

Curriculum Vitae

Xiaojun Bi

Assistant Professor
Department of Computer Science
Stony Brook University

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Research Interests

My research lies in the general area of Human Computer Interaction, with a primary focus on building interactive systems, designing interaction techniques, and studying fundamental issues of user interface design on mobile devices. One of my main research directions is improving text entry in mobile computing. I have contributed a number of innovations in this area, including bimanual gesture typing, optimizing the keyboard decoding algorithm for both correction and completion abilities, optimizing keyboard layouts, personalizing language models, and building automatic keyboard evaluation systems.

My other main research is in the design of new interactive systems and input techniques with emerging input modalities. Some major projects include *Magic Desk* (a desktop computing environment enhanced with multi-touch capabilities), *Gather Reader* (an e-reader with pen and multi-touch input), *WallTop* (a multi-window based, large display window management system prototype), and pen rolling & tilting interaction techniques.

Establishing robust laws and regularities is fundamental to a research field. This is increasingly important in HCI as new input modalities are emerging. My research in this area includes deriving the *Finger-Fitts Law* (i.e., *FFitts Law*) to specify the speed-accuracy tradeoff of touch input, and deriving the *Bayesian Touch Criterion* as a principled approach of ranking target likelihood in target acquisition tasks.

Professional Experience

- 2017 – Present **Assistant Professor**
Department of Computer Science
Stony Brook University
- 2012 – 2016 **Research Scientist,**
Mobile Interaction Research Group
Google Inc., Mountain View, USA
- 2011 – 2012 **Postdoctoral Research Scientist,**
Mobile Interaction Research Group,
Google Inc., Mountain View, USA

Education

- 2011 Ph.D.
Department of Computer Science, University of Toronto
Supervisor: Prof. Ravin Balakrishnan
- 2006 Master
Department of Computer Science, Tsinghua University
- 2003 Bachelor
Department of Automation (Control Theory and Engineering), Tsinghua University

Honors and Awards

- *ACM CHI 2015* Honorable Mention Award (Top 5%)
- *ACM CHI 2011* Honorable Mention Award (Top 5%)
- 2013 Google Influential Paper Award
- First place in *National Mathematic Contest* (China) in Yunnan province, recruited by Tsinghua University with National Entrance Examinations waived.

Refereed Publications


- [25]. Xin Yi, Weijie Xu, Chun Yu, **Xiaojun Bi**, Yuanchun Shi (2017) "COMPASS: Rotational Keyboard on Non-Touch Smartwatches". In *Proceedings of CHI 2017 - the SIGCHI Conference on Human Factors in Computing Systems*. 10 pages. To appear. [Acceptance Rate: 25%]
- [24]. Xin Yi, Chun Yu, Weinan Shi, **Xiaojun Bi**, Yuanchun Shi (2017) "Word Clarity as a Metric in Sampling Keyboard Test Sets". In *Proceedings of CHI 2017 - the SIGCHI Conference on Human Factors in Computing Systems*. 10 pages. To appear. [Acceptance Rate: 25%]
- [23] **Xiaojun Bi**, Shumin Zhai (2016) "Predicting Finger-Touch Accuracy Based on the Dual Gaussian Distribution Model". In *Proceedings of UIST 2016 - The ACM Symposium on User Interface Software and Technology*. 313 – 319. [Acceptance Rate: 20.6%]
- [22] **Xiaojun Bi**, Shumin Zhai (2016) "IJQwerty: What Difference Does One Key Change Make? Gesture Typing Keyboard Optimization Bounded by One Key

Position Change from Qwerty". In *Proceedings of CHI 2016 - the SIGCHI Conference on Human Factors in Computing Systems*. 49 - 58. [Acceptance Rate: 23.4%]

[21] Chun Yu, Hongyi Wen, Wei Xiong, **Xiaojun Bi**, Yuanchun Shi (2016) "Investigating Effects of Post-selection Feedback for Acquiring Ultra-Small Targets on Touchscreen". In *Proceedings of CHI 2016 - the SIGCHI Conference on Human Factors in Computing Systems*. 4699 - 4710 [Acceptance Rate: 23.4%]

[20] Brian Smith*, **Xiaojun Bi**, Shumin Zhai (2015) "Optimizing Touchscreen Keyboards for Gesture Typing". In *Proceedings of CHI 2015 - the SIGCHI Conference on Human Factors in Computing Systems*. 3365 - 3374. [Acceptance Rate: 23%]

***Brian Smith** was a summer intern supervised by **Xiaojun Bi** at Google.

[19] Andrew Fowler, Kurt Partridge, Ciprian Chelba, **Xiaojun Bi**, Tom Ouyang, Shumin Zhai (2015) "Effects of Language Modeling and its Personalization on Touchscreen Typing Performance". In *Proceedings of CHI 2015 - the SIGCHI Conference on Human Factors in Computing Systems*. 649 – 658. [Acceptance Rate: 23%]  **CHI 2015 Honorable Mention Award – Top 5%**

[18] **Xiaojun Bi**, Tom Ouyang, Shumin Zhai (2014) "Both Complete and Correct? Multi-Objective Optimization of Touchscreen Keyboard". In *Proceedings of CHI 2014 – the SIGCHI Conference on Human Factors in Computing Systems*. 2297-2306. [Acceptance Rate: 22.8%].

[17] **Xiaojun Bi**, Seok-Hyung Bae, Ravin Balakrishnan. (2014) "WallTop: Manage Overflowing Windows on a Large Display". *Human-Computer Interaction*. Volume 29, Issue 2, 153-203.

[16] **Xiaojun Bi**, Shumin Zhai (2013) "Bayesian Touch - A Statistic Criterion of Target Selection with Finger Touch". In *Proceedings of UIST 2013 – The ACM Symposium on User Interface Software and Technology*. 51-60. [Acceptance Rate: 20%]

[15] **Xiaojun Bi**, Yang Li, Shumin Zhai (2013) "FFitts Law: Modeling Finger Touch with Fitts' Law". In *Proceedings of CHI 2013 – the SIGCHI Conference on Human Factors in Computing Systems*. 1363-1372. [Acceptance Rate: 20%]

 **Google Influential Paper Award**

[14] **Xiaojun Bi**, Shiri Azenkot, Kurt Partridge, Shumin Zhai (2013) "Octopus: Evaluating Touchscreen Keyboard Correction and Recognition Algorithms via Remulation". In *Proceedings of CHI 2013 – the SIGCHI Conference on Human Factors in Computing Systems*. 543-552. [Acceptance Rate: 20%]

[13] **Xiaojun Bi**, Ciprian Chelba, Tom Ouyang, Kurt Partridge, and Shumin Zhai. (2012) "Bimanual Gesture Keyboard". In *Proceedings of UIST 2012 – The ACM*

Symposium on User Interface Software and Technology. 137-146. [Acceptance Rate: 21.5%]

[12] **Xiaojun Bi**, Barton A. Smith, Shumin Zhai. (2012) “Multilingual Touchscreen Keyboard Design and Optimization”. *Human-Computer Interaction*. Volume 27, Issue 4, 352-382.

[11] Ken Hinckley, **Xiaojun Bi**, Michel Pahud, and Bill Buxton (2012) “Informal Information Gathering Techniques for Active Reading”. In *Proceedings of CHI 2012 – the SIGCHI Conference on Human Factors in Computing Systems*. 1893-1896. [Acceptance Rate: 23%]

[10] Yizhong Xin, **Xiaojun Bi**, and Xiangshi Ren. (2012) “Natural Use Profiles for the Pen: An Empirical Exploration of Pressure, Tilt, and Azimuth”. In *Proceedings of CHI 2012 – the SIGCHI Conference on Human Factors in Computing Systems*. 801-804. [Acceptance Rate: 23%]

[9] **Xiaojun Bi**, Tovi Grossman, Justin Matejka, George Fitzmaurice. (2011) “Magic Desk: Bringing Multi-Touch Surfaces into Desktop Work”. In *Proceedings of CHI 2011 – the SIGCHI Conference on Human Factors in Computing Systems*. 2511-2520. [Acceptance Rate: 26%]

 **CHI 2011 Honorable Mention Award – Top 5%**

[8] Yizhong Xin, **Xiaojun Bi**, Xiangshi Ren. (2011) “Acquiring and Pointing: An Empirical Study of Pen Tilt-Based Interaction”. In *Proceedings of CHI 2011 – the SIGCHI Conference on Human Factors in Computing Systems*. 849-858. [Acceptance Rate: 26%]

[7] **Xiaojun Bi**, Seok-Hyung Bae, Ravin Balakrishnan. (2010) “Effects of Interior Bezels of Tiled-Monitor Large Displays on Visual Search, Tunnel Steering, and Target Selection”. In *Proceedings of CHI 2010 – the SIGCHI Conference on Human Factors in Computing Systems*. 65-74. [Acceptance Rate: 22%]

[6] **Xiaojun Bi**, Barton A. Smith, Shumin Zhai (2010) “Quasi-Qwerty Soft Keyboard Optimization”. In *Proceedings of CHI 2010 – the SIGCHI Conference on Human Factors in Computing Systems*. 283-286. [Acceptance Rate: 22%]

[5] **Xiaojun Bi**, Ravin Balakrishnan. (2009) “Comparing Usage of a Large High-Resolution Display to Single or Dual Desktop Displays for Daily Work”. In *Proceedings of CHI 2009 – the SIGCHI Conference on Human Factors in Computing Systems*. 1005-1014. [Acceptance Rate: 25%]

[4] **Xiaojun Bi**, Tomer Moscovich, Gonzalo Ramos, Ravin Balakrishnan, Ken Hinckley (2008) “An Exploration of Pen Rolling for Pen-based Interaction”. In *Proceedings of UIST 2008 - The ACM Symposium on User Interface Software and Technology*. 191-200. [Acceptance Rate: 18%]

[3] James Scott, Shahram Izadi, Leila Sadat Rezai, Dominika Ruszkowski, **Xiaojun Bi**, Ravin Balakrishnan, (2010)“RearType: Text Entry Using Keys on the Back of a Device”. In *Proceedings of MobileHCI - The ACM conference on Human computer interaction with mobile devices and services*. 171-180. [Acceptance Rate: 23%]

[2] **Xiaojun Bi**, Yuanchun Shi, Xiaojie Chen. (2006) “uPen: A Smart Pen-liked Device for Facilitating Interaction on Large Displays”. In *Proceedings of IEEE TableTop Conference on Horizontal Interactive Human-Computer Systems 2006*. 160-168.

[1] **Xiaojun Bi**, Yuanchun Shi, Xiaojie Chen, Peifeng Xiang (2005) "Facilitating Interaction with Large Displays in Smart Spaces". In *Soc-EUSAI, Smart Objects and Ambient Intelligence Conference*. France, October, 2005, 105-110.

Workshop Papers & Demos

[4]. **Xiaojun Bi**, Brian A. Smith and Shumin Zhai (2015) “Keyboard Layout Optimization”. In *CHI 2015 Workshop on Principles, Techniques and Perspectives on Optimization and HCI*.

[3]. Per Ola Kristensson, **Xiaojun Bi**, Andrew Howes, Antti Oulasvirta, Roderick Murray-Smith, Harold Thimbleby, John Williamson, Shumin Zhai (2015) “Principles, Techniques and Perspectives on Optimization and HCI.” In *CHI EA 2015 - the SIGCHI Conference on Human Factors in Computing Systems*. 2441-2444.

[2]. Hao-Chuan Wang, Gary Hsieh, **Xiaojun Bi**, Henry B. L. Duh, Yihsiu Chen (2015) “Chinese CHI Symposium in CHI 2015.” In *CHI EA 2015 - the SIGCHI Conference on Human Factors in Computing Systems*. 2313-2315.

[1]. Shumin Zhai, **Xiaojun Bi**, Shiri Azenkot, Kurt Partridge (2013) "The Grand Challenge of Automated Evaluation of Text Input Systems". In *CHI 2013 Workshop on Grand Challenges in Text Entry*.

Patents (11 issued, 9 pending)

[P20]. Shumin Zhai, **Xiaojun Bi**, Yu Ouyang. *Incremental multi-touch gesture recognition*. US Patent: 9,021,380. Filed: 10/5/2012. Issued: 4/28/2015

[P19]. **Xiaojun Bi**. *Keyboard gestures for character string replacement*. US Patent: 8,806,384. Filed: 7/2/2014. Issued: 4/14/2015.

[P18]. **Xiaojun Bi**, Kurt Partridge, Yu Ouyang, Shumin Zhai. *Character deletion during keyboard gesture*. US Patent: 8,914,751. Filed: 1/14/2013. Issued: 12/16/2014

[P17]. **Xiaojun Bi**, Shumin Zhai and Michael Cleron. *Dynamically-positioned character string suggestions for gesture typing*. US Patent: 8,887,103. Filed: 1/20/2013. Issued: 11/11/2014

[P16]. **Xiaojun Bi**, Yu Ouyang, Shumin Zhai. *Partial gesture text entry*. US Patent:

8,850,350. Filed: 10/16/2013. Issued: 9/30/2014

[P15]. Yu Ouyang, Shumin Zhai, **Xiaojun Bi**. *Multi-gesture text input prediction*. US Patent: 8,843,845. Filed: 4/8/2013. Issued: 9/23/2014

[P14]. **Xiaojun Bi**. *Keyboard gestures for character string replacement*. US Patent: 8,806,384. Filed: 10/24/2013. Issued: 8/12/2014

[P13]. Tom Ouyang, Shumin Zhai, Ciprian Chelba, **Xiaojun Bi**, Satoshi Kataoka, Ken Wakasa, Keisuke Kuroyanagi. *Incremental feature-based gesture-keyboard decoding*. US Patent: 8,782,549. Filed: 10/5/2012. Issued: 7/15/2014

[P12]. Shumin Zhai, Kurt Partridge, **Xiaojun Bi**, Tom Ouyang. *Visual feedback deletion*. US Patent: 8,584,049. Filed: 3/14/2013. Issued: 11/12/2013

[P11]. **Xiaojun Bi**, Barton Smith, Shumin Zhai. *Method for optimization of soft keyboards for multiple languages*. US Patent: 8,542,195. Filed: 3/30/2010. Issued: 9/24/2013

[P10]. **Xiaojun Bi**, Shumin Zhai. *Touchscreen text input*. US Patent: 8,405,630. Filed: 04/30/2012. Issued: 3/26/2013.

[P9]. **Xiaojun Bi**. *Suggestion selection during continuous gesture input*. Application Number: US 14/656,680. Filed: 3/12/2015.

[P8]. **Xiaojun Bi**. *Alternative gesture mapping for a graphical keyboard*. Application Number: US 14/623,281. Filed: 2/16/2015.

[P7]. **Xiaojun Bi**. *Alternative gesture mapping for a graphical keyboard*. Application Number: US 62/041,868. Filed: 8/26/2014.

[P6]. **Xiaojun Bi**, Shumin Zhai. *Thumb typing keyboard*. Application Number: US 14/323,377. Filed: 7/3/2014.

[P5]. **Xiaojun Bi**. *Word prediction for numbers and symbols*. Application Number: US 14/144,825. Filed: 12/31/2013.

[P4]. **Xiaojun Bi**. *Multiple character input with a single selection*. Application Number: US 14/102,161. Filed: 12/10/2013.

[P3]. Shumin Zhai, Kurt Edward Partridge, **Xiaojun Bi**, Yu Ouyang. *Gesture keyboard with gesture cancellation*. Application number: US 13/866,680. Filed: 4/19/2013

[P2]. Shumin Zhai, Kurt Edward Partridge, **Xiaojun Bi**, Yu Ouyang. *Contextually-specific automatic separators*. Application number: US 13/784,507. Filed: 3/4/2013.

[P1]. Tovi Grossman, Justin Frank Matejka, George Fitzmaurice, **Xiaojun Bi**. *Multi-Touch Integrated Desktop Environment*. Application number: US 12/985,308. Filed: 1/5/2011.

Supervised Students

Brian Smith,
Columbia University, 2014

Project: *Optimizing keyboard layouts for gesture typing*
Published at *CHI 2015* [20]

Andrew Fowler,
Oregon Health & Science University, 2013 & 2014
Project: *Personalizing language models for touchscreen text entry*
Published at *CHI 2015* [19].

Internships/Consulting Experience

- 02/2011 – 06/2011 **Research Intern**, *Google, Mountain View, USA*
Researched gesture-based interaction techniques on mobile devices
- 06/2010 – 09/2010 **Research Intern**, *Microsoft Research, Redmond, USA*
Designed and implemented *Gather Reader*, an e-reader with pen and multi-touch input that fluidly interleaved content consumption behaviours with information gathering and informal organization activities.
- 06/2010 – 09/2010 **Research Intern**, *Autodesk Research, Toronto, Canada*
Designed and implemented *Magic Desk*, a desktop computing environment providing users multi-touch-integrated computing experience.
- 06/2008 – 09/2008 **Research Intern**, *IBM Almaden Research Center, USA*
Computationally designed multilingual touchscreen keyboard layouts optimized for input speed.
- 10/2008 – 01/2010 **Consulting Researcher**, *ShapeWriter Inc. Toronto, Canada*
Designed the gesture typing algorithm for *ShapeWriter*.

Service

Associate Chair of Program Committees

ACM Conference on Human Factors in Computing Systems (CHI) 2015, 2016, 2017
ACM Symposium on User Interface Software and Technology (UIST) 2013, 2016

General Co-chair

The International Symposium of Chinese CHI 2016.

Program Co-chair

The International Symposium of Chinese CHI 2015.

Organized/Co-Organized Workshops

CHI 2015 Workshop on Principles, Techniques, and Perspectives on Optimization and HCI

Chinese CHI Symposium in CHI 2015

Chinese CHI Symposium in CHI 2016

Journal Paper Reviewer

International Journal of Industrial Ergonomics,
IEICE Transactions on Information and Systems,
IEEE Computer Graphics and Applications,
Behavior and Information Technology,
International Journal of Human Computer Studies.

Conference Paper Reviewer

CHI(2007~2016), UIST(2007~2015), Ubicomp(2009), HPG(2009)

Teaching Experience**(Teaching Assistantships at the University of Toronto)**

CSC318 The Design of Interactive Computational Media (2006 Fall)
CSC148 Introduction to Computer Science (2007 Winter, 2009 Winter)
CSC180 Introduction to Computer Programming (2008 Fall, 2010 Winter)
CSC108 Introduction to Computer Programming (2007 Fall, 2010 Winter)

References

Available Upon Request