Erik M. Rauch

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Education

Massachusetts Institute of Technology , PhD program in Computer Science beginning 9/97.

Stanford University, graduate study in Computer Science 9/96 - 4/97.

Yale University. B.S. in Computer Science and Mathematics, 5/96.

- Undergraduate Thesis: *The Geometry of Critical Ising Clusters*
  - Advisor: Benoit Mandelbrot

Park Ridge High School, Park Ridge, NJ, 1992 (Salutatorian).

Honors

NSF Graduate Fellowship beginning 9/97.
Morton B. Ryerson Scholarship, 1993-96 (Yale University).
Perspectives on Science (a selective interdisciplinary program at Yale.)

Programming Experience

Multiple years' experience in C and C++.
2 years as system administrator of an AIX network.
Parallel programming experience.
Also fluent in Lisp, Mathematica and HTML.

Experience

1/97 - 4/97 **Stanford Computer Science Department**
Research Assistant

I am working on fundamental issues raised by intelligent Internet agents. Fab, the testbed, is a system where multiple agents adapt to serve the same population of users by finding documents on the web that match their interests. The agents learn by reinforcement from feedback from the users. I am exploring the relationship between the individual strategies for the agents and some global measure of utility, such as the users' average evaluation of the documents retrieved by the agents; this knowledge will be used in changing the design of the agents.

9/96 - 12/96 **Stanford Computer Science Department**
Teaching Assistant for Object Oriented GUI Programming in C++ class

6/96 - 8/96 **IBM T.J. Watson Research Center**, Yorktown Heights, NY

I worked in the theoretical physics department, continuing my undergraduate thesis work with Benoit Mandelbrot.

12/95 - 5/96 **Undergraduate Thesis: The Geometry of Critical Ising Clusters with Benoit Mandelbrot.**

I worked closely with Dr. Mandelbrot doing my undergraduate thesis research on the fractal geometry of self-organized structures. In the course of this work, I developed several successful numerical techniques (see publications).

5/95 - 8/95 **Center for Nonlinear Studies, Los Alamos National Laboratory**
Summer Research

5/94 - 8/94 **The Santa Fe Institute**
NSF Research Experience for Undergraduates program

During these two summers, with Dr. Mark Millonas, I worked on a fundamental problem in multi-agent systems: understanding collective intelligence such as that found in insect swarms. By theoretical work and simulation, we investigated how adaptive global behavior is coordinated when agents have only limited, local knowledge. We discovered several results relating phase transitions in behavior to adaptablilty, which are described in a paper I first-authored (see "publications.")

10/94 - 5/95 **Yale Mathematics Department**
Research Assistant to Benoit Mandelbrot

I aided Prof. Mandelbrot's research in fractal geometry in the physical sciences by doing extensive numerical simulations.

5/93 - 4/94 **Yale Computer Science Department**
Summer and Term-Time Research

I designed and implemented MPGA, an object-oriented, parallel genetic algorithm. It was demonstrated by optimizing 60 floating-point variables on a problem that was hard for other optimizers. It was significantly faster than the optimizer it replaced.

Publications

Erik M. Rauch, Mark M. Millonas and Dante R. Chialvo. "Pattern Formation and Functionality in Swarm Models." *Physics Letters A* ***207*** *(1995) 185-193.*

Benoit B. Mandelbrot, Romualdo Pastor-Satorras and Erik M. Rauch. "The geometry of Critical Ising Clusters: Gap Independence and Global Structure." Submitted to *Physical Review Letters.*

Presentations

"Pattern Formation and Functionality in Swarm Models". Talk given at American Physical Society, 1996 Annual Meeting.

Los Alamos CNLS Colloquium, August 1995.

Activities

Yale Scientific Magazine, Senior Editor.

In addition to serving on the governing board of this 100-year-old magazine, I was a regular contributor on topics of science policy.

Science and Math Achiever Teams (SMArT),

a volunteer science mentor program for disadvantaged middle-school students.

Writer for several other publications
including the Yale Record and the Review of Politics.

Stanford Computer Science Department Student Webmaster.

Selected Coursework

Programming Languages
Scientific Computing
Algorithm Design
Operating Systems
Computer Organization & Sys. Programming

Machine Learning
Artificial Intelligence
Neural Networks

Computability and Formal Languages
Formal Methods in Software Development
Discrete Mathematics

Linear Algebra
Differential Equations
Stochastic Modelling
Chaotic Dynamics

Computational Economics
Complex Adaptive Systems
Self-organization in Biology & Physics

References

Prof. Benoit Mandelbrot
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