

Dave F. Kleinschmidt

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Education

- 2016 **Ph.D. Brain and Cognitive Sciences**, *University of Rochester*, Rochester, NY.
Perception in a Variable but Structured World: The Case of Speech Perception. Committee: T. Florian Jaeger (advisor), Richard Aslin, Lori Holt, Jeffrey Runner (chair)
- 2009 **B.A. Mathematics, concentration Cognitive Science**, *Williams College*, Williamstown, MA,
Summa cum laude, highest honors in Cognitive Science.
Senior thesis advisor: Safa Zaki

Appointments

- 2018 **Assistant Professor of Psychology and Center for Cognitive Science**, *Rutgers University*, New Brunswick.
- 2016–2018 **C.V. Starr Fellow**, *Princeton Neuroscience Institute*.
- 2009–2010 **Baggett Fellow**, *University of Maryland, Linguistics Department*.
Post-baccalaureate research fellowship. Advised by Bill Idsardi.
- 2006–2009 **Research Assistant**, *Williams College, Department of Psychology*.
Supervised by Safa Zaki.

Publications

Papers

- 2020 Luthra, S., Correia, J. M., **Kleinschmidt, D. F.**, Mesite, L., & Myers, E. B. Lexical information guides retuning of neural patterns in perceptual learning for speech. *Journal of Cognitive Neuroscience, Early Access*, 1–12. https://doi.org/10.1162/jocn_a_01612
- Wu*, M.-H., **Kleinschmidt***, D. F., Emberson, L., Doko, D., Edelman, S., Jacobs, R., & Raizada, R. Cortical transformation of stimulus-space in order to linearize a linearly inseparable task. *Journal of Cognitive Neuroscience, Early Access*, 1–13. https://doi.org/10.1162/jocn_a_01533
- 2019 **Kleinschmidt, D. F.** Structure in talker variability: How much is there and how much can it help? *Language, Cognition and Neuroscience*, 34(1), 43–68. <https://doi.org/10.1080/23273798.2018.1500698>
- Yarkoni, T., Markiewicz, C. J., de la Vega, A., Gorgolewski, K. J., Salo, T., Halchenko, Y. O., McNamara, Q., DeStasio, K., Poline, J.-B., Petrov, D., Hayot-Sasson, V., Nielson, D. M., Carlin, J., Kiar, G., Whitaker, K., DuPre, E., Wagner, A., Tirrell, L. S., Jas, M., Hanke, M., Poldrack, R. A., Esteban, O., Appelhoff, S., Holdgraf, C., Staden, I., Thirion, B., **Kleinschmidt, D. F.**, Lee, J. A., di Castello, M. V. O., Notter, M. P., & Blair, R. Pybids: Python tools for bids datasets. *Journal of Open Source Software*, 4(40), 1294. <https://doi.org/10.21105/joss.01294>
- 2018 **Kleinschmidt, D. F.**, Weatherholtz, K., & Jaeger, T. F. Sociolinguistic perception as inference under uncertainty. *Topics in Cognitive Science*, 10(4), 818–834. <https://doi.org/10.1111/tops.12331>
- 2016 **Kleinschmidt, D. F.**, & Jaeger, T. F. Re-examining selective adaptation: Fatiguing feature detectors, or distributional learning? *Psychonomic Bulletin & Review*, 23(3), 678–691. <https://doi.org/10.3758/s13423-015-0943-z>

* Indicates equal contributions.

- Pajak, B., Fine, A. B., **Kleinschmidt, D. F.**, & Jaeger, T. F. Learning additional languages as hierarchical probabilistic inference: Insights from first language processing. *Language Learning*, 66(4), 900–944. <https://doi.org/10.1111/lang.12168>
- 2015 **Kleinschmidt, D. F.**, & Jaeger, T. F. Robust speech perception: Recognize the familiar, generalize to the similar, and adapt to the novel. *Psychological Review*, 122(2). <https://doi.org/10.1037/a0038695>
- 2014 Salverda, A. P., **Kleinschmidt, D. F.**, & Tanenhaus, M. K. Immediate effects of anticipatory coarticulation in spoken-word recognition. *Journal of Memory and Language*, 71(1), 145–163. <https://doi.org/10.1016/j.jml.2013.11.002>
- Zaki, S. R., & **Kleinschmidt, D. F.** Procedural memory effects in categorization: Evidence for multiple systems or task complexity? *Memory & cognition*, 42(3), 508–24. <https://doi.org/10.3758/s13421-013-0375-9>
- 2011 Croft, W., Bhattacharya, T., **Kleinschmidt, D. F.**, Smith, D. E., & Jaeger, T. F. Greenbergian universals, diachrony, and statistical analyses. *Linguistic Typology*, 15(2), 433–453. <https://doi.org/10.1515/LITY.2011.029>

Submitted and in preparation

- submitted **Kleinschmidt, D. F.** *What constrains distributional learning in adults?* <https://doi.org/10.31234/osf.io/6yhbe>
- in preparation **Kleinschmidt, D. F.**, Raizada, R., & Jaeger, T. F. *Neural mechanisms of rapid adaptation to unfamiliar talkers via distributional learning.*

Refereed Proceedings Papers

- 2019 **Kleinschmidt, D. F.**, & Hemmer, P. A Bayesian model of memory in a multi-context environment. In A. Goel, C. Seifert, & C. Freksa (Eds.), *Proceedings of the 41st Annual Conference of the Cognitive Science Society*. Cognitive Science Society. osf.io/vuksn/
- 2018 **Kleinschmidt, D. F.** Learning distributions as they come: Particle filter models for online distributional learning of phonetic categories. In T. T. Rogers, X. Rau, X. Zhu, & C. Kalish (Eds.), *Proceedings of the 40th Annual Conference of the Cognitive Science Society* (pp. 1933–1938). Cognitive Science Society. <https://doi.org/10.31234/osf.io/dymc8>
- 2016 **Kleinschmidt, D. F.**, & Jaeger, T. F. What do you expect from an unfamiliar talker? In J. Trueswell, A. Papafragou, D. Grodner, & D. Mirman (Eds.), *Proceedings of the 38th annual meeting of the cognitive science society*. Cognitive Science Society.
- 2015 **Kleinschmidt, D. F.**, Raizada, R., & Jaeger, T. F. Supervised and unsupervised learning in phonetic adaptation. In R. Dale, C. Jennings, P. Maglio, T. Matlock, D. Noelle, A. Warlaumont, & J. Yoshimi (Eds.), *Proceedings of the 37th annual conference of the cognitive science society*. Cognitive Science Society.
- 2012 **Kleinschmidt, D. F.**, Fine, A. B., & Jaeger, T. F. A belief-updating model of adaptation and cue combination in syntactic comprehension. In N. Miyake, D. Peebles, & R. P. Cooper (Eds.), *Proceedings of the 34th annual conference of the cognitive science society* (pp. 599–604). Cognitive Science Society.
- Kleinschmidt, D. F.**, & Jaeger, T. F. A continuum of phonetic adaptation: Evaluating an incremental belief-updating model of recalibration and selective adaptation. In N. Miyake, D. Peebles, & R. P. Cooper (Eds.), *Proceedings of the 34th annual conference of the cognitive science society* (pp. 605–10). Cognitive Science Society.
- 2011 **Kleinschmidt, D. F.**, & Jaeger, T. F. A Bayesian belief updating model of phonetic recalibration and selective adaptation. *Proceedings of the 2nd ACL workshop on cognitive modeling and computational linguistics*. Association for Computational Linguistics.

Presentations

- 2020 **Kleinschmidt, D. F.** *Statsmodels.jl: Mistakes were made* [Talk presented at JuliaCon2020 (virtual)]. www.davekleinschmidt.com/juliacon2020/
- Knutsen, S., Stromswold, K., & **Kleinschmidt, D. F.** *Compensation, classification and inferring sentence structure from acoustic duration* [Poster presented at LabPhon 17]. osf.io/8x9fd/

- 2019 **Kleinschmidt, D. F.** *Who's talking and what are they saying?* [Talk presented at the 177th Meeting of the Acoustical Society of America]. osf.io/jt5wm/
- Knutsen, S., Stromswold, K., & Kleinschmidt, D. F.** *Segmental duration as a cue to sentence structure* [Poster presented at the 32nd CUNY Sentence Processing Conference]. osf.io/pmzes/
- Knutsen, S., Stromswold, K., & Kleinschmidt, D. F.** *Segmental duration as a cue to sentence structure* [Poster presented at the 177th Meeting of the Acoustical Society of America]. osf.io/na84g/
- Luthra, S., Correia, J. M., Kleinschmidt, D. F., Mesite, L., & Myers, E. B.** *Lexical information guides retuning of neural patterns in perceptual learning for speech* [Poster presented at the Society for the Neurobiology of Language].
- 2018 **Kleinschmidt, D. F.** *A formula for bridging the table-matrix divide* [Talk presented at Julia-Con2018]. www.davekleinschmidt.com/juliacon2018/slides.html
- Kleinschmidt, D. F., & Hemmer, P.** *A sequential Bayesian model for learning and memory in multi-context environments* [Talk presented at the 51st annual meeting of the Society for Mathematical Psychology]. www.davekleinschmidt.com/dots-contexts-recall-prediction/mathpsych-2018-slides.slides.html
- 2017 **Kleinschmidt, D. F.** *The ideal adapter: Life-long, hierarchical distributional learning* [Talk presented at ICON symposium "Models of category formation and adaptation: distributional learning of speech and language"].
- 2016 **Kleinschmidt, D. F., & Jaeger, T. F.** *What do you expect from an unfamiliar talker?* [Talk presented at the conference on Sociolinguistic Variation and Language Processing].
- Kleinschmidt, D. F., & Jaeger, T. F.** *What do you expect from an unfamiliar talker?* [Talk presented at LabPhon15].
- Kleinschmidt, D. F., Raizada, R., & Jaeger, T. F.** *Neural mechanisms for coping with talker variability by rapid distributional learning* [Talk presented at the Society for the Neurobiology of Language meeting].
- Kleinschmidt, D. F., Weatherholtz, K., & Jaeger, T. F.** *How informative is dialect about vowel distributions?* [Poster presented at the LabPhon15 workshop on higher-order structure in speech variability].
- 2015 **Kleinschmidt, D. F., Jaeger, T. F., & Raizada, R.** *Informativity in adaptation: Supervised and unsupervised learning of linguistic cue distributions* [Poster presented at the 28th Annual CUNY Sentence Processing Conference].
- 2014 **Jaeger, T. F., & Kleinschmidt, D. F.** *Efficient language understanding in a variable world: Prediction and adaptation* [Talk jointly presented at the 21st Annual Meeting of the Cognitive Neuroscience Society].
- Jaeger, T. F., & Kleinschmidt, D. F.** *Speech perception and adaptation as inference under uncertainty* [Plenary talk jointly presented at the 15th Australasian International Speech Science and Technology Conference].
- 2013 **Kleinschmidt, D. F., & Jaeger, T. F.** *Speech perception, the lack of invariance, and adaptation: A computational level analysis* [Poster presented at the Workshop on Current Issues and Methods in Speaker Adaptation].
- Kleinschmidt, D. F., & Jaeger, T. F.** *Speech perception, the lack of invariance, and adaptation: A computational level analysis* [Poster presented at the LSA Institute 2013 Workshop: How the brain accommodates variability in linguistic representations].
- Salverda, A. P., Kleinschmidt, D. F., & Tanenhaus, M. K.** *Immediate effects of anticipatory coarticulation in spoken-word recognition* [Talk presented at the 54th Annual Meeting of the Psychonomic Society].
- 2012 **Kleinschmidt, D. F., Fine, A. B., & Jaeger, T. F.** *A Bayesian belief-updating model of syntactic expectation adaptation* [Poster presented at the 25th CUNY Sentence Processing Conference].
- Kleinschmidt, D. F., & Jaeger, T. F.** *Evaluation of a Bayesian belief-updating model for the time course of linguistic adaptation* [Poster presented at the 25th CUNY Sentence Processing Conference].

- 2011 Zaki, S. R., & Kleinschmidt, D. F. *Response location effects in categorization: Evidence for multiple systems or task complexity?* [Poster presented at the 52nd Annual Meeting of the Psychonomic Society].
- 2010 Kleinschmidt, D. F. *Efficient coding of speech in the auditory cortex* [Poster presented at the 2nd Annual Neurobiology of Language Conference].

Invited Talks

Colloquia

- 2020 **Cognitive, Auditory, and Neural Bases of Language and Speech (CANBLS)**, Duke (Institute for Brain Sciences), Nov 9, 2020.
- 2019 **Integrated Language Science and Technology Seminar**, University of Pennsylvania, October 25, 2019.
- Cognition and Language Workshop**, Stanford University, May 9, 2019.
- Cognitive Science Center Colloquium**, Williams College, April 11, 2019.
- 2018 **Cognitive Brown Bag series**, Villanova University, February 8, 2018.
- 2017 **Psychology Dept. Perception/Action/Cognition seminar**, University of Connecticut, October 30, 2017.
- 2014 **New Zealand Institute of Language, Brain, and Behavior Seminar**, University of Canterbury, December 9, 2014.
- Cognition and Language Workshop**, Stanford University, October 2, 2014.
- Psychology Department Seminar**, Carnegie Melon University, July 22, 2014.
- Language Processing Brown Bag Seminar**, Beckman Institute, University of Illinois, March 6, 2014.
- Cognitive Science Colloquium**, Tufts University, February 13, 2014.

Conferences

- 2019 **Exploring the interface between linguistic processing and talker recognition**, *Special session of the Annual Meeting of the Acoustical Society of America*, May 13, 2019.

Internal

- 2019 **Rutgers Center for Cognitive Science Colloquium**, Rutgers, New Brunswick, April 23, 2019.

Teaching

Rutgers University

- 2020-F **Psycholinguistics (graduate)**, Rutgers New Brunswick, Psychology.
- 2020-S **Sensation and Perception**, Rutgers New Brunswick, Psychology.
- 2019-F **Language and Cognition**, Rutgers New Brunswick, Rutgers Center for Cognitive Science.
- 2019-S **Sensation and Perception**, Rutgers New Brunswick, Psychology.
- 2018-F **Advanced Topics II "Perception in a variable world"**, Rutgers New Brunswick, Rutgers Center for Cognitive Science.

University of Rochester

- 2013 **Teaching assistant: Foundations of Cognitive Science**, University of Rochester.
- 2011–2012 **Teaching assistant: Cognition**, University of Rochester.

Williams College

- 2009 **Teaching assistant: Ergodic Theory**, Williams College.

Mentoring

PhD supervision

- 2020-present Joselyn Rodriguez, Psychology (primary advisor).
2018-present Sten Knutsen, Psychology (primary advisor).
2018-present Yarkin Ergin, Psychology (committee member).
2018 Gwendolyn Rehrig, Psychology (committee member).

PhD (external)

- 2020-present Sahil Luthra, University of Connecticut, Department of Psychological Sciences

Masters supervision

- in progress* Joselyn Rodriguez, Psychology (primary advisor).
in progress Sten Knutsen, Psychology (primary advisor).
2019 Yarkin Ergin, Rutgers Psychology (committee member).
2019 Joseph Sommer, Rutgers Psychology (committee member).

Undergraduate supervision

- 2012 Supervised three University of Rochester undergraduate independent study students (jointly with one other graduate student).

Research support

Pending

- 2020 NSF CAREER: "CompCog quantifying the structure of talker variability with talker embeddings"

Completed

- 2015–2016 NIH F31 Ruth L. Kirschstein National Research Service Award (NRSA) Individual Predoctoral Fellowship: "Investigating neural mechanisms for flexible, robust speech perception with fMRI"
2010–2014 National Science Foundation, Graduate Research Fellowship: "Towards a neurally, behaviorally, and developmentally plausible model of speech perception"

Honors and Awards

- **Outstanding Dissertation Award (Natural Sciences)**, University of Rochester, 2017
- **Glushko Prize for Outstanding Doctoral Dissertations/theses in Cognitive Science**, Cognitive Science Society, 2017
- **Highest rated student abstract**, 2016 Meeting of the Society for the Neurobiology of Language
- **Best student presentation**, 2013 LSA Summer Institute Workshop: "How the brain accommodates variability in linguistic representations".
- **Best student talk**, 2011 Architectures and Mechanisms of Language Processing (AMLaP) Conference.
- **Sproull Fellowship**, University of Rochester, 2010–2015.
- **Baggett Fellowship**, University of Maryland Linguistics Department post-bac. research fellowship, 2009–2010.
- Member, **Phi Beta Kappa** honors society, inducted 2008.
- **Dean's List**, Williams College, 2005–2009.
- **Tyng Scholarship**, Williams College, 2005–2009.
- **National Merit Scholar**, 2005.
- Maine Educational Association **Clyde Russel Scholarship**, 2005.

Service

Department service

- 2020-present Psychology department website committee
- 2018-present Psychology department undergraduate honors committee
- 2018-present Psychology department statistics committee

Statistics outreach

I work to advance statistical literacy among cognitive scientists, psychologists, and linguists, via presentations at workshops and tutorials on statistical methods.

- 2020 *Mixed Models in the Julia Programming Language*, workshop at the Zentrum für interdisziplinäre Forschung (Center for Interdisciplinary Research), Universität Bielefeld, Germany, co-organized with Reinhold Kliegl, Doug Bates, and Philip Alday
- 2016–2018 Weekly statistics workshops for Princeton Neuroscience Institute graduate students and postdocs (jointly with Mike Shvartsman)
- 2014 Tutorial on simulation-based methods for understanding mixed models. *SST 2014 Tutorial: Regression and mixed effects models*
- 2013 Co-organized UR BCS Department statistics and data analysis working group with Steve Piantadosi.
- 2011 *Preparing data for analysis using R*, presentation with Alex B. Fine at University of Rochester BCS workshop on mixed-effects regression analysis for cognitive scientists.
- 2010 *ANOVA and Mixed-Effects Models in R for Language Scientists*, presentation at University of Maryland Linguistics Dept. Winter Storm language sciences workshop.

Open source software

I've contributed to a number of open source software projects. I've made substantial contributions to:

- **StatsModels.jl**: Primary maintainer and developer of StatsModels.jl, the statistical modeling package for the Julia language, which provides a familiar "formula language" for specifying regression models, contrast coding for categorical variables, etc.
- **MixedModels.jl**: Mixed-effects regression in Julia.
- **Gadfly.jl**: Data visualization in Julia, based on the grammar of graphics.

And contributed minor bug fixes and improvements to many JuliaStats packages as well as **Weave.jl** (knitr-like functionality for Julia), **latexdiff**, **lolcommits**, a node.js **mturk API**, and **FAAV/FAVE**.

Reviewing

Ad hoc reviewer for *Acta Psychologica*; *Annual Meeting of the Cognitive Science Society*; *Attention, Perception, & Psychophysics*; *Cognition*; *Experimental Brain Research*; *Journal of the Acoustical Society of America*; *Journal of Experimental Psychology*; *Journal of Laboratory Phonology*; *Journal of Memory & Language*; *Journal of Speech, Language, and Hearing Research*; *Language*; *Language and Cognitive Processes*; *Language Learning*; MIT Press; NSF SBE; PLoS One; *Psychonomic Bulletin and Review*; and *Topics in Cognitive Science*