Toby Jia-Jun Li

Curriculum Vitae

Human-Computer Interaction Institute
School of Computer Science
Carnegie Mellon University
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Research Interests

Human-Computer Interaction (HCI), End-User Development, Programming by Demonstration, Multi-Modal Interaction, Natural Language Programming, Instructable Agents, Human-Agent Interaction

Education

Ph.D. in Human-Computer Interaction ***(expected in Spring 2021)*** **2015 – Present**
Carnegie Mellon University, *Pittsburgh, PA*
Human Computer Interaction Institute, School of Computer Science
Advisor: Brad A. Myers
Committee Members: Tom M. Mitchell, Jeffery P. Bigham, John Zimmerman, Philip J. Guo

B.S. with Distinction in Computer Science **2012 – 2015**
University of Minnesota, *Minneapolis, MN*
Department of Computer Science and Engineering
Advisor: Brent J. Hecht

Major Peer-Reviewed Conference and Journal Papers

[C.10] **Toby Jia-Jun Li**, Jingya Chen, Brandon Canfield and Brad A. Myers. Privacy-Preserving Script Sharing in GUI-based Programming-by-Demonstration Systems. *Proceedings of the 23rd ACM Conference on Computer Supported Cooperative Work and Social Computing (CSCW 2020)*.

[C.9] **Toby Jia-Jun Li**, Marissa Radensky, Justin Jia, Kirielle Singarajah, Tom M. Mitchell and Brad A. Myers. PUMICE: A Multi-Modal Agent that Learns Concepts and Conditionals from Natural Language and Demonstrations. *Proceedings of the 32nd Annual ACM Symposium on User Interface Software and Technology (UIST 2019)*.

[C.8] **Toby Jia-Jun Li,** Igor Labutov, Xiaohan Nancy Li, Xiaoyi Zhang, Wenze Shi, Wanling Ding, Tom M. Mitchell and Brad A. Myers. A Multi-Modal Interface for Specifying Data Descriptions in Programming by Demonstration Using Verbal Instructions. *IEEE Symposium on Visual Languages and Human-Centric Computing (VL/HCC 2018)*.

[C.7] **Toby Jia-Jun Li** and Oriana Riva. KITE: Building conversational bots from mobile apps. *Proceedings of the 16th ACM International Conference on Mobile Systems, Applications, and Services (MobiSys 2018)*.

[C.6] **Toby Jia-Jun Li**, Yuanchun Li, Fanglin Chen and Brad A. Myers. Programming IoT Devices by Demonstration Using Mobile Apps. *End-User Development. International Symposium on End User Development (IS-EUD) 2017. LNCS, vol. 10303*. **Best Paper Award.**

[C.5] **Toby Jia-Jun Li**, Amos Azaria and Brad A. Myers. SUGILITE: Creating Multimodal Smartphone Automation by Demonstration. *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems (CHI 2017)*. **Best Paper Honorable Mention Award.**

[C.4] Yuanchun Li, Fanglin Chen, **Toby Jia-jun Li**, Yao Guo, Gang Huang, Matthew Fredrikson, Yuvraj Agarwal and Jason I. Hong. PrivacyStreams: Enabling Transparency in Personal Data Processing for Mobile Apps. *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (PACM IMWUT/UbiComp 2017)*.

[C.3] Isaac Johnson, Yilun Lin, **Toby Jia-Jun Li,** Andrew Hall, Aaron Halfaker, Johannes Schöning and Brent Hecht. Not at Home on the Range: Peer Production and the Urban/Rural Divide. *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems (CHI 2016)*.

[C.2] **Toby Jia-Jun Li,** Shilad Sen and Brent Hecht. *Leveraging Advances in Natural Language Processing to Better Understand Tobler's First Law of Geography*. *Proceedings of the 22nd ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems (SIGSPATIAL 2014)*.

[C.1] Shilad Sen, **Toby Jia-Jun Li,** WikiBrain Team and Brent Hecht. WikiBrain: Democratizing Computation on Wikipedia. *Proceedings of the 10th International Symposium on Open Collaboration (OpenSym/WikiSym 2014)*.

Minor Lightly-Reviewed Posters, Extended Abstracts and Workshop Papers

[W.8] **Toby Jia-Jun Li**, Jingya Chen, Tom M. Mitchell and Brad A. Myers. Towards Effective Human-AI Collaboration in GUI-Based Interactive Task Learning Agents. *CHI 2020 Workshop on Artificial Intelligence for HCI: A Modern Approach (AI4HCI)*.

[W.7] **Toby Jia-Jun Li**, Marissa Radensky, Justin Jia, Kirielle Singarajah, Tom M. Mitchell and Brad A. Myers. Interactive Task and Concept Learning from Natural Language Instructions and GUI Demonstrations. *The AAAI-20 Workshop on Intelligent Process Automation (IPA-20)*.

[W.6] **Toby Jia-Jun Li**, Marissa Radensky, Tom M. Mitchell and Brad A. Myers. A Multi-Modal Approach to Concept Learning in Task Oriented Conversational Agents. *CHI 2019 Workshop on Conversational Agents: Acting on the Wave of Research and Development*.

[W.5] Marissa Radensky, **Toby Jia-Jun Li**, and Brad A. Myers. How End Users Express Conditionals in Programming by Demonstration for Mobile Apps. *2018 IEEE Symposium on Visual Languages and Human-Centric Computing (VL/HCC 2018) Poster Track*.

[W.4] **Toby Jia-Jun Li**, Igor Labutov, Xiaohan Nancy Li, Tom M. Mitchell and Brad A. Myers. Supporting Co-Adaptive Human-Agent Relationship through Programming by Demonstration using Existing GUIs. *CHI 2018 Workshop on Rethinking Interaction*.

[W.3] **Toby Jia-Jun Li**. End User Mobile Task Automation using Multimodal Programming by Demonstration. *IEEE Symposium on Visual Languages and Human-Centric Computing (VL/HCC 2017) Graduate Consortium*.

[W.2] **Toby Jia-Jun Li**, Brad A. Myers, Amos Azaria, Igor Labutov, Alexander I. Rudnicky and Tom M. Mitchell. Designing a Conversational Interface for a Multimodal Smartphone Programming-by-Demonstration Agent. *CHI 2017 Workshop on Conversational UX Design*.

[W.1] **Toby Jia-Jun Li** and Brad A. Myers. Smartphone Text Entry in Cross-Application Tasks. *CHI 2016 Workshop on Inviscid Text Entry and Beyond*.

Book Sections

[B.2] **Toby Jia-Jun Li**, Igor Labutov, Brad A. Myers, Amos Azaria, Alexander I. Rudnicky and Tom M. Mitchell. 2018. Teaching Agents When They Fail: End User Development in Goal-oriented Conversational Agents. Chapter of *Studies in Conversational UX Design*, Robert J. Moore, Margaret H. Szymanski, Raphael Arar, Guang-Jie Ren eds. Springer.

[B.1] Brad A. Myers, Amy Ko, Chris Scaffidi, Stephen Oney, YoungSeok Yoon, Kerry Chang, Mary Beth Kery and **Toby Jia-Jun Li**. 2017. Making End User Development More Natural. Chapter of *New Perspectives in End-User Development*, Fabio Paternò and Volker Wulf, eds. Springer.

Patents

[P.1] Oriana Riva, Jason Kace, Doug Burger and **Toby Jia-Jun Li**. Automatically generating conversational services from a computing application. U.S. Patent Application 16/002,915. Filed December 12, 2019.

Invited Talks and Presentations

[T.9] Interactive Task Learning from GUI-Grounded Natural Language Instructions and Demonstrations. Invited Talk at *The AAAI-20 Workshop on Intelligent Process Automation (IPA-20)*. New York, NY. Feb 7, 2020.

[T.8] SUGILITE: A Multi-Modal Agent that Learns Tasks from Natural Language and Demonstrations. Invited Demo at *The 21st International ACM SIGACCESS Conference on Computers and Accessibility (ASSETS 2019)*. Pittsburgh, PA. Oct. 28, 2019.

[T.7] SUGILITE: A Multi-Modal Agent that Learns Tasks from Natural Language and Demonstrations. Invited Lightning Talk at CMU HCII 25th Anniversary. Pittsburgh, PA. Oct. 25, 2019.

[T.6] Machine Learning from Human Instruction: Every Person a Programmer (*with Forough Arabshahi*). Invited Talk at J.P. Morgan. New York, NY. May 24, 2019.

[T.5] Teaching Intelligent Agents New Tricks: Natural Language Instructions plus Programming-by-Demonstration for Teaching Tasks (*with Brad Myers*). Invited Talk at *Human Computer Interaction Consortium (HCIC '18)*. Watsonville, CA. Jun. 25, 2018.

[T.4] SUGILITE: Enabling InMind Agent to Learn New Tasks from User Demonstration. Invited Talk at Oath (formerly Yahoo!). Sunnyvale, CA. May 30, 2018.

[T.3] Atlasify – The Geography of Everything. Invited Demo at *3M Science and Engineering Symposium*. St Paul, MN. Jun 25, 2015.

[T.2] Atlasify – The Geography of Everything. Invited Demo at *The Social Media and Business Analytics Collaborative (SOBACO) Spring Research Symposium*. Minneapolis, MN. May 14, 2015.

[T.1] WikiBrain: Making Computer Programs Smarter with Knowledge from Wikipedia. Invited Demo at *The Social Media and Business Analytics Collaborative (SOBACO) Spring Research Symposium*. Minneapolis, MN. May 6, 2014.

Relevant Research Grants

JP Morgan Research Award: Machine Learning from Human Instruction: Every Person a Programmer
PI: Tom M. Mitchell, Co-PI: Brad A. Myers
$150,000 (2019)

- This grant was directly based on my research in [C.9] on combining natural language task instructions with GUI-grounded demonstrations. I helped write the proposal, prepared the progress reports, and gave invited talks at JP Morgan.

Google Cloud Research Credit Grant: SUGILITE: A Multi-Modal Agent that Learns Tasks from Natural Language and Demonstrations
PI: Toby Jia-Jun Li
$2,000 in credits (2019-2020)

- This grant funded the infrastructure and computational resources used the development and the field deployment of our SUGILITE system.

NSF IIS-1814472: CHS: Small: Multimodal Conversational Assistant that Learns from Demonstrations
PIs: Brad A. Myers and Tom M. Mitchell
$499,019 (2018-2021)

- This grant was directly based on my research in [C.5-9] on enabling conversational assistants to learn from demonstrations. I helped write the proposal and prepared the progress reports.

Yahoo InMind Award: Automating Repetitive and Cross-App Tasks
PI: Brad A. Myers, Co-I: Toby Jia-Jun Li
$400,000 (2016-2019)

- This grant was directly based on my research in [C.5] on automating repetitive and cross-app tasks through programming by demonstration. I helped write the proposal, prepared progress reports, and gave invited talks at Yahoo!.

Selected Honors and Awards

Yahoo! InMind Fellowship *(Full support for 4 years*)	2016 – 2019
NSF Travel Grant for ACM IUI 2019 *($450)*	2019
NSF Travel Grant for ACM MobiSys 2018 *($1,500)*	2018
Rethinking Interaction CHI 2018 Workshop Grant *($1,000)*	2018
IS-EUD 2017 Best Paper Award	2017
CHI 2017 Best Paper Honorable Mention Award	2017
VL/HCC 2017 Doctoral Consortium Grant *($1,200*)	2017
2016 Bosch/Bezirk Internet of Things Hackathon – 1st place *($1,000)*	2016
University of Minnesota Gold Global Excellence Scholarship *($33,680 over 4 years)*	2012 – 2015
UROP Undergraduate Research Opportunity Program Grant *($1,400)*	2013 – 2014
NSF Travel Grant for ACM SIGSPATIAL 2014 *($720)*	2014
ESRI Scholarship *($2,000)*	2014
University of Minnesota Cultural Corps Awards *($150)*	2014
University of Minnesota College of Science and Engineering: Dean's List	2012 – 2015
ACM/ICPC International Collegiate Programming Contest Word Final Qualifier	2013

Relevant Research Experience

Engineering Implementation Consultant **Aug. 2017 – Dec. 2017**
Research Intern **May. 2017 – Aug. 2017**
Microsoft Research, Redmond, WA
Mentor: Dr. Oriana Riva

- Designed, developed, and studied a new conversational bot development tool using deep neural network, user task modeling, and mobile app analysis. [C. 7][P.1]

Research Assistant **Jan. 2013 – Aug. 2015**
GroupLens Research, University of Minnesota

- Led the development and field deployment of ATLASIFY – a novel interactive spatial visualization and exploratory search system used by over 10,000 unique users. [P. 2] [P. 3]
- Developed major parts of WIKIBRAIN – a popular open-source software framework for knowledge extraction and computation on Wikipedia. [C. 1] [P. 1]
- Designed and conducted spatial and natural language analysis on Wikipedia data for evaluating Tobler's First Law of Geography and measuring the urban/rural bias in Wikipedia. [C. 2] [C. 3]

Teaching Experience

Teaching Assistant, *05391 / 05891: Designing Human-Centered Software* **Spring 2019**
Human-Computer Interaction Institute, Carnegie Mellon University

Teaching Assistant, *05410 / 05610: User-Centered Research & Evaluation* **Fall 2018**
Human-Computer Interaction Institute, Carnegie Mellon University

Teaching Staff, *CSCI 5715: From GPS and Google Maps to Spatial Computing* **Fall 2014**
Coursera MOOC & Dept. of Computer Science and Engineering, Univ. of Minnesota

Teaching Assistant, *CSCI 2011: Discrete Structures of Computer Science* **Fall 2013, Spring 2014**
Department of Computer Science and Engineering, University of Minnesota

Students Mentored

Tiffany Cai (CMU) **Spring 2017**
- Worked on a new mobile keyboard for recording text entries in demonstration.

Jeremy Wei (CMU) **Spring 2017**
- Worked on identifying crucial actions in demonstrated scripts.

Xiaohan Nancy Li (CMU, now at Microsoft) **Fall 2017**
- Worked on representing and querying snapshots of mobile GUIs. [C.8][W.4]

Wenze Shi (CMU) **Spring 2018**
- Worked on extracting semantic entities from mobile GUIs. [C.8]

Wanling Ding (CMU) **Spring 2018**
- Worked on generating user friendly representations for demonstrated scripts. [C.8]

Marissa Radensky (Amherst College, REU intern at CMU, now Ph.D. student at UW) **Summer 2018**
- Worked on supporting conditionals in programming by demonstration. [W.5][W.6][C. 9]

Justin Jia (CMU) **Spring 2019**
- Worked on semantic parsing for concept instructions. [C. 9]

Kirielle Singarajah (CMU) **Spring 2019**
- Worked on semantic parsing for concept instructions. [C. 9]

Brandon Canfield (Yale University, REU intern at CMU) **Summer 2019**
- Worked on enabling privacy-preserving sharing of end user developed scripts.

William Timkey (Cornell University, REU intern at CMU) **Summer 2019**
- Worked crowd-sourced data collection for semantic parsers.

Jingya Chen (CMU) **Summer 2019**
- Worked on multi-modal error handling for speech interfaces.

Professional Service

Academic Service

Associate Chair, ACM CHI 2020 Late Breaking Work Track
Program Committee, AAAI-20 Workshop on Intelligent Process Automation (IPA 20)
Associate Chair, ACM CHI 2019 Late Breaking Work Track
Session Chair, ACM CHI 2019 Session on *Conversational Interactions*

Paper Reviewing

Conferences: **ACM CHI** (2017-2020), **ACM UIST** (2017-2019), **ACM CSCW** (2018-2020), **ACM DIS** (2018-2020), **ACM MobileHCI** (2018-2020), **ACM TEI** (2018)**, ACM SIGCSE** (2018), **ACM CHI PLAY** (2019).

- Received "special recognitions" for excellent reviews for ACM UIST 2017 and ACM CHI 2018

Journals: **ACM IMWUT** (2017-2019), **IEEE TMC** (2018), **IEEE Pervasive** (2018-2019), **IJGIS** (2017), **IEEE Access** (2019)

Departmental and Community Service

Committee Member, CMU HCII Faculty Lunch Organization Committee (2019-2020)
Committee Member, CMU HCII Ph.D. Student Lounge Committee (2019-2020)
Committee Member, CMU HCII Ph.D. Admissions Committee (2018-2019)
Conference Student Volunteer, ACM IUI 2019, ACM SIGSPATIAL 2014

Languages

English – Native or bilingual proficiency, **Chinese (Mandarin)** – Native or bilingual proficiency

Technical Skills

Programming Languages: C/C++, Java, Python, Scheme, Android, JavaScript, SQL, HTML and others
Keywords: Machine Learning, Deep Learning, Natural Language Processing, Dialog Systems, Conversational UX