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NEVA CHERNIAVSKY DURAND

RESEARCH INTERESTS

I am broadly interested in creating effective yet theoretically sound algorithms to solve practical problems. My areas of expertise include computational biology, computer vision, machine learning, compression and signal processing, human computer interaction, and multimedia.

EDUCATION

2004-2009   Ph.D. in Computer Science
University of Washington, Seattle, WA
Thesis: Activity Analysis of Sign Language Video
Advisors: Richard Ladner and Eve Riskin

2002-2004   M.S. in Computer Science
University of Washington, Seattle, WA
Thesis: Grammar-based Compression of DNA Sequences
Advisor: Richard Ladner

1997-2001   B.S. in Computer Science and Mathematics (summa cum laude)
Tufts University, Medford, MA

RESEARCH EXPERIENCE

2011-Present   **Computational Biologist, Broad Institute:** Chief computationalist in biological lab focused on 3D reconstruction of the genome. Created one-click data pipeline for analysis of whole genome sequencing Hi-C experiments; invented algorithms for feature detection; built Java software for visualization of massive data sets; and helped author scientific papers describing our work. Other projects include statistical analysis of texts to identify cultural trends and image processing of satellite images for archeology.

2010-2011   **Postdoctoral Researcher, MIT CBCL:** Building an object recognition system for aerial video that includes refinement of neuromorphic features, dictionary learning and feature selection, classification, and tracking. Other projects include action recognition in real-world video data, semi-supervised learning on large image datasets, and experiments on crowd-sourcing for vision tasks.

2009-2010   **Postdoctoral Researcher, INRIA-Willow project**: Classification of person attributes from video data to aide sociologists in describing and analyzing change over time. We extract facial descriptors and train a classifier via semi-supervised learning on image and video data to predict attributes on movies.

2006-2009   **MobileASL**: Compressing sign language video to enable deaf users to communicate via mobile phone. We automatically recognize activity specific to sign language video, such as turn-taking and finger spelling, and adjust parameters in real-time to save power and bits while preserving intelligibility.

2005-2006	**Multimedia**: Broadcasting compressed variable bit rate movies to satisfy video-on-demand. Casting this problem as a version of generalized windows scheduling, we achieve low delay with a practical and efficient algorithm.
2005	**MultiStage**: Compressing video to obtain constant quality at a target average bit rate. We mapped the problem of bit allocation to the multiple choice knapsack problem and implemented our solution inside H.264, the newest standard for video compression.
2004-2005	**Auction Theory**: Selling items to impatient bidders. We prove bounds on the competitiveness of deterministic and randomized algorithms compared with the optimal offline solution.
2002-2004	**DNASequitur**: Compressing DNA sequences. We apply a linear time grammar compression algorithm that creates a unique grammar for DNA.

PUBLICATIONS

N. Cherniavsky, I. Laptev, J. Sivic, and A. Zisserman, "Semi-supervised Learning of Facial Attributes in Video," in *First International Workshop on Parts and Attributes*, in conjunction with ECCV 2010, September 2010.

N. Bansal, N. Chen, **N. Cherniavsky**, A. Rudra, B. Scheiber, and M. Sviridenko, "Dynamic Pricing for Impatient Bidders," *ACM Transactions on Algorithms*, 6(2), March 2010.

N. Cherniavsky, J. Chon, J. O. Wobbrock, R. E. Ladner, and E. A. Riskin, "Activity Analysis Enabling Real-time Video Communication on Mobile Phones for Deaf Users," in *UIST '09: Proceedings of the ACM Symposium on User Interface Software and Technology*, pages 79-88, October 2009.

N. Cherniavsky, "Activity Analysis of Sign Language Video," PhD thesis, University of Washington, March 2009.

J. Chon, **N. Cherniavsky**, E. A. Riskin, and R. E. Ladner, "Enabling Access through Real-time Sign Language Communication over Cell Phones," in *Asilomar Conference on Signals, Systems, and Computers*, November 2009.

N. Cherniavsky, R. E. Ladner, and E. A. Riskin, "Activity Detection in Conversational Sign Language Video for Mobile Telecommunication," in *IEEE Int'l Conference on Automatic Face and Gesture Recognition*, September 2008.

N. Cherniavsky, A. C. Cavender, R. E. Ladner, and E. A. Riskin, "Variable Frame Rate for Low Power Mobile Sign Language Communication", in *ASSETS '07: Proceedings of the Ninth International ACM SIGACCESS Conference on Computers and Accessibility*, pages 163-170, October 2007.

N. Cherniavsky, G. Shavit, M. F. Ringenburg, R. E. Ladner, and E. A. Riskin, "MultiStage: A MINMAX Bit Allocation Algorithm for Video Coders," *IEEE Transactions on Circuits and Systems for Video Technology* volume 17, number 1, pages 59-67, January 2007.

N. Bansal, **N. Cherniavsky**, N. Chen, A. Rudra, B. Scheiber and M. Sviridenko, "Dynamic Pricing for Impatient Bidders," in *Symposium on Discrete Algorithms (SODA),* pages 726-735, January 2007.

N. Cherniavsky and R. E. Ladner, "Practical Low Delay Broadcast of Compressed Variable Bit Rate Movies," in *Data Compression Conference (DCC)*, pages 362-371, March 2006.

N. Cherniavsky and R. E. Ladner, "Grammar-based compression of DNA Sequences", UW CSE Technical Report (TR2007-05-02), presented at the *DIMACS Working Group on the Burrows-Wheeler Transform*, August 2004.

M.J. McAuliffe, D.P. McGarry, W. Gandler, **N. Cherniavsky**, D.A. Parsons, H.J. Singh, and B.L. Trus, "Medical Image Processing, Analysis, and Visualization", presented at the National Institutes of Health Research Festival, Oct 2000.

TEACHING EXPERIENCE

Summer 2006   **Instructor, *Data Structures***: I served as the sole instructor for a 28 student class consisting of computer science majors, supervising one teaching assistant. I taught three weekly lectures, combining previous material with original work; held office hours; prepared a new project, including a new code base with visualization; wrote and graded exams; answered student questions via a newsgroup and private email; and maintained the course website with up-to-date lecture materials and assignments.

Spring 2005   **Teaching Assistant, *Professional Masters Program Algorithms***: Duties included communicating with the (all off-campus) students over email, answering questions on the message board, writing solutions to homework problems, holding office hours, and grading assignments and exams.

Winter 2005   **Teaching Assistant, *Graduate Algorithms***: Duties included website maintenance, providing extra help in office hours, and grading assignments and exams.

Autumn 2004   **Teaching Assistant, *Introduction to Computer Science***: I taught two different hour-long weekly sessions, each containing about 30 students. My duties also included holding office hours for individual help and grading assignments and exams.

Spring 2004   **Teaching Assistant, *Discrete Structures***: I taught a weekly hour-long session attended by around 30 students. I had great leeway to teach what I thought was interesting and relevant. My duties also included holding office hours for individual help and grading assignments and exams.

Winter 2004   **Teaching Assistant, *Data Compression***: Duties included website maintenance, providing extra help in office hours, grading assignments and exams, writing solutions to assignments, and setting up and maintaining project code.

WORK EXPERIENCE

1998-2002   **National Institutes of Health, Bethesda, MD**: Important member of a programming team that is developing a general-purpose image-processing product to support research in the NIH intramural program. The MIPAV (Medical Image Processing, Analysis, and Visualization) application enables quantitative analysis and visualization of medical images to support NIH scientists and physicians. Java software modules implemented include:
- Automated image registration technique used in a variety of physician research, such as Alzheimer's studies and stroke detection and treatment.

- Surface visualization tool for modeling structures found in medical images.
- Interactive, semi-automatic "intelligent scissors" tool for delineating objects of special interest, such as tumors.
- Reusable graph component used in the analysis of image data. Major graph attributes include: zooming, auto scaling, resizing, and multiple function display.

HONORS

2007	UW SWE Outstanding Female Graduate Award in CSE
2002-2005	NSF Graduate Research Fellowship
2002	Phi Beta Kappa, Tufts University
2001	Benjamin Brown Scholarship, Tufts University
1998	Dean's Prize for Academic Excellence, Tufts University

SERVICE

Program committee	International Conference on Intelligent User Interfaces
Reviewer	IEEE Transactions on Multimedia IEEE Transactions on Circuits and Systems for Video Technology Journal of Discrete Algorithms ACM SIGCHI conference on Human Factors in Computing Systems IEEE Transactions on Image Processing EURASIP Journal on Bioinformatics and Systems Biology IEEE Transactions on Broadcasting
2005-2009	Tutor, CSE undergraduates
2006-2007	Graduate student seminar coordinator
2006	Editor for disabilities office: translated mathematics portions of textbooks into Latex to make them accessible to blind students
2005-2006	CSE graduate student coordinator: served as the liaison between the faculty and the graduate students
2005-2006	Graduate admissions committee
2004-2005	Graduate and Professional Student senator
2004-2006	Mentor for Making Connections, a program that matches disadvantaged high school women with successful mentors

SKILLS

Extensive programming experience in Matlab, OpenCV, C, C++, Java, awk, Perl, shell scripts, and HTML/Javascript. Comfortable using Unix, Visual Studio, IntelliJ, and .NET.

Proficient in French (oral and written expression)