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Computer Science & Engineering
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RESEARCH INTERESTS

My research is at the intersection of human-computer interaction and artificial intelligence with a focus on improving web access. My work seeks to both improve our understanding of how web information is accessed and create tools that support better non-visual access to the web. Solutions in these areas are broadly applicable to web access in other contexts, such as on small-screen devices and on cheap voice phones in the developing world. I am particularly interested in addressing problems in these areas by helping people improve their own web experiences.

EDUCATION

Ph.D. (Expected Spring 2009)

University of Washington – Department of Computer Science and Engineering

Thesis Title: *Enabling Blind Web Users to Collaboratively Build Accessibility into the Web*

Advised by Richard E. Ladner

Conducting user studies designed to explore web accessibility from the perspective of blind users, creating tools to enable blind users to independently improve accessibility, and building a web-based screen reader that enables web access from any computer that happens to be available.

Master of Science, June 2005

University of Washington – Department of Computer Science and Engineering

Qualifying Exam Project: *Boosting Relation Extraction Recall with Soft Rules*

Advised by Oren Etzioni

Used novel “relaxed rules” to boost unsupervised information extraction recall. Constructed systems that infer new information from learned facts and automatically discover new attributes of identified classes.

Bachelor of Science and Engineering, June 2003

Princeton University – Department of Computer Science

Thesis Title: *On Using Error-Correcting Codes and Boosting to Learn Multi-Class Classification Problems*

Advised by Amit Sahai and Robert Shapire

Investigated the multi-class classification problem, concentrating on methods that use error-correcting codes and boosting. Developed novel method of rule-based clustering built on top of ECC multi-class boosting.

HONORS AND AWARDS

University of Washington College of Engineering Innovator Award	(2009)
NCTI Technology in the Works Award - \$15k	(2009)
NISH National Scholar Award for Workplace Innovation & Design – Slide Rule (Honorable Mention)	(2009)
NISH National Scholar Award for Workplace Innovation & Design – WebAnywhere (Honorable Mention)	(2009)
Andrew W. Mellon Foundation Award for Technology Collaboration (MATC) - \$50k	(2008)
ASSETS 2008 Best Student Technical Paper [C.15]	(2008)
Microsoft Imagine Cup Accessible Technology Award	(2008)
Osberg Endowed Presidential Fellowship	(2008)
W4A Accessibility Challenge Delegate’s Award [O.5]	(2008)
National Science Foundation Graduate Research Fellowship (Honorable Mention)	(2004)

REFEREED CONFERENCE PAPERS

- [C.17] **Bigham, J. P.** and Cavender, A. C. Evaluating Existing Audio CAPTCHAs and an Interface Optimized for Non-Visual Use. In *Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI 2009)*, pp. 1829-1838. Boston, Massachusetts, 2009. [Acceptance Rate: 24%]
- [C.16] **Bigham, J. P.**, Lau, T. A., and Nichols, J. W. TrailBlazer: Enabling Blind Users to Blaze Trails Through the Web. In *Proceedings of the 12th International Conference on Intelligent User Interfaces (IUI 2009)*, pp. 177-186. Sanibel Island, Florida, 2009. [Acceptance Rate: 25%]

- [C.15] Borodin, Y., **Bigham, J. P.**, Raman, R. and Ramakrishnan, I. V. What's New? - Making Web Page Updates Accessible. In *Proceedings of the 10th International ACM SIGACCESS Conference on Computers and Accessibility (ASSETS 2008)*, pp. 145-152. Halifax, Canada, 2008. [Acceptance Rate: 36%]
***Winner of Best Student Technical Paper**
- [C.14] Brudvik, J. T., **Bigham, J. P.**, Cavender, A. C. and Ladner, R. E. Hunting for Headings: Sighted Labeling vs. Automatic Classification of Headings. In *Proceedings of the 10th International ACM SIGACCESS Conference on Computers and Accessibility (ASSETS 2008)*, pp. 201-208. Halifax, Canada, 2008. [Acceptance Rate: 36%]
- [C.13] Kane, S., **Bigham, J. P.** and Wobbrock, J. O. Slide Rule: Making Mobile Touch Screens Accessible to Blind People Using Multi-Touch Interaction Techniques. In *Proceedings of the 10th International ACM SIGACCESS Conference on Computers and Accessibility (ASSETS 2008)*, pp. 73-80. Halifax, Canada, 2008. [Acceptance Rate: 36%]
- [C.12] Kawanaka, S., Borodin, Y., **Bigham, J. P.**, Lunn, D., Takagi, H. and Asakawa, C. Accessibility Commons: A Metadata Infrastructure for Web Accessibility. In *Proceedings of the 10th International ACM SIGACCESS Conference on Computers and Accessibility (ASSETS 2008)*, pp. 153-160. Halifax, Canada, 2008. [Acceptance Rate: 36%]
- [C.11] **Bigham, J. P.**, Prince, C. M. and Ladner, R. E. Addressing Performance and Security in a Screen Reading Web Application that Enables Accessibility Anywhere. In *Proceedings of the International Conference on Web Engineering (ICWE 2008)*, pp. 273-284. Yorktown Heights, New York, 2008. [Acceptance Rate: 34%]
- [C.10] **Bigham, J. P.**, Prince, C. M. and Ladner, R. E. WebAnywhere: A Screen Reader On-the-Go. In *Proceedings of the 5th International Cross-Disciplinary Conference on Web Accessibility (W4A 2008)*, pp. 73-82. Beijing, China, 2008 [Acceptance Rate: 36%].
- [C.9] **Bigham, J. P.**, Aller, M. B., Brudvik, J. T., Leung, J. O., Yazzolino, L. and Ladner, R. E. Inspiring Blind High School Students to Pursue Computer Science with Instant Messaging Chatbots. In *Proceedings of the 39th SIGCSE Technical Symposium on Computer Science Education (SIGCSE 2008)*, pp. 449-453. Portland, Oregon, 2008. [Acceptance Rate: 31%]
- [C.8] **Bigham, J. P.**, Cavender, A. C., Kaminsky, R. S., Prince, C. M. and Robison, T. S. Transcendence: Enabling a Personal View of the Deep Web. In *Proceedings of the 13th International Conference on Intelligent User Interfaces (IUI 2008)*, pp. 169-178. Gran Canaria, Spain, 2008. [Acceptance Rate: 15%]
- [C.7] **Bigham, J. P.**, Cavender, A. C., Brudvik, J. T., Wobbrock, J. O. and Ladner, R. E. WebinSitu: A Comparative Analysis of Blind and Sighted Browsing Behavior. In *Proceedings of the 9th International ACM SIGACCESS Conference on Computers & Accessibility (ASSETS 2007)*, pp. 51-58. Tempe, Arizona, 2007. [Acceptance Rate: 31%]
- [C.6] **Bigham, J. P.** and Ladner, R. E. Accessmonkey: A Collaborative Scripting Framework for Web Users and Developers. In *Proceedings of the 4th International Cross-Disciplinary Conference on Web Accessibility (W4A 2007)*, pp. 25-34. Banff, Canada, 2007. [Acceptance Rate: 40%]
- [C.5] **Bigham, J. P.** Increasing Web Accessibility by Automatically Judging Alternative Text Quality. In *Proceedings of the 12th International Conference on Intelligent User Interfaces: Short Papers Track (IUI 2007)*, pp. 349-352. Waikiki, Hawaii, 2007. [Acceptance Rate: 34%]
- [C.4] **Bigham, J. P.**, Kaminsky, R. S., Ladner, R. E., Danielsson, O. M., and Hempton, G. L. WebInSight: Making Web Images Accessible. In *Proceedings of the International ACM SIGACCESS Conference on Computers & Accessibility (ASSETS 2006)*, pp. 181-188. Portland, Oregon, 2006. [Acceptance Rate: 36%]
- [C.3] Pasca, M., Lin, D., **Bigham, J. P.**, Lifchits, A., and Jain, A. Names and Similarities on the Web: Fact Extraction in the Fast Lane. *Proceedings of the International Committee on Computational Linguistics and the Association for Computational Linguistics (COLING-ACL 2006)*, pp. 809-816. Sydney, Australia, 2006. [Acceptance Rate: 23%]
- [C.2] Pasca, M., Lin, D., **Bigham, J. P.**, Lifchits, A., and Jain, A. Organizing the World Wide Web of Facts - Step One: the One-Million Fact Extraction Challenge. *Proceedings of the National Conference on Artificial Intelligence (AAAI 2006)*, pp. 1400-1405. Boston, Massachusetts, 2006. [Acceptance Rate: 30%]
- [C.1] Turney, P., Littman, M., **Bigham J. P.**, and Shnayder, V. Combining independent modules to solve multiple-choice synonym and analogy problems. In *Proceedings of the International Conference on Recent Advances in Natural Language Processing (RANLP 2003)*, pp. 482-489. Borovets, Bulgaria, 2003. [Acceptance Rate: 28%]

JOURNAL ARTICLES

- [J.2] **Bigham, J. P.**, Brudvik, J. T., Leung, J. O. and Ladner, R.E. Enabling Web Users and Developers to Script Accessibility with Accessmonkey. In *Disability and Rehabilitation: Assistive Technology*, 2009.
- [J.1] Turney, P., Littman, M., **Bigham, J. P.**, and Shnayder, V. Combining independent modules in lexical multiple-choice problems. In *Recent Advances in Natural Language Processing III*, Nicolov, Nicolas, Kalina Bontcheva, Galia Angelova and Ruslan Mitkov (eds.), 101 ff, 2004.

WORKSHOP PAPERS

- [W.2] **Bigham, J. P.** Enabling End Users to Independently Build Accessibility Into the Web. In *Proceedings of the CHI 2009 Workshop on End User Programming and the Web*. Boston, Massachusetts, 2009.
- [W.1] **Bigham, J. P.** Accessmonkey: Enabling and Sharing End User Accessibility Improvements. In *Accessibility and Computing: The Newsletter of ACM SIGACCESS*. New York: ACM Press. First appeared in the Doctoral Consortium of ACM ASSETS 2007. Tempe, Arizona (Oct. 15-17).

REFEREED PAPERS ACCOMPANYING POSTERS AND DEMONSTRATIONS

- [P.3] **Bigham, J. P.**, Prince, C. M., and Ladner, R. E. WebAnywhere: Enabling a Screen Reading Interface for the Web on Any Computer. In *Proceedings of the International Conference on the World Wide Web (WWW 2008)*. Beijing, China, 2008.
- [P.2] **Bigham, J. P.**, Cavender, A. C., DeWitt, J. N., Otero, D., and Ladner, R. E. ASL-STEM Forum: A Bottom-Up Approach to Enabling American Sign Language to Grow in STEM Fields. In *Proceedings of the International Conference on Weblogs and Social Media (ICWSM 2008)*. Seattle, Washington, 2008.
- [P.1] **Bigham, J. P.** and Prince, C. M. WebAnywhere: A Screen Reader On-the-Go. (Demonstration) In *Proceedings of the Ninth International ACM SIGACCESS Conference on Computers & Accessibility (ASSETS 2007)*. Tempe, Arizona, 2007.

OTHER PUBLICATIONS

- [O.7] **Bigham, J. P.** WebAnywhere. *National Federation of the Blind Technology Blog*. Invited Post. September, 2008. <http://www.nfb.org/nfb/NewsBot.asp?MODE=VIEW&ID=361>
- [O.6] **Bigham, J. P.** A Web 2.0 Approach to Web Accessibility. In *Proceedings of the 9th International Conference on Low Vision (VISION 2008)*. Invited Paper. Montreal, Canada, 2008.
- [O.5] **Bigham, J. P.**, Prince, C. M., Hahn, S., and Ladner, R. E. WebAnywhere: A Screen Reading Interface for the Web on Any Computer. In *Proceedings of the International Cross-Disciplinary Conference on Web Accessibility (W4A 2008) – Web Accessibility Challenge*. Beijing, China, 2008. ***Winner of W4A Accessibility Challenge Delegate’s Award.**
- [O.4] Borodin, Y., **Bigham, J. P.**, Stent, A., and Ramakrishnan, I.V. Towards One World Web with HearSay3. In *Proceedings of the International Cross-Disciplinary Conference on Web Accessibility (W4A 2008) – Web Accessibility Challenge*. Beijing, China, 2008.
- [O.3] **Bigham, J. P.** Enabling Blind Web Users to Create Accessible Web Content. *General Exam Document*. University of Washington Department of Computer Science and Engineering, 2007.
- [O.2] **Bigham, J. P.** Boosting Relation Extraction Recall with Soft Rules. *Qualifying Exam Document*. University of Washington Department of Computer Science and Engineering, 2005.
- [O.1] **Bigham, J. P.** On Using Error-Correcting Codes and Boosting to Learn Multi-Class Classification Problems. *Undergraduate Thesis*. Princeton University, 2003.

INVITED TALKS AND PANELS

- [T.18] *Improving Access for Blind Web Users*. MIT CSAIL. Boston, Massachusetts, April, 2009.
- [T.17] *Improving Access for Blind Web Users*. University of Wisconsin. Madison, Wisconsin. March, 2009.
- [T.16] *Improving Access for Blind Web Users*. Washington University. St. Louis, Missouri. March, 2009.
- [T.15] *Improving Access for Blind Web Users*. University of Oregon. Eugene, Oregon. February, 2009.

- [T.14] *Improving Access for Blind Web Users*. Oregon State University. Corvallis, Oregon. February, 2009.
- [T.13] *Improving Access for Blind Web Users*. Microsoft Research. Redmond, Washington. February, 2009.
- [T.12] *Improving Access for Blind Web Users*. University of Rochester. Rochester, New York. February, 2009.
- [T.11] *Understanding the Global Marketplace – Perspectives from WebAnywhere*. National Center for Technology Innovation (NCTI) Technology Innovators Conference. Washington, D.C. November, 2008.
- [T.10] *Overview of NFB Youth Slam Computer Science Track*. AccessComputing Leadership Institute. Panel. Seattle, Washington. November, 2008.
- [T.9] *Research Trends in Supporting Accessibility*. Scripting Enabled. Adobe, Inc. Seattle, WA. November, 2008.
- [T.8] *Accessibility, Usability, and Availability – Building an Inclusive Web Experience*. Amazon Accessibility Day, Amazon Inc. Seattle, Washington. October, 2008.
- [T.7] *Accessibility Panel*. LMS Seminar, Electronics and Computer Science Department. Panel. Southampton University, United Kingdom. September, 2008.
- [T.6] *Toward Social Accessibility*. National Association of Disability Practitioners Conference: The Future of Supporting Students Through Technology. High Wycombe, United Kingdom. September, 2008.
- [T.5] *A Web 2.0 Approach to Web Accessibility*. International Conference on Low Vision (VISION 2008). Montreal, Canada. July, 2008.
- [T.4] *WebAnywhere: A Screen Reader On-the-Go*. Microsoft Imagine Cup Finals. Paris, France. July, 2008.
- [T.3] *A Web 2.0 Approach to Web Accessibility*. Stony Brook University, Stony Brook, New York. November, 2007.
- [T.2] *WebAnywhere: A Screen Reader On-the-Go*. Tech Talk, Google Inc. Kirkland, WA. August, 2007.
- [T.1] *WebInSight: Making Web Images Accessible*. Tech Talk, Google Inc. Kirkland, WA. May 2007.

SELECTED PRESS

- [S.10] *Recipients of Third Annual Mellon Awards for Technology Collaboration Announced*. December, 2008. <http://matc.mellon.org/press-release>
- [S.9] Paulson, Tom. *Professor's work erases technological barriers: Projects help deaf, blind benefit everyone*. Seattle Post-Intelligencer. December, 2008. http://seattlepi.nwsourc.com/local/390358_cybersigning03.html
- [S.8] Aycinena, Peggy. *Access For All*. Communications of the ACM. August, 2008.
- [S.7] Thomas, Jeffrey. *The Blind Can Now Use the Web from Anywhere*. America.gov. August, 2008. <http://www.america.gov/st/educ-english/2008/August/200808011316311CJsamohT0.1210901.html>
- [S.8] Makovec, Anne. *Project makes web more accessible to blind*. ABC News. July, 2008. http://abclocal.go.com/kgo/story?section=news/drive_to_discover&id=6243441
- [S.5] Nelson, Bryn. *Opening New Portals for the Blind*. MSNBC. July, 2008. <http://www.msnbc.msn.com/id/25630182/>
- [S.4] Stansbury, Meris. *Emerging Tech Makes Learning More Accessible*. eSchool News. July, 2008. <http://www.eschoolnews.com/news/top-news/index.cfm?i=54514>
- [S.3] Blankinship, Donna. *Web-Based Program Gives the Blind Internet Access*. Associated Press. July, 2008. http://www.usatoday.com/tech/products/services/2008-07-16-blind-web-access_N.htm
http://seattlepi.nwsourc.com/business/371483_blindweb21.html
- [S.2] *Imagine Cup 2008: Web-based Screen Reader Wins Top Accessibility Prize*. Microsoft PressPass. June, 2008. <http://www.microsoft.com/presspass/features/2008/jun08/06-18imagineaccess.msp>
- [S.1] Hickey, Hannah. *Online Service Lets Blind Surf the Internet From Any Computer, Anywhere*. University of Washington Press Release. June, 2008. <http://uwnews.org/article.asp?articleID=42563>

INDUSTRY EXPERIENCE

Intern, USER Research Group, IBM Almaden Research Center, San Jose, CA (Summer 2008)

Mentor: Tessa Lau

Created TrailBlazer, a non-visual, programming-by-demonstration system that makes web tasks easier to complete with a screen reader by enabling users to record, playback and share scripts describing web tasks. Developed a novel, machine-learning technique that uses a user's history and a short task description to suggest a next step even when no script for the desired task exists. [C.17]

Summer Fellow, Benetech, Palo Alto, CA (Summer 2008)

Manager: Reuben Firmin

Worked with a team to improve the WebAnywhere web-based screen-reading web application. Put the initial release of WebAnywhere through formal quality assurance, adapted WebAnywhere for site-specific release, and made it easier for other developers to join the project.

Intern, Google Research, Mountain View, CA (Summer 2005)

Mentor: Marius Pasca

Tackled substantial quantitative and qualitative problems with the goal of automatically generating a million correct relational facts from unstructured web text starting with ten seed facts. Made improvements to both the scoring metrics used to evaluate facts and to the extraction mechanism used to extract facts. Adapted the extraction system to use the Map-Reduce paradigm, so it could scale linearly and extract over a million facts. [C.2][C.3]

Research Intern, AT&T Shannon Labs, Florham Park, NJ (Summer 2003)

Advisors: Wen-Ling Hsu and Guy Jacobson

Tasked with improving the automatic classification and routing of email based on subject. Discovered that the categories currently in use overlapped and were often confused even by human representatives. Developed tools to identify problems in a supplied categorical hierarchy, suggest improved categories through iterative hierarchy improvement, and produce informative visualizations that illustrate confusion in a hierarchy.

Intern, Microsoft, Redmond, WA (Summer 2002)

Mentor: Adam Nathan

Developed an application designed to automatically generate test cases for the Interop area of the .NET Common Language Runtime. Using my program, logical representations of test cases were generated and executed in order to automatically test the entire Interop space.

TEACHING EXPERIENCE

Tutor, University of Washington (Spring 2005, Fall 2005, Fall 2007)

Operating Systems (CSE 451), Artificial Intelligence (CSE 473)

Held weekly tutoring sessions with groups of 1-3 students.

National Federation of the Blind (NFB) Youth Slam (August 2007)

Led the development of the curriculum for the computer science track at the Youth Slam and used it as part of an intensive class for 15 blind high school students to teach them the excitement of programming in 4 days. [C.8]

<http://webinsight.cs.washington.edu/nfbslam/>

Teaching Assistant, University of Washington (Fall 2003 – Winter 2006)

Computer Vision (CSE 455) with Steve Seitz, Cyber-Terrorism (CSEP 590TU) with Ed Lazowska, Machine Organization and Assembly Language Programming (CSE 378) with Jean-Loupe Baer, Artificial Intelligence – non-majors (CSE 415) with Steven Tanimoto, Artificial Intelligence (CSE 473) with Henry Kautz

Responsibilities included leading quiz sections, creating and grading assignments, and supporting students. Also prepared and presented lectures and quiz sections.

Lab Assistant, Princeton University (Fall 2000 – Spring 2003)

Introduction to Computer Science, Algorithms & Data Structures, Programming Systems

Answered student questions on assignments in the introductory classes offered at Princeton University.

STUDENTS SUPERVISED

Daniel Otero, with *Richard E. Ladner* (Fall 2007 – Present)
Supervised Daniel's development of the ASL-STEM Forum [P.2]. Mentored Daniel in applying to graduate school and in applying for a Mary Gates Scholarship (received Winter 2008).

Jeremy T. Brudvick, with *Richard E. Ladner* (Winter 2007 – Summer 2008)
Supervised Jeremy on our work on the WebinSitu [C.7], the NFB Youth Slam [C.9], and Accessmonkey Projects. Mentored Jeremy in applying to graduate schools (accepted offer to Georgia Institute of Technology) and in writing about his research for a Mary Gates Scholarship (received Fall 2007). Worked closely with Jeremy in writing his first conference paper. [C.14]

Jessica O. Leung, with *Richard E. Ladner* (Summer 2007 – Fall 2008)
Supervised Jessica's work on the Accessmonkey [C.6] and NFB Youth Slam [C.9] Projects. Mentored Jessica in applying for summer internships and in writing about her research for a Mary Gates Scholarship (received Fall 2008).

Maxwell B. Aller, with *Richard E. Ladner* (Winter 2007 – Winter 2008)
Supervised Max's design and implementation of the Chatbots framework supporting the NFB Youth Slam. [C.9]

Gordon Hempton, with *Richard E. Ladner* (Winter 2006 – Summer 2006)
Oscar M. Danielsson, with *Richard E. Ladner*
Supervised Gordon and Oscar's contributions to the WebInSight for Images system. Collaborated actively with them to write the research paper describing this work [C.4]. Supervised Oscar on a summer project to improve the efficacy of the Optical Character Recognition of the WebInSight for Images System.

PROFESSIONAL SERVICE

Program Committee

ASSETS: ACM Conference on Accessibility and Computing (2009)
CHI: ACM Conference on Computer-Human Interaction: Work-In-Progress Track (2009)
W4A: International Cross-Disciplinary Conference on Web Accessibility (2009)

Organizing Committee

ASSETS: ACM Conference on Accessibility and Computing – Web Chair (2009)
W4A-Special Issue: Co-Editor of W4A Special Issue Journal Publication (2009)

Reviewer of Journal Publications

ACM Transactions on Accessible Computing (2008, 2009)
IBM Systems Journal (2008)
ACM Transactions on Computer-Human Interaction (2007)

Reviewer of Conference Publications

IJCAI: International Joint Conference on Artificial Intelligence (2009)
CHI: ACM Conference on Human Factors in Computing Systems (2007, 2008, 2009)
UIST: ACM Symposium on User Interface Software and Technology (2007, 2009)

Student Volunteer

ICWSM: ACM Conference on Weblogs and Social Media (2008)
IUI: ACM Conference on Intelligent User Interfaces (2008)

Professional Memberships

AAAI: Association for the Advancement of Artificial Intelligence (2008 – Present)
ACM: Association for Computing Machinery (2008 – Present)
SIGACCESS: ACM Special Interest Group on Accessibility (2008 – Present)

OTHER PROFESSIONAL ACTIVITIES

Human Computer Interaction Consortium (HCIC) Conference – Student Delegate (02/04/09 – 02/08/09)
WebAnywhere Web-Based Screen Reader Open Source Project [C.10][C.11] (06/07 – Present)
HearSay Non-Visual Web Browser, Development Team (02/08 – Present)
Accessible Web Capacity Building Institute, University of Washington DO-IT Program (11/28/06 – 12/01/06)
Vertical Mentoring Workshop for the Blind in STEM, Volunteer (07/26/06 – 07/28/06)
DO-IT Game of Life Workshop, Volunteer (07/17/06 – 07/21/06)

REFERENCES

Available on request.