

JOSHUA C. PETERSON

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EMPLOYMENT & EDUCATION

Princeton University, Department of Computer Science
Postdoctoral Associate, 2018 – current

University of California, Berkeley
Ph.D., Psychology, 2018

Dissertation: *Leveraging deep neural networks to study human cognition*

University of California, Davis
B.A., Cognitive Science, 2012

Designer of the UCD major, and first graduate

Honors: *Magna Cum Laude*

Thesis: *Groove, enjoyment, and listening time in polyphonic music sequences*

Research Assistant: Ghetti Lab, 2010-2011; Janata Lab, 2011-2012, Center for Mind & Brain

Folsom Lake College

A.A., General Education, 2010

A.S., Interdisciplinary Studies, 2010

Honors: Valedictorian

JOURNAL PAPERS (preprints at www.joshpeterson.io)

1. **Peterson, J.**, Bourgin, D. D., Agrawal, M., Reichman, D., & Griffiths, T. L. (2021). Using large-scale experiments and machine learning to discover theories of human decision-making. *Science*, 372(6547), 1209-1214.
2. Battleday, R. M., **Peterson, J.**, & Griffiths, T. L. (2021). From convolutional neural networks to models of higher-level cognition (and back again). *Annals of the New York Academy of Sciences*, 40, 1-24.
3. Battleday, R. *, **Peterson, J.***, & Griffiths, T. (in press). Capturing human categorization of natural images at scale by combining deep networks and cognitive models. *Nature Communications*, 11(1), 1-14.
4. Agrawal, M., **Peterson, J.**, Griffiths, T. (2020). Scaling up Psychology via Scientific Regret Minimization. *Proceedings of the National Academy of Sciences (PNAS)*, 117(16), 8825-8835.
5. **Peterson, J.***, Chen, D.*, & Griffiths, T. (in press). Parallelograms revisited: Exploring the limitations of vector space models for simple analogies. *Cognition*, 205, 104440.
6. **Peterson, J.**, Abbott, J., & Griffiths, T. (2018). Evaluating (and improving) the correspondence between deep neural networks and human representations. *Cognitive Science*, 42(8), 2648-2669.
7. Janata, P., **Peterson, J.**, Ngan, C., Keum, B., Whiteside, H., & Ran, S. (2018). Psychological and Musical Factors Underlying Engagement with Unfamiliar Music. *Music Perception: An Interdisciplinary Journal*, 36(2), 175-200.

CONFERENCE PAPERS (preprints at www.joshpeterson.io)

1. Singh, P., **Peterson, J.**, Battleday, R., Griffiths, T. (2020). End-to-end Deep Prototype and Exemplar Models for Predicting Human Behavior. *Proceedings of the 42nd Annual Conference of the Cognitive Science Society*.
2. Jha, A., **Peterson, J.**, Griffiths, T. (2020). Extracting low-dimensional psychological representations from convolutional neural networks. *Proceedings of the 42nd Annual Conference of the Cognitive Science Society*.

3. **Peterson, J.***, Battleday, R.*, Griffiths, T., & Russakovsky, O. (2019). Human uncertainty makes classification more robust. *Proceedings of the IEEE International Conference on Computer Vision (ICCV)*.
4. Bourgin, D.*, **Peterson, J.***, Reichman, D., Griffiths, T., & Russell, S. (2019). Cognitive model priors for predicting human decisions. *Proceedings of the International Conference on Machine Learning (ICML)*.
5. Grant, E., **Peterson, J.**, & Griffiths, T. (2019) Learning deep taxonomic priors for concept learning from few positive examples. *Proceedings of the 41st Annual Conference of the Cognitive Science Society*.
6. Agrawal, M., **Peterson, J.**, & Griffiths, T. (2019). Using machine learning to guide cognitive modeling: A case study in moral reasoning. *Proceedings of the 41st Annual Conference of the Cognitive Science Society*.
7. **Peterson, J.**, Suchow, J., Aghi, K., Ku, A., & Griffiths, T. (2018). Capturing human category representations by sampling in deep feature spaces. *Proceedings of the 40th Annual Conference of the Cognitive Science Society*.
8. **Peterson, J.**, Soulos, P., Nematzadeh, A., & Griffiths, T. (2018). Learning Hierarchical Visual Representations in Deep Neural Networks Using Hierarchical Linguistic Labels. *Presented as a poster at the 40th Annual Conference of the Cognitive Science Society*.
9. Suchow, J.W.*, **Peterson, J.*** & Griffiths, T.L. (2018). Learning a face space for experiments on human identity. *Proceedings of the 40th Annual Conference of the Cognitive Science Society*.
10. **Peterson, J.**, & Griffiths, T. (2017). Evidence for the size principle in se-mantic and perceptual domains. *Proceedings of the 39th Annual Conference of the Cognitive Science Society*.
11. Chen, D., **Peterson, J.**, & Griffiths, T. (2017). Evaluating vector-space models of analogy. *Proceedings of the 39th Annual Conference of the Cognitive Science Society*.
12. **Peterson, J.**, Abbott, J., & Griffiths, T. (2016). Adapting Deep Network Features to Capture Psychological Representations. *Proceedings of the 38th Annual Conference of the Cognitive Science Society*.
Computational Modeling Prize in "Perception/Action" Category
13. Tang, S., **Peterson, J.**, & Pardos, Z. (2016). Deep Neural Networks and How They Apply to Sequential Education Data. *In the Proceedings of the 3rd Annual ACM Conference on Learning at Scale (L@S)*.
14. Dubey, R.*, **Peterson, J.***, Khosla, A., Yang, M., & Ghanem, B. (2015). What makes an object memorable? *Proceedings of the International Conference on Computer Vision (ICCV)*.
15. **Peterson, J.**, Pardos, Z., Rau, M., Swigart, A., Colin, G., & McKinsey, J. (2015). Understanding Student Success in Chemistry using Gaze Tracking & Pupillometry. *Proceedings of the Artificial Intelligence in Education Conference, Madrid, Spain, June 2015*.

MANUSCRIPTS

1. Plonsky, O., Apel, R., Ert, E., Tennenholtz, M., Bourgin, D., **Peterson, J.**, Reichman, D., Griffiths, T., Russell, S., Carter, E., Cavanagh, J., Erev, I. (manuscript). Predicting human decisions with behavioral theories and machine learning. *arXiv preprint arXiv:1904.06866*.

BOOK CHAPTERS

- Tang, S., **Peterson, J.**, & Pardos, Z. (2017). Predictive modelling of student behaviour using granular large-scale action data. *The Handbook of Learning Analytics*, 223-233.

WORKSHOP ORGANIZATION

2nd Workshop on *Shared Visual Representations in Human and Machine Intelligence*, NeurIPS 2020
 Co-organized with Arturo Deza, Apurva Ratan Murty, and Thomas Griffiths
<https://www.svrhm.com/>

Workshop on *Bridging AI and Cognitive Science (BAICS)*, ICLR 2020
 Program Committee Member
<https://baicsworkshop.github.io>

1st Workshop on *Shared Visual Representations in Human and Machine Intelligence*, NeurIPS 2019
 Co-organized with Arturo Deza, Apurva Ratan Murty, and Thomas Griffiths
<https://www.svrhm2019.com/>

TALKS, PRESENTATIONS, & POSTERS

Speaker at Workshop on Scaling Cognitive Science, CogSci 2020
Scaling choices and categories

Invited Talk at Emerging Area of Research (EAR) workshop, IU Bloomington, May 17-18, 2019
Evaluating (and improving) the correspondence between deep neural networks and humans
<https://www.brainnetworkslab.com/ear-workshop-2019>

Agrawal, M., Peterson, J., & Griffiths, T. (2019). Understanding a Large Dataset of Moral Decisions Through Scientific Regret Minimization. *Presented as a talk at the 1st RLDM Workshop on Moral Decision Making (MoDeM)*.

Peterson, J., Soulos, P., Nematzadeh, A., & Griffiths, T. (2019). Learning to generalize like humans using basic-level object labels. *Presented as a poster at the Vision Sciences Society conference, St. Pete, FL*.

Peterson, J., Aghi, K., Suchow, J.W., Ku, A., & Griffiths, T. L. (2018). Capturing human category representations by sampling in deep feature spaces. *Presented as a poster and workshop paper at the 6th International Conference on Learning Representations (ICLR), workshop track, in Vancouver, Canada*.

Peterson, J. C., Aghi, K., Suchow, J. W., Ku, A., Griffiths, T. L. (2018). Sampling from object and scene representations using deep feature spaces. *Presented as a poster at the Vision Sciences Society conference, St. Pete, FL*.

Suchow, J. W., Peterson, J. C., & Griffiths, T. L. (2018). A learned generative model of faces for experiments on human identity. *Presented as a talk at the Vision Sciences Society conference, St. Pete, FL*.

Peterson, J., Abbott, J., & Griffiths, T. (2017). Adapting Deep Network Features to Capture Psychological Representations: An Abridged Report. *Presented as a poster and short paper at the 26th International Joint Conference on Artificial Intelligence*.
Sister Conference Best Paper Track

Speaker at Workshop on Deep Learning in Computational Cognitive Science, CogSci 2017
Comparing neural network representations to human behavior

Grant, E., Finn, C., Peterson, J., Abbott, J., Levine, S., Griffiths, T.L. & Darrell, T. (2017). Concept acquisition via meta-learning: Few-shot learning from positive examples. *Presented as poster and short paper at the Workshop on Cognitively Informed Artificial Intelligence (CIAI) at NeurIPS 2017*.

Peterson, J., Soulos, P., Nematzadeh, A., & Griffiths, T. (2017). Multi-level Classification: Implications for Human-like Generalization. *Presented as a poster and short paper at the Visually Grounded Interaction and Language Workshop at NIPS 2017, Long Beach, CA, USA.*

Battleday, R., Peterson, J., & Griffiths, T. (2017). Modeling human categorization of natural images using deep feature representations. *Presented as a poster at the 39th Annual Conference of the Cognitive Science Society.*

Peterson, J., Abbot, J. Battleday, R., Suchow, J. W. & Griffiths, T. L. (2017). Using large natural image datasets to study cognition. *Presented as a poster at the 58th Annual Meeting of the Psychonomic Society, Vancouver, Canada, November 2017.*

Peterson, J., Abbott, J., & Griffiths, T. (2016). Deep CNN features as a basis for modeling human representations. *15th Neural Computation and Psychology Workshop (NCPW).*

Peterson, J., Abbott, J., & Griffiths, T. (2016). Deep CNN features approximate human psychological representations. *Representation Learning in Artificial and Biological Neural Networks Workshop at NIPS 2016.*

Palmer, S., & Peterson, J. (2016). Hierarchical Structure of Musical and Visual Meter in Cross-modal "Fit" Judgments. *Presented as a poster and short paper at the 14th International Conference on Music Perception and Cognition (ICMPC).*

Peterson, J., & Palmer, S. (2015). Emotionally mediated cross-modal correspondences affect classification performance. *Presented as a poster at the 37th Annual Meeting of the Cognitive Science Society, Pasadena, CA, July 2015.*

Dubey, R., Peterson, J., Ghanem, B., Yang, M., & Hsieh, P. (2015). Exploring the visual components that make an image memorable. *Presented as a poster at the 14th Annual Meeting of the Vision Sciences Society, St. Pete Beach, FL, May 2015.*

Peterson, J., & Palmer, S. (2015). Emotion mediation in audio-visual correspondences among natural sounds, texture, and art. *Presented as a poster at the 14th Annual Meeting of the Vision Sciences Society, St. Pete Beach, FL, May 2015.*

Langlois, T., Peterson, J., & Palmer, S. (2015). Relations among Visual Texture, Musical Features, and Emotion. *Presented as a poster at the 14th Annual Meeting of the Vision Sciences Society, St. Pete Beach, FL, May 2015.*

Hatem, J., Peterson, J., Langlois, T., & Palmer, S. (2015). Texture-Color Associations in Non-synesthetes. *Presented as a poster at the 14th Annual Meeting of the Vision Sciences Society, St. Pete Beach, FL, May 2015.*

Peterson, J., Langlois, T., & Palmer, S. (2014). The texture of musical sounds: Cross-modal associations from musical timbres and intervals to visual textures. *Presented as a poster at the 13th Annual Meeting of the Vision Sciences Society, St. Pete Beach, FL, May 2014.*

Langlois, T., Peterson, J., & Palmer, S. (2014). Visual Texture, Music, and Emotion. *Presented as a poster at the 13th Annual Meeting of the Vision Sciences Society, St. Pete Beach, FL, May 2014.*

Janata, P. & Peterson, J. (2013). On the determinants of listening time for novel musical excerpts. *Society for Music Perception and Cognition. Presented as a poster at the 13th International Conference on Music Perception and Cognition, Toronto, CA, FL, August 2014.*

PRESS

AAAS, 2021

Machine Learning, Big Data Reveal New Theories of Human-Decision-Making

www.aaas.org/news/machine-learning-big-data-reveal-new-theories-human-decision-making

TechXplore, 2021

Using large-scale dataset experiments and machine learning to discover new theories of decision-making

techxplore.com/news/2021-06-large-scale-dataset-machine-theories-decision-making.html

SciencePost, 2021

Une IA pour comprendre les dessous de la prise de décision humaine

sciencepost.fr/ia-comprendre-prise-decision-humaine/

Numerama, 2021

Cette IA fait des choix comme un humain

numerama.com/sciences/718030-cette-ia-fait-des-choix-comme-un-humain.html

New Scientist, 2019

AI learns to gamble illogically like humans to predict our behaviour

newscientist.com/article/2207324-ai-learns-to-gamble-illogically-like-humans-to-predict-our-behaviour/

TechXplore, 2019

Infusing machine learning models with inductive biases to capture human behavior

techxplore.com/news/2019-06-infusing-machine-inductive-biases-capture.html

UC Davis College of Letters and Science Magazine, 2018

New major spans disciplines to study how we think and learn

lettersandscience.ucdavis.edu/matter-mind

The California Aggie, 2012

Undeclared? Try a new interdisciplinary field

theaggie.org/2012/09/27/undeclared-try-a-new-interdisciplinary-field/

AWARDS, HONORS, & SCHOLARSHIPS

1st Place, Choice Prediction Competition (CPC), 2018

<https://arxiv.org/abs/1904.06866>

Sister Conference Best Paper, 26th International Joint Conference on Artificial Intelligence, 2017

<https://ijcai-17.org/sister-conf.html>

Computational Modeling Prize in Perception/Action Category (\$1000)

39th Annual Conference of the Cognitive Science Society 2016

<https://cogsci.mindmodeling.org/2016/pdfs/section0004.pdf>

Honorable Mention, National Science Foundation GRF, 2015

High Honors, UC Davis, 2012

H. & G. Smith Undergraduate Scholarship, UC Davis, 2010-2012

Dean's List, College of Letters and Science, UC Davis, 2010-2012

Entering Undergraduate Scholarship, UC Davis, 2010-2011

Parker Family Foundation Scholarship, UC Davis, 2010-2011

First Year Scholar Award, UC Davis, 2010

Valedictorian Honors, Folsom Lake College, 2010

Dean's List, Folsom Lake College, 2007-2010

Perry & Stella Scholarship, 2007

FELLOWSHIPS & GRANTS

Innovation Fund for New Ideas in the Natural Sciences (PI: Alex Todorov), Princeton U., 2019

SocialGAN: Generating infinitely many hyper-realistic faces with a simple web application

National Science Foundation Grant (PI: Thomas Griffiths), 2018

Leveraging Deep Neural Networks for Understanding Human Cognition

Mark R. Rosenzweig Graduate Fellowship, 2017

Institute of Cognitive and Brain Sciences Research Grant, UC Berkeley, 2015

Neural Mechanisms in Timbre-Color Synesthesia

TEACHING

Guest Lecturer, UC Berkeley, 2016

Computational Models of Cognition, Section on Similarity and Generalization

Graduate Student Instructor, UC Berkeley, 2015-2016 (2 semesters)

Computational Models of Cognition

Graduate Student Instructor, UC Berkeley, 2012-2014 (3 semesters)

Research and Data Analysis in Psychology

Undergraduate Teaching Assistant, UC Davis

Research Methods in Psychology

SERVICE

Psychological Department Newsletter, UC Berkeley, 2013-2015

Writer, Layout Editor

Graduate Assembly for Students in Psychology (GASP), UC Berkeley, 2013-2014

Member, Web Developer

Getting into Graduate School (GiGS) Program, UC Berkeley, 2013-2014

Graduate Student Mentor / Web Developer

DATASETS

Choices13k: Human Responses for 10,000 Risky Choice Problems, Peterson et al. (2021)

<https://github.com/jcpeterson/choices13k>

CIFAR-10H: Human Perceptual Soft Labels, Peterson & Battleday et al. (2020)

<https://github.com/jcpeterson/cifar-10h>

Analogy and Relational Similarity Dataset from Dawn, Peterson, & Griffiths (2017)

<https://github.com/sdawnchen/vector-space-analogy-analysis>

Image Similarity Judgments Dataset from Peterson, Abbott, & Griffiths (2016)

<https://github.com/jcpeterson/percept2vec>

Object Memory Dataset from Dubey & Peterson et al., (2015)

<http://cocosci.princeton.edu/jcpeterson/objmem/>

SOFTWARE

OpenWebText: Web content scraper for creating high-quality large-scale corpora like WebText

<https://github.com/jcpeterson/openwebtext>

VISUAL DEMONSTRATIONS

Generating hyper-realistic faces for use in vision science experiments

Presented with Jordan Suchow and Stefan Uddenberg at the VSS 2019 Demo Night

<https://www.visionssciences.org/2019-demo-night/>

REFERENCES

Thomas L. Griffiths

Professor, Departments of Psychology and Computer Science, Princeton University
Henry R. Luce Professor of Information Technology, Consciousness, and Culture, Princeton U.
tomg@princeton.edu

Alexander Todorov

Professor, Associate Chair, Department of Psychology, Princeton University
Affiliated Faculty, Princeton Neuroscience Institute, Princeton University
Affiliated Faculty, Woodrow Wilson School, Princeton University
atodorov@princeton.edu

Stephen E. Palmer

Professor Emeritus, Department of Psychology, University of California, Berkeley
palmerse@berkeley.edu

Olga Russakovsky

Assistant Professor, Department of Computer Science, Princeton University
Affiliated Faculty, Center for Statistics and Machine Learning, Princeton University
Affiliated Faculty, Center for Information Technology Policy, Princeton University
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