

# Robert Lindsey, PhD

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## Professional Summary

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- Mission-oriented machine learning researcher and entrepreneur specializing in medical imaging
- Chief Science Officer and co-founder of Imagen, a healthcare company developing software to help physicians interpret medical images more accurately and efficiently. Imagen has multiple groundbreaking FDA clearances for deep learning software in X-ray imaging.
- Published in top-tier academic journals and conferences on diverse topics including deep learning, radiology, Bayesian statistics, natural language processing, psychology, cognitive science, and education

## Education

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- **University of Colorado** **Boulder, CO**  
*PhD, Computer Science* *2008–2014*  
Research Focus: Bayesian statistics and computational cognitive science  
Advisor: Prof. Michael Mozer  
NSF Graduate Research Fellow
- **Rensselaer Polytechnic Institute** **Troy, NY**  
*BS, Dual Major in Computer Science and Philosophy* *2005–2008*  
Summa Cum Laude

## Employment

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- **Imagen Technologies** **New York City**  
*Co-founder and Chief Science Officer* *2015–present*  
Imagen is extending the frontiers of medicine and AI to improve human well-being. In the short term, Imagen is building state-of-the-art AI software to reduce diagnostic errors in radiology and improve patient outcomes. Over the long term, Imagen is transforming early disease identification and management through interdisciplinary research at the intersection of medicine and AI.

As the Chief Science Officer and technical founder of Imagen, I am responsible for our machine learning, clinical, and regulatory work. We created the first FDA-cleared deep learning software for diagnosis and detection on X-ray imaging, and we have published novel research demonstrating how AI can significantly reduce the rate of misdiagnoses in medicine. I helped lead the creation of a team of over 60 full-time employees, develop our commercial vision and strategy, and played a key role in raising \$60mm from leading venture capitalists, hospitals and health systems, and technology entrepreneurs including DFJ and GV.

- **Boulder Analytics** **Boulder**  
*Founder* *2014–2015*  
Deep learning and statistical machine learning consulting for the U.S. defense industry. More information available upon request.

## Sensory

Boulder

### ○ Computer Vision Research Scientist

2014–2015

While finishing graduate school, I worked at Sensory to develop novel computer vision and deep learning models for face verification. They are designed to be robust to impostor attacks and, unlike most other biometric security systems, they work on-device (without internet access). The models were used in many consumer electronic devices, including LG phones.

## Publications

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- Jones, R., Sharma, A., Hotchkiss, R., Sperling, J., Hamburger, J., Ledig, C., O'Toole, R., Gardner, M., Venkatesh, S., Roberts, M., Sauvestre, R., Shaktkhin, M., Gupta, A., Kumaravel, M., Daluiski, A., Plogger, W., Nascone, J., Potter, H., Lindsey, R. (In Press). Assessment of a Deep-Learning System for Fracture Detection in Musculoskeletal Radiographs. *Nature Digital Medicine*.
- Lindsey, R., Daluiski, A., Chopra, S., Lachapelle, A., Mozer, M., Sicular, S., Hanel, D., Gardner, M., Gupta, A., Hotchkiss, R., & Potter, H. (2018). A deep neural network improves fracture detection by clinicians. *Proceedings of the National Academy of Sciences*, 115, 11591-11596. DOI: 10.1073/pnas.1806905115.
- Mozer, M. C., Kazakov, D., & Lindsey, R. V. (2018). Discrete-event continuous-time recurrent networks. arXiv:1710.04110 [cs.NE].
- Mozer, M. C., & Lindsey, R. V. (2017). Predicting and improving memory retention: Psychological theory matters in the big data era. In M. Jones (Ed.), *Big Data in Cognitive Science* (pp. 34-64). New York: Routledge.
- Khajah, M., Lindsey, R., & Mozer, M. (2016). How deep is knowledge tracing? In T. Barnes, M. Chi, & M. Feng (Eds.), *Proceedings of the Ninth International Conference on Educational Data Mining* (pp. 94-101). Educational Data Mining Society Press. [**Awarded Best Overall Paper at EDM 2016**]
- Khajah, M., Roads, B., Lindsey, R., Liu, Y., & Mozer, M. (2016). Designing engaging games using Bayesian optimization. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems* (pp. 5571-5582). New York: ACM.
- Wilson, K.H., Xiong, X., Khajah, M., Lindsey, R.V., Zhao, S., Karklin, Y., Van Inwegen, E.G., Han, B., Ekanadham, C., Beck, J.E., Heffernan, N., & Mozer, M.C. (2016). Estimating student proficiency: Deep learning is not the panacea. In R. G. Baraniak, J. Ngiam, C. Studer, P. Grimaldi, & A. S. Lan (Eds.), *Proceedings of the 2016 NIPS Workshop on Machine Learning for Education*.
- Lindsey, R., Khajah, M., & Mozer, M. (2014). Automatic discovery of cognitive skills to improve the prediction of student learning. In Z. Ghahramani, M. Welling, C. Cortes, N. D. Lawrence, & K. Q. Weinberger (Eds.), *Advances in Neural Information Processing Systems 27* (pp. 1386-1394). La Jolla, CA: Curran Associates Inc.
- Probabilistic Models of Student Learning and Forgetting (2014). PhD Thesis, University of Colorado.
- Khajah, M., Wing, R., Lindsey, R., & Mozer, M. (2014). Incorporating latent factors into knowledge tracing to predict individual differences in learning. In J. Stamper, Z. Pardos, M. Mavrikis, & B. M. McLaren (Eds), *Proceedings of the 7th International Conference on Educational Data Mining* (pp. 99-106). Educational Data Mining Society Press. [**Awarded Best Overall Paper at EDM 2014**]
- Kang, S. H. K., Lindsey, R., Mozer, M. C., & Pashler, H. (2014). Retrieval practice over the long term: Should spacing be expanding or equal-interval? *Psychonomic Bulletin & Review*, 21, 1544-1550.

- o Lindsey, R., Shroyer, J. D., Pashler, H., & Mozer, M. C. (2014). Improving students' long-term knowledge retention with personalized review. *Psychological Science*, 25(3), 639–647.
- o Khajah, M., Lindsey, R., & Mozer, M. C. (2014). Maximizing students' retention via spaced review: Practical guidance from computational models of memory. *Topics in Cognitive Science*, 6, 157–169. [**Awarded Cognitive Modeling Prize at CogSci 2013**]
- o Lindsey, R., Mozer, M. C., Huggins, W. J., & Pashler, H. (2013). Optimizing instructional policies. In C.J.C. Burges et al. (Eds.), *Advances in Neural Information Processing Systems 26* (pp.2778–2786). La Jolla, CA: Curran Associates, Inc. [**1% acceptance rate for full oral presentations**]
- o Khajah, M., Lindsey, R., & Mozer, M. C. (2013). Maximizing students' retention via spaced review: Practical guidance from computational models of memory. In M. Knauff, M. Pauen, N. Sebanz, & I. Wachsmuth (Eds.), *Proceedings of the 35th Annual Conference of the Cognitive Science Society* (pp. 758-763). Austin, TX: Cognitive Science Society.
- o Lindsey, R., Headden, W. P., Stipicevic, M. J. (2012). A Phrase-Discovering Topic Model Using Pitman-Yor Processes. *Empirical Methods in Natural Language Processing*, 2012.
- o Mozer, M. C., Pashler, H., Wilder, M., Lindsey, R., Jones, M. C., & Jones, M. N. (2010). Decontaminating human judgments to remove sequential dependencies. In J. Lafferty, C. K. I. Williams, J. Shawe-Taylor, R. S. Zemel, & A. Culota (Eds.), *Advances in Neural Information Processing Systems 23* (pp. 1705–1713). La Jolla, CA: NIPS Foundation.
- o Lindsey, R., Lewis, O., Pashler, H., & Mozer, M. C. (2010). Predicting students' retention of facts from feedback during training. In S. Ohlsson & R. Catrambone (Eds.), *Proceedings of the 32nd Annual Conference of the Cognitive Science Society*. Austin, TX: Cognitive Science Society.
- o Mozer, M. C., Pashler, H., Cepeda, N., Lindsey, R., & Vul, E. (2009). Predicting the optimal spacing of study: A multiscale context model of memory. In Y. Bengio, D. Schuurmans, J. Lafferty, C.K.I. Williams, & A. Culotta (Eds.), *Advances in Neural Information Processing Systems 22* (pp. 1321–1329). La Jolla, CA: NIPS Foundation.
- o Lindsey, R., Mozer, M., Cepeda, N. J., & Pashler, H. (2009). Optimizing Memory Retention with Cognitive Models. In A. Howes, D. Peebles, R. Cooper (Eds.), *9th International Conference on Cognitive Modeling*, Manchester, UK.
- o Lindsey, R., Stipicevic, M., Veksler, V. D., & Gray, W. D. (2008). Best Path Length on a Semantic Self-Organizing Map. In B. C. Love, K. McRae, & V. M. Sloutsky (Eds.), *Proceedings of the 30th Annual Conference of the Cognitive Science Society* (pp. 481-487). Austin, TX: Cognitive Science Society.
- o Lindsey, R., Veksler, V. D., Grintsveyg, A., & Gray, W. D. (2007). Effects of Corpus Selection on Measuring Semantic Relatedness. *Proceedings of the 8th International Conference on Cognitive Modeling* (pp. 279–284), Ann Arbor, MI.
- o Grintsveyg, A., Veksler, V. D., Lindsey, R., & Gray, W. D. (2007). Vector Generation from an Explicitly-defined Multidimensional Space. *Proceedings of the 8th International Conference on Cognitive Modeling* (pp. 231–232), Ann Arbor, MI.
- o Veksler, V. D., Grintsveyg, A., Lindsey, R., & Gray, W. D. (2007). A proxy for all your semantic needs. *Proceedings of the 29th Annual Cognitive Science Society* (pp. 1878). Austin, TX: Cognitive Science Society.
- o Lindsey, R., Mozer, M. C., & Pashler, H. Predicting Individual Differences in Student Learning via Collaborative Filtering. Submitted for publication.
- o Mozer, M. C., Pashler, H., Lindsey, R., & Jones, J. Efficient training of visual search via attentional highlighting. Submitted for publication.

- o Lindsey, R., Polsdofer, E., Mozer, M.C., Kang, S. H. K., & Pashler, H. Long-term recency is nothing more than ordinary forgetting. Submitted for publication.

## **Academic Awards and Honors**

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- o Award for best overall paper at EDM 2016
- o Award for best overall paper at EDM 2014
- o NSF Graduate Research Fellow, 2010–2013
- o Cognitive Science Society Computational Modeling Prize, 2013
- o Ralph J. Slutz Student Excellence Award, University of Colorado, 2013
- o Neural Information Processing Systems travel award, 2013, 2014
- o Temporal Dynamics of Learning Center, Trainee Fellowship Award, 2010, 2011, 2013
- o Engineering Excellence Fund award, University of Colorado, 2010
- o Dean's Graduate Assistantship, University of Colorado, 2008–2009
- o Dean's Outstanding Merit Scholarship, University of Colorado, 2008–2009
- o University Fellowship, University of Colorado, 2008–2009
- o Graduate Student Research and Community Development Award, University of Colorado, 2009
- o NSF Graduate Research Fellowship Program Honorable Mention, 2009
- o Academic citation for excellence in Capstone Experience in Philosophy, Rensselaer Polytechnic Institute, 2008
- o Upsilon Pi Epsilon (computer science honor society), Rensselaer Polytechnic Institute, 2007–2008
- o Undergraduate Research Award in Cognitive Science, Rensselaer Polytechnic Institute, 2008
- o Dean's List, Rensselaer Polytechnic Institute, 2005–2008
- o NSF Research Experiences for Undergraduates, University of Oklahoma, 2007
- o Leadership Award, Rensselaer Polytechnic Institute, 2005–2008
- o President's Award, Rensselaer Polytechnic Institute, 2005
- o Co-organizer of the Neural Information Processing Systems workshop on Personalizing Education with Machine Learning, 2013
- o Temporal Dynamics of Learning Center Trainee Committee member, 2009–2012
- o Teaching Assistant, Temporal Dynamics of Learning Center Trainee Boot Camp, 2009
- o Session chair, Evaluating Judgments and Meaning, 30th Annual Meeting of the Cognitive Science Society, 2008
- o President of the New York Eta Chapter of Upsilon Pi Epsilon, 2007–2008
- o Member of Rensselaer Polytechnic Institute's Minds and Machines Program, 2005–2008