Belinda Thom Curriculum Vitae

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Research Interests

- Computing in interactive artistic and creative domains.
- Intelligent agents that collaborate in real-time and as first-class citizens with musicians.
- Machine learning—e.g., feature selection, clustering, temporal sequence learning—applied to modeling music.

Education

2001	Ph.D.	Carnegie Mellon University	Computer Science
1997	M.S.	Carnegie Mellon University	Computer Science
1988	B.S.	University of California at Berkeley	Mechanical Engineering

Academic Experience

2002–2006	Assistant Professor	Department of Computer Science Harvey Mudd College
2001–2002	Visiting Fulbright Scholar	Universität Karlsruhe (ILKD)
1994–2001	Graduate Research Asst.	Computer Science Department Carnegie Mellon University
1989	Research Asst.	Building Energy Analysis Group Lawrence Berkley Laboratory

Professional Experience

1992–1994	Assoc. Development Engineer	Astrophysics Group Lawrence Berkeley Laboratory
1990–1992	Control Systems Engineer	Engineering Services Inc.
1989–1990	Control Systems Engineer	Berkeley Process Control
1987	Engineering Intern	Research & Product Development Spectra Physics

Honors and Awards

2001–2002	Universität Karlsruhe	Fulbright Research Fellowship
1994–1997	Carnegie Mellon University	National Science Foundation Graduate Fellowship
1985–1988	UC Berkeley	Dean's List
1988	UC Berkeley	Chevron Mechanical Engineering Academic Scholarship
1985	College of the Desert	Excellence in Physics Scholarship

Teaching

Harvey Mudd College:
- CS 5: Introduction to Programming
- CS 140: Algorithms
- IE 197: Seminar in Science Education
- CS 182-1: Machine Learning Seminar
- Clinic Advisor: Medtronic, Sandia National Laboratory, Applied Biosystems, Fair Isaac

Carnegie Mellon University:
- Teaching Asst: Machine Learning
- Teaching Asst: Introduction to Artificial Intelligence

UC Berkeley:
- High School Math & Science Tutor: Minority Engineering Program (MESA, 1985-1988)

Undergraduate Research Mentoring (at HMC)

- J. McCullough: Pitch Tracking and Note Onset Detection
- M. Beyer: Experiments with Sequence Learning Algorithms
- M. Mason, S. Ricco & D. Buchfuhrer: Machine Learning Independent Study Group
- S. Jones & A.Wolin: *Impro-Visor* Interactive Jazz Composition Tool (joint w/R. Keller)
- C. Erickson: Probabilistic Suffix Trees & Gaussian Mixture Models
- B. Young: Multinomial Mixture Models
- A. Hammerly: Jazz Analysis Tool
- M. Nelson: Real-time MIDI Performance Analysis & Rhythm Quantization
- K. Perdue: Short Time Fourier Transforms & Pitch Tracking

Grants

Research Mentor for Harvey Mudd College NSF REU Site
- Title: Artificial Intelligence, Systems, and   Optical   Networking
- May 1, 2005 - April 30, 2007, $286,209

Faculty Enhancement Grant from the Mellon Foundation (with R. Keller)
- New Venture Grant for development of an improvisation advisor tool
- May 2005 – 2006, $25,000

Beckman Grants
- Research Assistant Funding: Summer 2004 $3,900
- Research Assistant Funding: Summer 2003 $3,800

Service

Computer Science Department at Harvey Mudd College
- Computer Science Colloquium organizer (2002-present)
- CS 5 Redesign subcommittee member (Fall 2005/Spring 2006)
- CS Diversity subcommittee member (Fall 2003)
- I currently advise twelve CS majors

Harvey Mudd College
- HMC Women's Luncheonette organizer (Summer and Fall 2005)
- Weekly campus-wide AI/creativity reading group organizer (2003-2005)
- HMC Core Coordinators committee member (Fall 2005)

- Study Abroad committee member (2003-2005)
- IE assessment evaluator (2003)
- Presenter, computer science lesson, the SWE WEST conference (2003, 2005)

The Claremont Colleges

- Violinist, Claremont College Concert Orchestra (2002-present)
- CS senior thesis advisor (Jon Huang, CMC, 2004)
- Guest lecturer for IWS Gender and Science course (Spring 2004)

Carnegie Mellon University

- Co-founder/organizer *Computer Science Student Seminar Series* (1998-2000)
- Founder/organizer: Alternative Machine Learning Reading Group (1995–1997)

Scholarly Activity

Service

- Intelligent Systems Demonstration Co-Chair (AAAI-05)
- Conference reviewer / Session Chair for venues like AAAI, ISMIR, and ICMC
- Journal reviewer for venues like INFORMS JoC (Cluster on Computation in Music), JNMR, and IEEE Transactions on Neural Networks
- Reviewer on an NSF Information and Intelligent Systems panel (2003)

Growth

- Attended TTL-Chicago Machine Learning Summer School (2005)
- Visited Christopher Raphael, School of Informatics, Indiana University (2005)
- Developed a Machine Learning seminar course (CS 182-1, Spring 2005)

Invited Talks

Musical Intelligence and Machine Learning

- Invited speaker, the National Academy of Sciences' Japanese-American Frontiers of Science Symposium: Session on Algorithmic Approaches to Music
- Beckman Center, UC Irvine, December 2004

Computer Music Makes for Really Interesting Computer Science!

- Invited speaker, the Stauffer Series
- Harvey Mudd College, July 2004

A Machine Learning Computation Model for Jazz Improvisation:

- Invited speaker, INFORMS, OR in the Arts: Applications In Music
- Atlanta, July 2003

Machine Learning and Interactive Music Agents

- Guest lecturer, Mathematics and Music course (ID1-19)
- Pomona College, November 2002

Using Clustering to Perceive and Generate Improvised Melodies

- Sandia National Laboratory, October 2002

Interactive Music Companions

- 48th Annual Berlin Seminar for Fulbright Scholars, Berlin, March 2002

Interesting Properties of Multinomial Mixture Distributions

- Research Seminar, Universität Darmstadt, April 2002

Machine Learning Techniques for Real-time Improvisational Solo Trading

- Computer Music Seminar, Universität Karlsruhe, February 2002
- Computer Music Seminar, Universität Darmstadt, April 2002

Publications (bold type indicates collaborations with undergraduates)

Journal Articles

[1] B. Thom, "Interactive Improvisational Music Companions," User Modeling and User-Adapted Interaction, Special Issue on User Modeling and Intelligent Agents.   A. Paiva and E. Andre (guest eds.), 2003, Vol 13, pgs 133-177.

Refereed Conference Papers

[2] **B. Thom and M. Nelson**, "An In-Depth Analysis of Real-Time MIDI Performance," Proceedings of the International Computer Music Conference (ICMC 2004), November 2004, Miami, Florida.

[3] **M. Nelson and B. Thom**, "A Survey of Real-Time MIDI Performance," Proceedings of the New Instruments for Musical Expression Conference (NIME 2004), June 2004, Hamamatsu, Japan.

[4] C. Spevak, B. Thom, and K. Höthker, "Evaluating Melodic Segmentation," Proceedings of the Second International Conference on Music and Artificial

Intelligence (ICMAI 2002), September 2002, Edinburgh, Scotland, UK. Available as Springer-Verlag Lecture Notes in Computer Science, Volume 2445, C. Anagnostopoulou, M. Ferrand, and A. Smaill (eds.).

[5]   B. Thom, C. Spevak, and K. Höthker, "Melodic Segmentation: Evaluating the Performance of Algorithms and Musical Experts," Proceedings of the International Computer Music Conference (ICMC-2002), September 2002, Gothenburg, Sweden.

[6]   B. Thom, "Machine Learning Techniques for Real-time Improvisational Solo Trading," Proceedings of the International Computer Music Conference (ICMC-2001), October 2002, Havana, Cuba.

[7]   B. Thom, "Unsupervised Learning and Interactive Jazz/Blues Improvisation," Proceedings of the Seventeenth Conference on Artificial Intelligence (AAAI-2000), August 2000, Austin, Texas.

[8]   B. Thom, "Artificial Intelligence and Real-time Interactive Improvisation," Proceedings of the Seventeenth Conference on Artificial Intelligence (AAAI-2000), Workshop on Artificial Intelligence and Music, W. Birmingham, R. Dannenberg, and G. Widmer (eds.), August 2000, Austin, Texas.

[9]   B. Thom, "BoB: an Interactive Improvisational Companion," Proceedings of the Fourth International Conference on Autonomous Agents (Agents-2000), July 2000, Barcelona, Spain. Also appeared in the Workshop on Interactive Robotics and Entertainment (WIRE-2000), April 2000, Pittsburgh, PA.

[10] B. Thom, "Learning Melodic Models for Interactive Melodic Improvisation," Proceedings of the International Computer Music Conference (ICMC-99), September 1999, Beijing, China.

[11] R. Dannenberg, B. Thom, and D. Watson, "A Machine Learning Approach to Style Recognition," Proceedings of the International Computer Music Conference (ICMC-97), September 1997, Thessalonica, Greece.

[12] B. Thom and R. Dannenberg, "Predicting Chords in Jazz," Proceedings of the International Computer Music Conference (ICMC-95), September 1995, Banff, Canada.

[13] B. Thom, "Predicting Chords in Jazz: the Good, the Bad, and the Ugly," International Joint Conference on Artificial Intelligence, Workshop on AI and Music, G. Widmer (ed.), September 1995, Montreal, Canada.

Other

[14] B. Thom, "BoB: an Improvisation Music Companion," PhD thesis, School of Computer Science, Carnegie Mellon University, July 2001. Committee: M. Veloso (advisor), R. Dannenberg, T. Mitchell, D. Wessel.

[15] **B. Keller, S. Jones, B. Thom, and Aaron Wolin**, "Impro-Visor: An Interactive Tool for Learning Improvisation Through Composition," Technical Report, Harvey Mudd College, 2005, HMC-CS-2005-02.