

## Peter Alexander Jansen, PhD

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Computational Language Understanding (CLU) Lab  
School of Information  
University of Arizona, Tucson, AZ  
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### Research Interests

- Human language technology: robust methods for automated inference in question answering, semantic knowledge representation and extraction, combining cognitive, infant development, and machine learning methods for automated inference
- Cognitive models of infant concept, word, and grammar acquisition
- Applied signal processing for research methods/tool development
- High-performance and distributed computing
- Tabula rasa learning

### Teaching Interests

- Psycholinguistics, cognitive science, and computational models of cognitive processes
- Computational linguistics
- Artificial intelligence and machine learning
- Knowledge representation

### 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)
- Senior Artificial Intelligence Engineer** **2012 - 2013**  
Industrial Research Postdoctoral Fellowship  
Scanadu Inc, NASA Ames Research Park Moffett Field, California, USA  
*Topics:* Natural language processing and knowledge representation (applied to automated medical diagnosis). Signal processing/algorithm development. Embedded hardware design.
- 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.**, Sharp, B., Surdeanu, M., and Clark, P. (In revision). Framing Question Answering as Building and Ranking Answer Justifications. *Submitted to Computational Linguistics*.
- 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). (NLP)
- 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). (NLP)
- 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. (NLP)
- Jansen, P.**, Surdeanu, M., and Clark, P. Discourse Complements Lexical Semantics for Non-factoid Answer Reranking. In Proceedings of the 52nd Annual Meeting of the Association for Computational Linguistics (ACL), 2014. (NLP)
- 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, 2013. (NLP)

- 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) (ML/HPC)
- 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. (ML/HPC)
- 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. (COG/PSYCHLING)
- 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. (COG/PSYCHLING)
- Jansen, P.**, and Watter, S. (2008). SayWhen: An automated method for high-accuracy speech onset detection. Behavior Research Methods, 40, 744-751. (COG/PSYCHLING)
- Jansen, P.** (2004). Lexicography in an interlingual ontology. Canadian Undergraduate Journal of Cognitive Science, 3, 1-5. (NLP)

### Posters, Talks, and Conference Presentations

- Jansen, P.** (2012). The joy of figuring things out. **Invited talk at TEDxBruussels 2012: Bits, Atoms, Neurons, Genes.** (Science Pedagogy)
- Jansen, P.** (2012). The Tricorder Project. Invited presentation at MAKE Innovation Showcase 2012. Xerox PARC, Palo Alto, CA, USA. (Science Pedagogy)
- Dunlop, M., **Jansen, P.**, Golish, D. R., Gehm, M. E. (2012). AFSSI-C: the Adaptive Feature-Specific Spectral Imaging Classifier. Talk presented at the Computational Optical Sensing and Imaging (COSI) 2012 meeting. Monterey, CA. (ML/HPC)
- Golish, D. R., Vera, E., Kelly, K., Gong, Q., **Jansen, P.**, Hughes, J., Kittle, D. S., Brady, D. J., and Gehm, M.E. (2012). Challenges in Gigapixel Multiscale Image Formation. Talk presented at the Optics Society of America 2012: Imaging and Applied Optics meeting. Monterey, CA. (ML/HPC)
- Dunlop, M., **Jansen, P.\***, Gehm, M. (2011). An adaptive, feature-specific spectral imaging classifier. Talk presented at the Optics Society of America 2011: Computational Optical Sensing and Imaging meeting (COSI). Toronto, ON. (ML/HPC)
- Rodriguez, I., **Jansen, P.**, Dinakarababu, D., Gehm, M. (2011). Information optimal adaptive feature-specific spectroscopy for rapid chemical classification. Talk presented at the Optics Society of America 2011: Computational Optical Sensing and Imaging meeting (COSI). Toronto, ON. (ML/HPC)
- D'Angelo, M., **Jansen, P.**, and Humphreys, K. R. (2010). Implicit learning of tip-of-the-tongue states: Assessing a Hebbian learning account. Poster presented at the 51st Annual Meeting of the Psychonomic Society. St. Louis, MO. (COG/PSYCHLING)
- Jansen, P.**, Watter, S., and Humphreys, K. R. (2010). Chimaera neural networks for self-organizing grammar acquisition. Talk presented at the 20th Annual Meeting of the Canadian Society for Brain, Behavior, and Cognitive Science (CSBBCS). Halifax, NS. (COG/PSYCHLING)  
**Hebb Student Award (Runner up) for best paper/presentation.**
- Jansen, P.**, Watter, S., and Humphreys, K. R. (2009). Chimaera neural networks for self-organizing grammar acquisition. Poster presented at the 50th Annual Meeting of the Psychonomic Society. Boston, MA. (COG/PSYCHLING)
- Jansen, P.** (2009). Multilayer Chimaera networks: Self-organizing neural networks for temporal sequence learning. Poster presented at the Shared Hierarchical Academic Research Computing Network (SHARCNET) Research Day 2009. Waterloo, ON. (COG/PSYCHLING)

- Jansen, P.** (2008). Chimaera networks: Temporal self-organizing artificial neural networks for sequence learning. Poster presented at the 18th Annual Meeting of the Canadian Society for Brain, Behavior, and Cognitive Science (CSBBCS). London, ON. (COG/PSYCHLING)
- Jansen, P., Watter, S.** (2008). SayWhen: An automated method for high-accuracy speech onset detection. Poster presented at the 18th Annual Meeting of the Canadian Society for Brain, Behavior, and Cognitive Science (CSBBCS). London, ON. (COG/PSYCHLING)

## Other Research Experience

**Undergraduate Research Assistant** **2004**  
 Research Works! for Child Literacy, University of Waterloo  
*Supervisor:* Kathleen Bloom (Psychology)  
*Project:* Developing a model correlating early childhood literacy to later economic gain

## Grants and Awards

**Allen Institute for Artificial Intelligence** **2015**  
*Title:* Explainable Robust Approximate Inference for Question Answering  
 Investigator. (PI: Mihai Surdeanu; Total Budget: \$149,000)

**National Institute of Health** **2015 - 2017**  
*Title:* Enhancing Nurse Decision-Making via Augmented Communication Tools  
 Investigator. (PI: Jane Carrington; Total Budget: \$745,000)

**Hackaday Prize 2014** **2014**  
 Global design and manufacturing competition for electronic devices. Placed 4<sup>th</sup> of 800+ teams.  
*Title:* Open Source Science Tricorder  
 Awarded Value: \$5,000

**Hebb Student Award (Runner up) for best paper** **2010**  
 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.

**Dr. Ronald V. Joyce Award in Science (Ontario Graduate Scholarship)** **2009**  
 Awarded Value: \$15,000

## Teaching Experience

**Lecturer**  
 Statistical Natural Language Processing (LING/COMPSCI 439/539) 2015  
*Description:* An upper-year/graduate course in the foundations of statistical natural language processing, including n-grams, hidden markov models, PCFGs, and machine translation.

Computers and Linguistic Analysis (LING 4D03) 2008  
*Description:* A fourth-year, project-based computational linguistics course focused on linguistic processing, including an introduction to finite state automations, parsers, and machine translation.  
 [ <http://cogsci.mcmaster.ca/peter/ling4d03/> ]

**Guest Lectures** at University of Arizona, in ISTA 555 (Applied Natural Language Processing), and ISTA 556 (Text Retrieval and Web Search).

## Professional Development

Introduction to programming for graduate students. 3-session hands-on workshop designed and delivered at McMaster University to 30 participants.

## Teaching Assistant

2005 - 2010

*Courses:* Psychology of Language, Child Development, Human Learning and Cognition, Behavioral Neuroscience, Fundamentals of Neuroscience, Perception Lab, Sensory Processes

## Professional Development

*Attendee,* SHARCNET High-performance Computing Workshop

*Topic:* Cluster programming with MPI

*Attendee,* Center for Leadership in Learning six-week course

*Topic:* Making Effective Presentations – Lecturing

## 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> ]

## Selected Areas of Technical Expertise

C/C++, Scala, MATLAB (including distributed MATLAB). Some Java, LISP, Python, and Prolog. Cluster computing with MPI (hundreds of cores). Research experience in massively parallel implementations of neural networks and distributed image processing (data-parallel).

## Selected NLP Software

### SISTA-QA Discourse-aware Question Answering System (co-author)

A state-of-the-art question answering system including shallow and deep (RST) discourse models. [ <http://nlp.sista.arizona.edu/releases/ac12014/> ]

### Straw2Gold (co-author)

A package for training monolingual alignment and lexical semantic models using discourse structure. [ <http://clulab.cs.arizona.edu/software.php> ]

### NLP Processors (contributor)

A one-stop package for NLP processors and data structures, through a Scala API. [ <https://github.com/sistanlp/processors> ]

### SayWhen: Speech Onset Detection (co-author)

A state-of-the-art automated algorithm and interface for highly-accurate speech onset detection in psycholinguistics and cognitive experiments. [ <http://cogsci.mcmaster.ca/peter/saywhen/> ]

## 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/tricorder>
- \*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/>