

## Peter Alexander Jansen, PhD

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Cognitive AI Lab ( [cognitiveai.org](http://cognitiveai.org) ) and Computational Language Understanding Lab ( [clulab.org](http://clulab.org) )  
School of Information  
Courtesy Appointment, Department of Linguistics  
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### Short Bio

Dr. Peter Jansen is a broadly interdisciplinary cognitive artificial intelligence researcher with backgrounds in both cognition, computational neuroscience, and computer science. As a new Assistant Professor at the University of Arizona, he works in the emerging field of explanation-centered inference, working to teach computers to read textbooks and synthesize information to pass standardized science exams while explaining the reasoning for their answers. As a postdoctoral researcher he worked on projects funded by NSF, NIH, DARPA, and the Paul Allen Institute for Artificial Intelligence. He is also a prolific science educator and open source author, with his work featured in over 50 articles in international news media, including Reuters, Forbes, WIRED, and the Washington Post.

### Education

#### **PhD: Neural Computation and Cognitive Language Modeling** **2010**

Cognitive Science Laboratory, Department of Psychology, Neuroscience, and Behavior  
McMaster University, Hamilton, Ontario, Canada

*Committee:* Scott Watter (Supervisor, Psychology), Karin Humphreys (Psychology), Lee Brooks (Psychology), Alex Sevigny (Communications and Media Studies)

*Topics:* Unsupervised models of grammar acquisition, self-organizing neural network models, abstract and concrete grounded representations of concepts, representational grounding, cognitive modeling, signal processing.

*Thesis Title:* A self-organizing computational neural network architecture with applications to sensorimotor grounded linguistic grammar acquisition.

#### **BIS: Physics and Cognitive Artificial Intelligence** **2005**

Bachelor of Independent Studies, Option in Cognitive Science  
University of Waterloo, Waterloo, Ontario, Canada

*Supervisors:* Chrysanne DiMarco (Computer Science), Paul Thagard (Philosophy/Computer Science)

*Topics:* Developmental knowledge representation, computational linguistics, cognitive architecture, children's thinking, astrophysics, optics.

*Thesis Title:* Developmental knowledge representation: a proposal for the representational substrate

### Professional Appointments

#### **Assistant Professor of Data Science** **2016 - Current**

Computational Language Understanding (CLU) Lab, School of Information  
University of Arizona, Tucson, Arizona, USA

*Topics:* Natural language processing, knowledge representation, and inference for developmental question answering tasks.

#### **Research Professor of Human Language Technology** **2015 - 2016**

Computational Language Understanding (CLU) Lab, Department of Linguistics  
University of Arizona, Tucson, Arizona, USA

**Postdoctoral Research Fellow****2013 - 2015**

Computational Language Understanding (CLU) Lab, School of Information  
University of Arizona, Tucson, Arizona, USA  
*Supervisor:* Mihai Surdeanu (School of Information)

**Postdoctoral Research Fellow****2011 - 2012**

Lab for Engineering Non-traditional Sensors (LENS), Department of Electrical Engineering  
University of Arizona, Tucson, Arizona, USA  
*Supervisor:* Michael Gehm (Electrical Engineering / Optical Sciences)  
*Topics:* Artificial Intelligence/Machine Learning and sequential Bayesian techniques for adaptive classification (applied to spectroscopy). High performance parallel distributed computing (applied to the DARPA MOSAIC/AWARE 10-gigapixel camera project).

**Refereed Journal Publications and Conference Papers**

- Jansen, P.** (2018). Multi-hop Inference for Sentence-level TextGraphs: How Challenging is Meaningfully Combining Information for Science Question Answering? *In Proceedings of the Workshop on TextGraphs (TextGraphs)*.
- Jansen, P.**, Wainwright, E., Marmorstein, S., and Morrison, C. (2018). WorldTree: A Corpus of Explanation Graphs for Elementary Science Questions supporting Multi-hop Inference. *In Proceedings of the Language Resource and Evaluation Conference (LREC)*.
- Kwon, H., Trivedi, H., **Jansen, P.**, Surdeanu, M., and Balasubramanian, N. (2018). Controlling Information Aggregation for Complex Question Answering. *In Proceedings of the European Conference on Information Retrieval (ECIR)*.
- Jansen, P.** (2017). A Study of Automatically Acquiring Explanatory Inference Patterns from Corpora of Explanations: Lessons from Elementary Science Exams. *Proceedings of the Workshop on Automated Knowledge Base Construction (AKBC'2017)*.
- Sharp, B., Surdeanu, M., **Jansen, P.**, Valenzuela-Escarcega, M. A., Clark, P., and Hammond, M. (2017). Tell Me Why: Using Question Answering as Distant Supervision for Answer Justification. *Proceedings of the Conference on Natural Language Learning (CoNLL)*.
- Jansen, P.**, Sharp, B., Surdeanu, M., and Clark, P. (2017). Framing Question Answering as Building and Ranking Answer Justifications. *Computational Linguistics*.
- Jansen, P.**, Balasubramanian, N., Surdeanu, M., and Clark, P. (2016). What's in an Explanation? Characterizing Knowledge and Inference Requirements for Elementary Science Exams. *In Proceedings of the Conference on Computational Linguistics (COLING)*.
- Sharp, B., Surdeanu, M., **Jansen, P.**, Clark, P., and Hammond, M. (2016). Creating Causal Embeddings for Question Answering with Minimal Supervision. *In Proceedings of the Conference on Empirical Methods in Natural Language Processing (EMNLP)*.
- Sharp, B., **Jansen, P.**, Surdeanu, M., and Clark, P. (2015). Spinning Straw into Gold: Using Free Text to Train Monolingual Alignment Models for Non-factoid Question Answering. *In Proceedings of the Conference of the North American Chapter of the Association for Computational Linguistics-Human Language Technologies (NAACL HLT)*.
- Fried, D., **Jansen, P.**, Hahn-Powell, G., Surdeanu, M., and Clark, P. (2015). Higher-order Lexical Semantic Models for Non-factoid Answer Reranking. *Transactions of the Association of Computational Linguists (TACL)*, 3, 197-210.
- Jansen, P.**, Surdeanu, M., and Clark, P. (2014). Discourse Complements Lexical Semantics for Non-factoid Answer Reranking. *In Proceedings of the 52nd Annual Meeting of the Association for Computational Linguistics (ACL)*.

- Forbes, A., Surdeanu, M., **Jansen, P.**, and Carrington, J. (2013) Transmitting Narrative: An Interactive Shift-Summarization Tool for Improving Nurse Communication. *Proceedings of the 3rd IEEE Workshop on Interactive Visual Text Analytics*.
- Jansen, P. A.**, Dunlop, M. J., Golish, D. R., and Gehm, M. E. (2012). Adaptive feature-specific spectral imaging, Proc. SPIE 8365, *Proceedings of 2012 SPIE Defense Security and Sensing Symposium*
- Golish, D., Vera, E., Kelly, K., Gong, Q., **Jansen, P.**, Hughes, J., Kittle, D., Brady, D., and Gehm, M. (2012). Development of a scalable image formation pipeline for multiscale gigapixel photography. *Optics Express*, 20, 22048-22062.
- Jansen, P.**, and Watter, S. (2012). Strong systematicity through sensorimotor conceptual grounding: an unsupervised, developmental approach to connectionist sentence processing. *Connection Science*, 24, 25-55.
- Jansen, P.**, Fiacconi, C., and Gibson, L. (2010). A computational vector-map model of neonate saccades: Modulating the externality effect through refraction periods. *Vision Research*, 50, 2551-2558.
- Jansen, P.**, and Watter, S. (2008). SayWhen: An automated method for high-accuracy speech onset detection. *Behavior Research Methods*, 40, 744-751.

## Selected Talks

- Jansen, P.** (2018). What's in an Explanation? Toward Explanation-centered Inference for Science Exams. **Allen Institute for Artificial Intelligence (AI2) Distinguished Lecture Series**.
- Jansen, P.** (2012). The joy of figuring things out. **Invited talk at TEDxBussels 2012: Bits, Atoms, Neurons, Genes.** (Science Pedagogy)
- Many invited public talks on academic research, open source work, or science pedagogy.

## External Grants

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|---|--------------------|
| <b>National Science Foundation (Recommended/Pending)</b>                                    | <b>2018</b>        |
| <i>Title:</i> Explainable Natural Language Inference (Collaborative Research)               |                    |
| Arizona PI. (PI: Niranjana Balasubramanian, Total Budget: \$499,001)                        |                    |
| <b>Allen Institute for Artificial Intelligence</b>  | <b>2017</b>        |
| <i>Title:</i> Explanation-centered Structured Knowledge Base for Science Question Answering |                    |
| Principal Investigator. (Total Budget: \$60,000)  |                    |
| <b>Allen Institute for Artificial Intelligence</b>  | <b>2015</b>        |
| <i>Title:</i> Explainable Robust Approximate Inference for Question Answering               |                    |
| Investigator. (PI: Mihai Surdeanu; Total Budget: \$149,000)                                 |                    |
| <b>National Institute of Health</b>   | <b>2015 - 2017</b> |
| <i>Title:</i> Enhancing Nurse Decision-Making via Augmented Communication Tools             |                    |
| Investigator. (PI: Jane Carrington; Total Budget: \$745,000)                                |                    |

## Selected Awards

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|---|-------------|
| <b>Hackaday Prize 2014</b>  | <b>2014</b> |
| Global design and manufacturing competition for electronic devices. Placed 4 <sup>th</sup> of 800+ teams. |             |
| <i>Title:</i> Open Source Science Tricorder   |             |
| <b>Hebb Student Award (Runner up) for best paper</b>  | <b>2010</b> |

National award for talk: "Chimaera neural networks for self-organizing grammar acquisition".  
20<sup>th</sup> Annual Meeting of the Canadian Society for Brain, Behavior, and Cognitive Science.

## Community Involvement and Outreach

### **The Tricorder Project** (Science pedagogy)

Extra-curricular science pedagogy work aimed at grounding science education, particularly for Children. Received widespread coverage in international news media including Reuters, Forbes, Wired, MSNBC, PBS, and the Washington Post. [ <http://www.tricorderproject.org> ]

### **Open Source Computed Tomography (CT) Scanner**

3D volumetric scanner aimed at science pedagogy [ <http://www.tricorderproject.org/openct> ]

## Exhibits

### **German Museum of Technology (Berlin)** (Science pedagogy)

2015

Open source science tricorder placed on permanent exhibit. [ <http://www.sdtb.de> ]

## Selected Popular Media and Press

### **\*Reuters: Scientist beams up a real "Star Trek" tricorder**

Broadly syndicated in international media, from the Huffington Post to the Sydney Morning Herald  
<http://www.reuters.com/article/us-startrek-tricorder-idUSBRE83C1FK20120413>

### **\*Forbes: Tricorder Update – Social Medicine is the Next Big Thing After Social Media**

<http://www.forbes.com/sites/markpmills/2012/05/21/tricorder-update-social-medicine-is-the-next-big-thing-after-social-media/>

### **\*Mythbusters Jamie & Adam's TESTED.COM: Maker Profile: Peter Jansen's Tricorder Project**

<http://www.tested.com/inventern/453525-maker-profile-peter-jansens-real-life-tricorder/>

### **\*Washington Post: Homemade tricorders and handheld health care**

[https://www.washingtonpost.com/blogs/innovations/post/homemade-tricorders-and-handheld-healthcare/2012/03/30/gIQAd9MD1S\\_blog.html](https://www.washingtonpost.com/blogs/innovations/post/homemade-tricorders-and-handheld-healthcare/2012/03/30/gIQAd9MD1S_blog.html)

### **\*TechCrunch: A Chicken In Every Pot And An Open-Source Tricorder In Every Home**

<http://techcrunch.com/2012/03/29/a-chicken-in-every-pot-and-an-open-source-tricorder-in-every-home/>

### **\*Ars Technica: Researcher publishes specs for real Linux-powered Star Trek tricorder**

"I can't help but wonder if Jansen is really a time traveler, borrowing Berlinghoff Rasmussen's business model."

<http://arstechnica.com/gadgets/2012/03/researcher-publishes-specs-for-real-linux-powered-star-trek-tricorder/>

### **\*NASA.GOV: From Star Trek to SCOUT: The Story of a Real-World Medical Tricorder**

[http://www.nasa.gov/centers/ames/researchpark/news/partners/2013/scanaduscout\\_prt.htm](http://www.nasa.gov/centers/ames/researchpark/news/partners/2013/scanaduscout_prt.htm)

### **\*WIRED (UK): Researcher publishes specs for real Linux-powered Star Trek tricorder**

<http://www.wired.co.uk/news/archive/2012-03/29/researcher-publishes-specs-for-real-linux-powered-star-trek-tricorder>

### **\*PBS Arizona (TV): Technology and Innovation: A Working Tricorder**

<http://www.azpbs.org/technology/play.php?vidId=4336>

### **\*THE VERGE: Scientist designs and shares open-source plans for real-world Tricorders**

<http://www.theverge.com/2012/3/29/2910153/scientist-designs-and-shares-open-source-plans-for-real-world>

### **\*Engadget: Tricorder designs go open course: can detect magnetic fields, reveal Trekkies**

“Dr. Jansen’s hope is to make scientists out of everyone – including your kids. That is, right after they ask you what Star Trek is.”

<http://www.engadget.com/2012/03/29/tricorder-designs-go-open-source/>

**\*Bloomberg: Star Trek’s Tricorders are Almost Here**

<http://www.bloomberg.com/bw/articles/2014-07-03/star-treks-tricorders-are-almost-here-5-devices>

**\*BoingBoing (Cory Doctorow): Open source “tricorders”: handheld sensor packages for everyone**

<http://boingboing.net/2012/03/29/open-source-tricorders-ha.html>

**\*International Business Times: Star Trek-like Tricorder Now a Reality: Why We’re so Excited?**

<http://www.ibtimes.com/star-trek-tricorder-now-reality-why-were-so-excited-432362>

**\*Geek.com: Canadian PhD builds a working Tricorder**

<http://www.geek.com/geek-cetera/canadian-phd-builds-a-working-tricorder-1479641/>

**\*Gizmag: Doctor creates his own Tricorder**

<http://www.gizmag.com/jansen-tricorder-project/22019/>

**\*CBC: ‘Tricorder’ project seeks helping hands**

<http://www.cbc.ca/news/technology/tricorder-project-seeks-helping-hands-1.1218445>

**\*Phys.org: Cognitive researcher designs and builds a real-world modular working tricorder**

<http://phys.org/news/2012-03-cognitive-real-world-modular-tricorder.html>

**\*Vice.com: Star Trekkin’ IRL: The Iconic Tricorder Actually Exists**

<http://motherboard.vice.com/blog/tricoder>

**\*Network World: Open-source designs for your very own tricorder now available online**

<http://www.networkworld.com/article/2187246/data-center/open-source-designs-for-your-very-own-tricorder-now-available-online.html>

**\*Smithsonian: A List of All the Times People Have Tried to Build a Working Tricorder**

<http://www.smithsonianmag.com/smart-news/all-times-weve-tried-build-working-tricorder-180956033/?no-ist>

**\*Gizmodo: The World Gets One Step Closer To a Working Tricorder**

<http://gizmodo.com/5897395/the-world-gets-one-step-closer-to-a-working-tricorder>

**\*IEEE Spectrum: Make It So: Open Source, Arduino-Based Tricorder Nears Completion**

<http://spectrum.ieee.org/tech-talk/computing/hardware/make-it-so-open-source-arduino-based-tricorder-nears-completion->

**\*CNET Tomorrow Daily: An Arduino Tricorder**

<http://www.cnet.com/news/tomorrow-daily-068-arduino-tricorder-potential-myst-tv-show-romocart-racing/>

**\*ZDNet Smart Planet: How to make your own tricorder**

<http://www.zdnet.com/article/how-to-make-your-own-tricorder/>

**\*MSNBC: Star Trek-like open-source tricorder sees magnetic fields and more**

“A person with that level of smarts, apparently, has enough brain power leftover in his spare time to invent tricorders, not to mention the greedlessness to share the blueprint with DIYers who want their own.”

<http://www.futureoftech.msnbc.msn.com/technology/technolog/star-trek-open-source-tricorder-sees-magnetic-fields-more-594820> [broken link]

**\*WIRED.de: Ein Erfinder hat den Tricorder aus “Star Trek” nachgebaut (German)**

<https://www.wired.de/collection/latest/der-arducorder-mini-entdeckt-unsichtbare-details-eurer-umwelt>

**\*MAKE Magazine: Open-Source CT Scanner**

<http://makezine.com/2014/04/15/open-source-ct-scanner/>

**SlashDot.org: Tricorder Project Releases Prototype Open Source 3D Printable Spectrometer**

<http://tech.slashdot.org/story/13/09/09/1945223/tricorder-project-releases-prototype-open-source-3d-printable-spectrometer>

**ExtremeTech: DIY CT scanner built for price of one commercial scan**

<http://www.extremetech.com/extreme/180694-diy-ct-scanner-built-for-price-of-one-commercial-ct-scan>

**HotHardware.com: Canadian Developer Building Open Source Tricorders**

<http://hothardware.com/news/canadian-developer-building-open-source-tricorders>

**TechVibes: Canadian Creates Star Trek-like Tricorder**

<http://www.techvibes.com/blog/canadian-creates-star-trek-like-tricorder-2012-04-05>

**Daily Caller: Health tech trends mobile with \$10M ‘tricorder’ prize**

<http://dailycaller.com/2012/04/23/health-tech-trends-mobile-with-10m-tricorder-prize/>

**Engineering.com: First Tricorders, Next Artificial Intelligence – a Moonshot Project**

<http://www.engineering.com/DesignerEdge/DesignerEdgeArticles/ArticleID/6842/First-Tricorders-Next-Artificial-Intelligence--A-Moonshot-Project.aspx>

**Digital Journal (Sydney): Op-Ed: A real Star Trek Tricorder – Working and creating a new world**

<http://www.digitaljournal.com/article/323029>

**SlashGear: Specs for Linux-powered Star Trek tricorder published**

<http://www.slashgear.com/specs-for-linux-powered-star-trek-tricorder-published-29220506/>

**Yahoo!: ‘Star Trek’ tricorder comes closer to reality**

<https://cricket.yahoo.com/news/star-trek-tricorder-comes-closer-reality-061432828.html>

**GeekBeat.tv: Star Trek Tricorder Comes to Life**

<http://geekbeat.tv/star-trek-like-tricorder-comes-to-life/>

**bit-tech: Tricorder Project brings Star Trek to the classroom**

<http://www.bit-tech.net/news/hardware/2012/03/30/tricorder-science/1>

**NSBE: Star Trek Inspires NSBE Space Project**

<http://www.nsbe.org/getattachment/293bdfd0-367e-41f5-9d6e-e2ec944d1a4c/Star-Trek-Inspires-NSBE-Space-Project.aspx>

**Giyism: Nerds invent tricorder, of course it runs on Linux**

<http://brobible.com/guyism/article/nerds-invent-tricorder-of-course-it-runs-on-linux/>

**ITBusiness.ca: Canadian designer releases DIY Star Trek tricorder specs**

<http://www.itbusiness.ca/news/canadian-designer-releases-diy-star-trek-tricorder-specs/17498>

**WebProNews: ‘Real’ Tricorder Created by Canadian Inventor**

<http://www.webpronews.com/real-tricorder-created-by-canadian-inventor-2012-03/>

**Robot Magazine: Open-source Tricorder you can make with your toaster oven**

<http://www.botmag.com/open-source-tricorder-you-can-make-with-your-toaster-oven/>

**Tech the Future: Open Hardware Tricorder may take its Maker into Space**

<http://www.techthefuture.com/technology/open-hardware-tricorder-may-take-its-maker-into-space/>

**Geeky Gadgets: Open Source Star Trek Tricorder Created by Dr. Peter Jansen**

<http://www.geeky-gadgets.com/open-source-star-trek-tricorder-created-by-peter-jansen-video-29-03-2012/>

**University of Arizona News: Attention, Trekkies: Get your Tricorders here**

<https://uanews.arizona.edu/story/attention-trekkies-get-your-tricorders-here>

**Design Engineering: Canadian scientist open sources science tricorder designs**

<http://www.design-engineering.com/canadian-scientist-open-sources-science-tricorder-designs-59990/>