

Joseph Scott German

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My primary interest is in the computational modeling of how knowledge is efficiently acquired and represented for robust perception and decision-making, and how insights from this research can be incorporated into machine learning to improve their ability to model human cognition. To that end, I believe it is important to explore computational modeling from a variety of perspectives, including not only machine learning techniques such as deep neural networks, but also descriptive models based on Bayesian inference, traditional symbolic methods of knowledge representation and reasoning, and relevant mathematical fields such as information theory and optimization, among others. Each of these can shed light on human cognition at a different level of analysis, from the nature of the problems the brain needs to solve to the mechanistic, physical processes it employs to solve them. Simultaneously, conducting behavioral experiments with human participants can both test the novel predictions of those models and uncover phenomena that inspire new directions in computational modeling.

Education

- Current: PhD student in Brain & Cognitive Sciences and Computer Science (joint) at the University of Rochester (Expected graduation **Summer 2022**)
- MM in Viola Performance and MM in Music Cognition from the Peabody Institute of the Johns Hopkins University **May 2016 /GPA: 3.99**
- Bachelor of Music, Viola Performance from the Peabody Institute of the Johns Hopkins University with a minor (courses concentrated in neuroscience/cognition) from the Krieger School of Arts and Sciences at the Johns Hopkins University **May 2013 / GPA: 3.94**
- Non degree student summer and fall of 2016 at the University of Maryland, Baltimore County: math and programming classes /**GPA 4.0**
- Non degree student at Howard Community College taking programming classes, non credit

Academic Honors

- **NSF NRT Fellowship 2017-2018**: National Science Foundation Data-Enabled Science and Engineering (NRT-DESE) award
- Appointed as a Visiting Scholar to the Department of Cognitive Science at Johns Hopkins University 2016-2017
- **Mollie G. and Joseph L. Forscher Music Cognition Award** (\$250), Peabody Conservatory 2016
- Delegate Terri Hill scholarship from the state of MD 2015-2016 \$1000
- Graduate Assistantship 2015-2016 – teaching assistant to Dr. Susan Weiss at Peabody and JHU
- Johns Hopkins Golden Key International Honor Society 2010-present
- Maryland Distinguished Scholar – received \$12,000 scholarship (SAT 2320 and co-valedictorian of HS class) 2009-2013
- Graduated Summa Cum Laude 2013
- Several full scholarships to summer music festival programs such as the Orchestra Institute Napa Valley, where I was selected as one of eight violists from worldwide auditions.

Research and Lab Experience

University of Rochester, Rochester, NY, 2017–2022

Graduate Researcher; Advisor: Robert Jacobs

- Created a database of human similarity judgments of objects using Amazon Mechanical Turk and used machine learning algorithms, including metric learning and DNNs, to characterize these judgments, revealing the importance of part-based representations.
- Collected data on human recognition of MNIST digits and Devanagari characters using Amazon Mechanical Turk and analyzed it with machine learning algorithms, including DNNs
 - Examined the relationship between human reaction time and ease with value for neural network training

- Explored the concept of “runtime learning”, in which knowledge and reasoning are used to assemble training sets from memory for extemporaneous learning in response to unfamiliar tasks. Consistent with runtime learning, neural networks trained with valuable subsets better explained human reactions in both a direct comparison and a drift-based process model.

Johns Hopkins University, Baltimore, MD, 2013–2017

Research Assistant (2015–2017), Visiting Scholar (2016–2017); Advisor: Michael McCloskey

- Helped to investigate how people assign intrinsic axes to real-world objects with unusual geometries.
- Duties included running the (in-person) experiment, analyzing the data, and helping to interpret the results.

Student research (2015); Instructor: Soojin Park

- Participated in a pilot study extending a 2014 study by Ferrara and Park, who examined scene-selective fMRI activation in the retrosplenial complex and parahippocampal place area to mats, curbs, and walls.

Student research (2014); Instructor: Juan Huang

- Designed and conducted an experiment examining the contribution of global information to the illusory continuity of tones

Peabody Institute of the Johns Hopkins University, Baltimore, MD, 2013–2016

Graduate researcher (2015–2016); Advisor: Susan Weiss

- Master’s thesis work: Developed a novel neural network architecture for object recognition in vision and music

Teaching

University of Rochester, Rochester, NY

- Graduate Teaching Assistant, Music and the Mind, Fall 2018 & Fall 2019
- Graduate Teaching Assistant, Language & Psycholinguistics, Fall 2020

Peabody Institute of the Johns Hopkins University, Baltimore, MD

- Graduate Teaching Assistant, History of Music I, 2015–2016

Publications

Chaisilprungraung, T., **German, J.**, & McCloskey, M. (2019). How are object shape axes defined? Evidence from mirror-image confusions. *Journal of Experimental Psychology: Human Perception and Performance*, 45(1), 111.

German, J. S., & Jacobs, R. A. (2020). Can machine learning account for human visual object shape similarity judgments? *Vision research*, 167, 87-99.

German, J. S., Cui, G., Xu, C., & Jacobs, R. A. (2021). Rapid runtime learning by curating small datasets of high-quality items obtained from memory. (Submitted for initial review.)

Posters

Chaisilprungraung, T., **German, J.**, & McCloskey, M. (2017, May). *Principal axes of real-world objects: evidence from orientation reflection errors*. Poster session presented at the annual conference of the Visual Sciences Society, St. Pete Beach, FL.

German, J.S., & Jacobs, R.A. (2019, July). *Human visual object similarity judgments are viewpoint-invariant and part-based as revealed via metric learning*. Poster session presented at the 41st annual conference of the Cognitive Science Society, Montreal, QC.

German, J.S., & Jacobs, R.A. (2020, July). *Modeling human cognitive flexibility with extemporaneous networks*. Poster session presented at the 42nd annual conference of the Cognitive Science Society, Toronto, ON.

Master's Thesis

German, J. (2016). *The idealization network: a model of object recognition in vision and music*. (Unpublished master's thesis). Peabody Institute, Johns Hopkins University, Baltimore. Presented at the Second Annual Musicology Graduate Research Symposium.

Programming Languages and Software

- R
- Python
- Javascript
- C++
- MATLAB
- Stata
- Brainvoyager
- Photoshop
- Psiturk and Amazon Mechanical Turk

Paid Work Experience

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| ■ Private violin/viola teacher | 2016-2017 |
| ■ Violist with the Occasional Symphony Orchestra | 2012-2016 |
| ■ Graduate Teaching Assistant to Dr. Susan Weiss | 2015-2016 |
| ■ Front desk and AV desk at the Peabody Institute's Friedheim Music Library | 2012-2015 |

Volunteer Work

- Creative Access performances (community outreach concerts at Hospice, nursing homes, etc.)
- Volunteer performer for Road Scholar music vacations for seniors
- Volunteer for the Music Cognition seminar and orientation week at the Peabody Institute
- Bird watcher and long time bird count volunteer for the Audubon Society

Musical Experience

The various orchestras I have played in over the years have afforded me the opportunity to perform in venues such as Carnegie Hall, the Meyerhoff, Lisner Auditorium, and the Lyric Opera under conductors such as Marin Alsop, Leon Fleischer, and Martin West, among many others.

My extensive experience with 21st century music gives me a unique perspective on how the brain perceives music.

Experimental pieces such as "Labyrinth" by David Dzubay and "As a Spell Against Falling Objects (or how I Learned to Love Gravity)" by Jeremy Podgursky focus on exploring mental states of mind.'

As a capstone of my musical experiences, in October 2015, as a member of the Peabody Symphony Orchestra, I worked with Maestro Marin Alsop, music director of the Baltimore Symphony Orchestra, to record a professional CD of Kevin Puts works for the Naxos label: https://www.amazon.com/Kevin-Puts-Symphony-No-2/dp/B01GVYDWL2/ref=sr_1_2?ie=UTF8&qid=1471014398&sr=8-2&keywords=kevin+puts