David J. Finton

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Education

Ph.D. in Computer Sciences Area of Specialization: Artificial Intelligence.
University of Wisconsin-Madison, Madison, Wisconsin, January 2002.
Dissertation: Cognitive Economy and the Role of Representation in On-Line Learning
http://www.cs.wisc.edu/~finton/thesis/abstract.html
Ph.D. Qualifiers: Artificial Intelligence, Mathematical Programming
Ph.D. Minor: Psychology / Philosophy (human information processing, distributed representation, philosophy of mind)

NASA Graduate Student Researchers Program Fellowship 1993–1996.

M.S. in Computer Sciences University of Wisconsin-Madison, Madison, Wisconsin, May 1985.

B.S. in Mathematics with honors, Michigan State University, East Lansing, Michigan, June 1983.

Research Interests

- Bioinformatics and genomic science, artificial intelligence, learning and autonomous systems, knowledge representation.

Current Position

Postdoctoral Fellow / Genomic Sciences Training Program Laboratory for Molecular and Computational Genomics, University of Wisconsin-Madison, Madison, Wisconsin, 2003–present.

- Current project: the analysis of DNA restriction maps obtained via whole-genome optical mapping, leading to a state-space description of genomic changes observed in neoplastic progression.

Teaching Experience

Teaching Assistant Computer Sciences Department, University of Wisconsin-Madison, Madison, Wisconsin, Spring, 2000.

- Taught recitation sections of CS 302, "Introduction to Programming." Course covered object-oriented programming and problem-solving in Java.

Teaching Assistant Computer Sciences Department, University of Wisconsin-Madison, Madison, Wisconsin, Fall, 1996.

- TA for CS 540, "Introduction to Artificial Intelligence." Created and graded assignments and exam questions; held office hours and created Web pages.

Teaching Assistant and *Lecturer* Computer Sciences Department, University of Wisconsin-Madison, Madison, Wisconsin, 1983–1990.

- Taught CS 302, "Introduction to Programming," for ten semesters. Was responsible for all aspects of course, including lectures, assignments, exams, and grades.

- Grader and consultant for courses in expert systems, artificial intelligence, data structures, and non-linear optimization.

Teaching Assistant Department of Mathematics, Michigan State University, East Lansing, Michigan, 1981–1983.

- Taught recitation sections of calculus and college algebra courses while an undergraduate.

Professorial Assistant Department of Mathematics, Michigan State University, East Lansing, Michigan, 1979–1981.

- Graded papers and staffed calculus tutorial room.

Other Experience

Project Assistant School of Music, University of Wisconsin-Madison, Madison, Wisconsin, 2001–2002.

- Developed a new Web site for the School (*http://www.wisc.edu/music/*, deployed Spring, 2002).

- Ported Professor Stephen Dembski's *Circles* application to Mac OS-X/Cocoa.

Project Assistant Smith Lab, Department of Chemistry, University of Wisconsin-Madison, Madison, Wisconsin, 1997–1999.

- Developed software for gel-based DNA sequencing, including Objective-C code for OPENSTEP and GNUstep, and a Java applet for an SNP assay.

Project Assistant School of Music, University of Wisconsin-Madison, Madison, Wisconsin, 1992–1993.

- Developed a graphical user interface for Professor Stephen Dembski's *Circles* music theoretic framework; integrated NEXTSTEP AppKit interface objects and Objective-C code with Dembski's existing Lisp code base.

Member of Technical Staff-1 AT&T Bell Laboratories, Naperville, Illinois, 1991–1992.

- Developed real-time software in C for the 5ESS digital telephone switch, as a member of the traffic measurements software team. Projects included the design, implementation, documentation and testing of a new traffic measurements report; and location and correction of software errors, including customer-reported field problems.

Professional Activities

- Reviewed papers for the Journal of Engineering Manufacture, the Journal of Cognitive Systems Research, the European Conference on Machine Learning, and IEEE Transactions on Systems, Man, and Cybernetics.
- Member of AAAI, 1998–2004.

Grants / Awards

- NASA Graduate Student Researchers Program Fellowship, 1993–1996.

Publications

David J. Finton. On-Line Feature Extraction Via Cognitive Economy. May, 2003. (While in submission, a copy may be found at *http://www.cs.wisc.edu/~finton/cogeconfeatures.html*).

David J. Finton and Yu Hen Hu. Importance-Based Feature Extraction for Reinforcement Learning. In Thomas Petsche, et. al., editors, *Computational Learning Theory and Natural Learning Systems,* volume III: Selecting Good Models, Chapter 5, MIT Press, 1995.

David J. Finton and Yu Hen Hu. An Application of Importance-Based Feature Extraction in Reinforcement Learning. In J. Vlontzos, J-N. Hwang, and E. Wilson, editors, *Neural Networks for Signal Processing,* volume IV, pages 52–60. IEEE Press, Piscataway, NJ, September 1994.

David J. Finton and Yu H. Hu. Reinforcement Learning for Multi-Step Problems. Poster presented at Computational Learning Theory and Natural Learning Systems, 1992.

Research Statement

My research interests involve the development of a state-space analysis of genomic variation within single cancerous cells. The Laboratory for Molecular and Computational Genomics has fully integrated systems for the genomic analysis of ensembles of single molecules. The Optical Mapping system produces ordered restriction maps to reveal sequence dependent patterns that serve as "bar codes" that uniquely identify any given molecule. Optical maps taken from either single cells or ensembles will be used to characterize genomic aberrations that accumulate as a consequence of oncogenic progression. The maps will link mutated genomic loci with sequence and annotation derived from public databases. A collection of these genomic "time slices" will be considered as a Markov chain to confidently identify those regions showing variation as typified by indels, translocations, or rearrangements. As a first level of analysis, optical map differences will be used to identify clusters of the most frequent cellular states. Any such generalization over a state-space depends critically on the selection of important features for cluster identity. I will apply methods I had previously developed—for characterizing such features on the basis of their ability to make critical distinctions in robotic control tasks and otherwise generalize over similar states—to further parse genomic loci in terms of their oncogenic relevance in the development of the cells.

Teaching Statement

I have been an instructor or lecturer for 10 semesters, in addition to my experience as a grader and lab consultant. I would be comfortable teaching courses in bioinformatics, artificial intelligence, machine learning, neural networks, intelligent agents, reinforcement learning, and autonomous systems, as well as undergraduate courses in computer programming, data structures, discrete mathematics, theory of computation, and mathematical optimization.

I enjoy interacting with students and discussing the concepts behind the techniques. I believe in motivating theoretical discussion by concrete examples, and in finding core issues that underlie multiple techniques (rather than presenting a collection of unrelated techniques, as some AI courses do). I believe that teaching is not only a meaningful investment in others, but a stimulus to further research.