Model for Parallel Evolutionary Algorithms," *Proceedings, Congress on Evolutionary Computation*, CEC 2002, IEEE World Congress on Computational Intelligence, Honolulu, Hawaii, May, 2002.
  35. Z. Fan, **J. Hu**, K. Seo, E. D. Goodman, R. C. Rosenberg, and B. Zhang, "Bond Graph Representation and GP for Automated Analog Filter Design," 2001 *Genetic and Evolutionary Computation Conference Late-Breaking Papers*, E. Goodman, ed., ISGEC Press, San Francisco, pp. 81-86., 2001.

### Workshop Articles

36. **J. Hu**, E. D. Goodman, K. Seo, Z. Fan, R. C. Rosenberg, "HFC: A Continuing EA Framework for Scalable Evolutionary Synthesis", *Proceedings of the 2003 AAAI Spring Symposium - Computational Synthesis: From Basic Building Blocks to High Level Functionality*, Stanford, California, March, 24-26, pp. 106-113, 2003
37. Z. Fan, K. Seo, R. C. Rosenberg, **J. Hu**, E. D. Goodman, "Computational Synthesis of Multi-Domain Systems", *Proceedings of the 2003 AAAI Spring Symposium - Computational Synthesis: From Basic Building Blocks to High Level Functionality*, Stanford, California, March, 24-26, pp. 59-66, 2003
38. E. D. Goodman, K. Seo, Z. Fan, **J. Hu**, R. C. Rosenberg, "Automated Design of Mechatronic Systems: Novel Search Methods and Modular Primitives to Enable Real-World Applications," 2003 NSF Design, Service and Manufacturing Grantees and Research Conference, January 6-9, Birmingham, Alabama, 2003
39. E. D. Goodman, K. Seo, R. C. Rosenberg, Z. Fan, **J. Hu**, and B. Zhang, "Automated Design Methodology for Mechatronic Systems Using Bond Graphs and Genetic Programming," 2002 NSF Design, Service and Manufacturing Grantees and Research Conference, January 7-10, San Juan, Puerto Rico, 2002

## SOFTWARES

**imISS**: integrative missing value estimation for microarray datasets

**EvoGraph**: open source graph evolving package using genetic programming. It can be used to evolve arbitrary types of graphs or structures.

**HFC**: a sustainable evolutionary computation framework. It can greatly increase the search capability and robustness of existing evolutionary algorithms.

**BondGraph Simulator**: bond graph based dynamic/mechatronic system modeling and simulation

## REFERENCES

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**Erik D. Goodman, Professor**

(Dissertation Advisor)

Chair, Senior Fellow, International Society

for Genetic and Evolutionary Computation

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**Bill Punch, Associate Professor**

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