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Research Interests

I study how intelligent systems shape the content that they help people make.

Education

Harvard University, Cambridge, MA USA
Ph.D., Computer Science Expected Spring 2019
Research: Effects of Predictive Typing on Writing Content
Advisor: Krzysztof Z. Gajos, Intelligent Interactive Systems group

Massachusetts Institute of Technology, Cambridge, MA USA
S.M., Media Arts and Sciences (MIT Media Lab) February 2010
Research: natural-language code search, commonsense reasoning
Advisor: Henry Lieberman, Software Agents Group, MIT Media Lab

Cornell University, Ithaca, NY USA
B.S., Electrical and Computer Engineering, magna cum laude June 2007

Conference and Journal Papers

K.C. Arnold, K. Chauncey, and K.Z. Gajos. **Predictive Typing Affects both Word Choice and Efficiency**. *under revision.*

K.C. Arnold, K. Chauncey, and K.Z. Gajos. **Sentiment bias in predictive text recommendations results in biased writing**. *Graphics Interface* (GI) 2018.

K.C. Arnold, A. Kalai, and K.Z. Gajos. **On Suggesting Phrases vs. Predicting Words for Mobile Text Composition**. UIST 2016.

K.C. Arnold, K. Chang, and A. Kalai. **Counterfactual Language Model Adaptation for Suggesting Phrases**. IJCNLP 2017.

K.E. Boronow, H.P. Susmann, K.Z. Gajos, R.A. Rudel, K.C. Arnold, P. Brown, R. Morello-Frosch, L. Havas, J.G. Brody. **DERBI: a digital method to help researchers offer "right-to-know" personal exposure results**. Environmental health perspectives, vol. 125 no. 2, 2017.

K. Siangliulue, K.C. Arnold, K.Z. Gajos, and S. P. Dow. **Toward Collaborative Ideation at Scale: Leveraging Ideas from Others to Generate More Creative and Diverse Ideas**. CSCW 2015.

C-Z. Huang. D. Duvenaud, K.C. Arnold, B. Partridge, J.W. Oberholtzer, and K. Z. Gajos. **Active learning of intuitive control knobs for synthesizers using Gaussian processes**. IUI 2014.

K.C. Arnold and H. Lieberman. **Managing Ambiguity in Programming by Finding Unambiguous Examples**. *Object oriented programming systems languages and applications*, OOPSLA 2010.

K. Gold, C. Havasi, M. Anderson, and K.C. Arnold. **Comparing Matrix Decomposition Methods for Meta-analysis and Reconstruction of Cognitive Neuroscience Results**, *Florida Artificial Intelligence Research Society Conference*, FLAIRS 2011.

R. Speer, J. Krishnamurthy, C. Havasi, D. Smith, H. Lieberman, K.C. Arnold. **An interface for targeted collection of common sense knowledge using a mixture model**. IUI 2009.

N.E. Huang, Z. Wu, S.R. Long, K.C. Arnold, X. Chen, K. Blank. **On Instantaneous Frequency**. *Advances in adaptive data analysis*, vol 1 issue 2, Dec. 2009.

Posters and Workshop Papers

K.C. Arnold and K.Z. Gajos. **Effective Interactions for Personalizing Spatial Visualizations of Collections**. *UIST 2015*.

K.C. Arnold and H. Lieberman. **Embracing Ambiguity**. *FSE/SDP Workshop on the Future of Software Engineering Research*, 2010.

K.C. Arnold and H. Lieberman. **Scruffy Cross-Domain Inference**. *AAAI Fall Symposium on Common Sense Knowledge*, 2010.

J.B. Alonso, K.C. Arnold, and C. Havasi. **Envisioning a Robust, Scalable Metacognitive Architecture Built on Dimensionality Reduction**. *AAAI-10 Workshop on Metacognition for Robust Social Systems*, 2010.

C. Havasi, R. Speer, K.C. Arnold, H. Lieberman, J. Alonso, J. Moeller. **Open Mind Common Sense: Crowd-sourcing for Common Sense**. *AAAI-10 Workshop on Collaboratively-Built Knowledge Sources and Artificial Intelligence*, 2010.

K.C. Arnold **Reusing Code by Reasoning About its Purpose**. Master's thesis, MIT, 2010.

D. Smith and K.C. Arnold. **Learning hierarchical plans by reading simple English narratives**. *Commonsense Workshop at the ACM International Conference on Intelligent User Interfaces (IUI)*, 2009.

Patents

From my internship at Microsoft Research:

Interactive context-based text completions. Kenneth C. Arnold, Kai-Wei Chang, Adam Tauman Kalai. (US20180101599A1, pending).

From my internship at IBM (all list inventors as: Jacob C. Albertson, Kenneth C. Arnold, Steven D. Goldman, Michael A. Paolini, Anthony J. Sessa):

Controlling resource access based on user gesturing in a 3D captured image stream of the user. (US7971156 issued Jun, 28 2011).
Informing a user of gestures made by others out of the user's line of sight. (US7725547 issued May, 25 2010).
Tracking a range of body movement based on 3D captured image streams of a user. (US7840031 issued Nov, 23 2010).
Warning a vehicle operator of unsafe operation behavior based on a 3D captured image stream. (US7792328 issued Sep, 7 2010).
Controlling a document based on user behavioral signals detected from a 3D captured image stream. (US7877706 issued Jan 25, 2011).
Controlling a system based on user behavioral signals detected from a 3D captured image stream. (US7801332 issued Sep, 21 2010).
Warning a user about adverse behaviors of others within an environment based on a 3D captured image stream. (US8269834 issued Sep 18, 2012).
Adjusting a consumer experience based on a 3D captured image stream of a consumer response. (US8295542 issued Oct 23, 2012).

Teaching

CS 109A: Introduction to Data Science, Harvard University
Teaching Fellow (with Pavlos Protopapas and Kevin Rader) Fall 2018
Taught a section, wrote and graded homework assignments, advised final project teams.

CS 282r: Decision-Making Under Uncertainty, Harvard University
Teaching Fellow (with Prof. Finale Doshi-Velez) Spring 2015
Prepared and graded assignments, advised final project teams.

CS 179: Design of Usable Interactive Systems, Harvard University
Teaching Fellow (with Prof. Krzysztof Z. Gajos) Spring 2013
Led a design studio, graded design artifacts, and taught server-side web programming.

CS 314: Computer Organization, Cornell University
Head Consultant (with Prof. Sally A. McKee) Spring 2006
Designed and implemented tooling for students to simulate hardware implementations using Cadence ASIC design tools, developed the reference MIPS processor implementation and verification testbenches, wrote and taught section notes on Verilog, and assisted students during the semester as a lab consultant.

Johns Hopkins Center for Talented Youth, St. Mary's City, MD USA
Computer Science Teaching Assistant Summer 2005
Assisted in teaching two sessions of an intensive Fundamentals of Computer Science course to middle and high-school students, including primary responsibility for units on computer architecture and graphics. Wrote instructional materials and support software, including an online code submission system and a framework upon which students built five functional video games.

Work Experience

Microsoft Research New England, Cambridge, MA USA
Research Internship Fall 2015
I worked with Adam Kalai on autocompleting email. We developed a contextual information retrieval system to automatically find opportunities to reuse text you've written in the past without explicitly creating templates. We validated that such opportunities occur with moderate frequency in the email of people throughout the organization, such as courtesies ("feel free to give me a call if you have any questions"), office processes ("you have a package available at the front desk"), and personal information (e.g., addresses, driving directions). We explored interactive interfaces for presenting these recommendations in the moment of composition, both on desktop and mobile. We presented the result at Microsoft's annual TechFest.

Luminoso, Cambridge, MA USA
Co-founder, Researcher, Developer 2011 and Summer 2013
Our unique analytics engine, based on my group's research at the Media Lab, combines associations it finds in documents with crowdsourced "common sense" relationships in order to elucidate insights from text.

MIT Media Lab, Cambridge, MA USA
Research Assistant August 2007–August 2011
Beyond research (see Publications above), I also did software development and devops:

- Developed, maintained, and supported widely-used research software, including:
  - ConceptNet and Divisi: Python libraries for common-sense reasoning, natural language processing, and machine learning, used in academic institutions around the world and at several Media Lab sponsor companies
  - Open Mind Common Sense: Website for acquiring, rating, and browsing common-sense knowledge
  - Luminoso: an analysis and visualization tool for exploring semantic spaces of free-text data

- Extensive Linux and Mac OS X system administration for our group's several complex public websites, streaming computation platforms, and development environments.
  - Deployed, maintained, and scaled database-backed Python web applications
  - Implemented a virtualized server platform based on KVM and libvirt, including configuration management (Puppet), private networking, NFS, etc.

IBM, Austin, TX USA
Extreme Blue Intern Summer 2006
Our team of four took two webcams and a Cell processor and made a full software stack for interacting with a computer by hand gestures. We built a SIMD-optimized stereo object tracking system on the Cell processor, a networked video processing pipeline, and applications for drawing, presentation, and map navigation. Our team was granted eight patents for gesture recognition applications.

NASA Goddard Space Flight Center, Greenbelt, MD USA
Nonlinear Signal Analysis Research Programmer Summer 2003 and 2004
I worked with the inventor of the Hilbert-Huang Transform (HHT) technique on implementation and applications. I wrote optimized numerical algorithms in MATLAB and C/C++ that improved accuracy over existing methods. I also developed a tool to visualize the signal analysis process.

Service

- **Reviewer**: CHI (2012, 2017, 2018, 2019), IUI (2012, 2014), IEEE Intelligent Systems (2012), JADD (2011). Awarded "Special recognition" for CHI 2017 reviewing.
- **Student Volunteer**: CHI 2014
- **Teaching** with MIT's Educational Studies Program (2007, 2010).
- **Teaching** with Clubes de Ciencia Ensenada, Summer 2016: Deep Learning and Remote Sensing