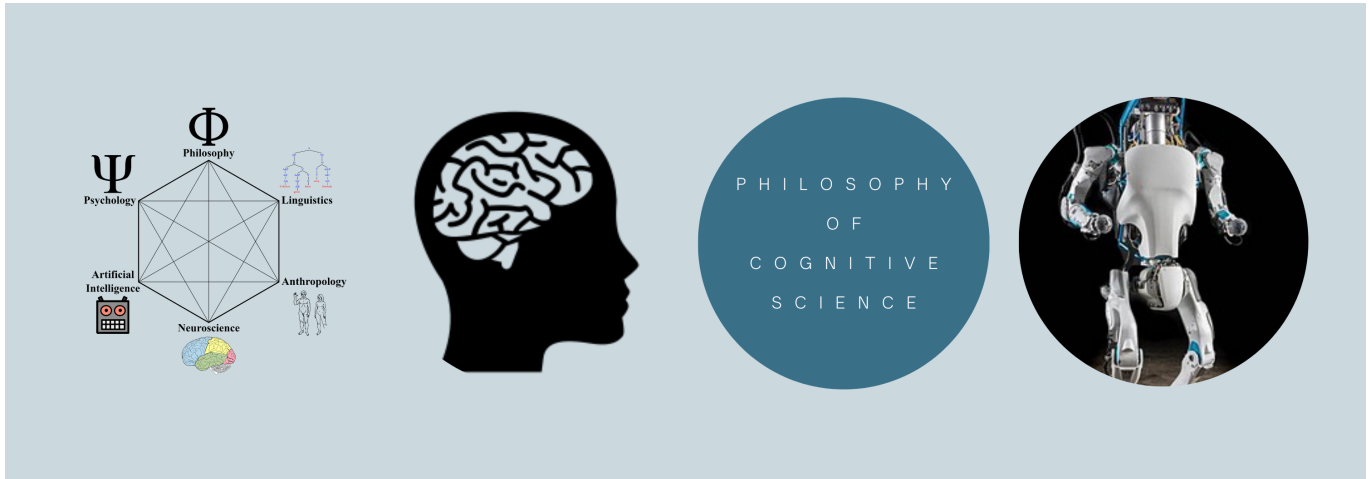


# Philosophy of Cognitive Science Syllabus

Instructor: Shannon Proksch — Summer 2021



## Course Description

This course is a survey of philosophical and foundational issues in Cognitive Science – the study of mind, intelligence, and behavior. If you are a Cognitive Science major, this course fulfills your upper division requirement for the BA or BS in Cognitive Science, and if you are a Philosophy Major this course fulfills the Applications Requirement for your BS in Philosophy. *Prerequisite: students must have passed PHIL 001 (Introduction to Philosophy) or COGS 001 (Introduction to Cognitive Science).*

## Course Goals and Outcomes

1. **Course Goals** This course will engage with many of the interdisciplinary approaches and philosophical foundations within the umbrella of Cognitive Science, including: philosophy, psychology, computer science, neuroscience, behavioral studies, and evolution. Course modules will consist of synchronous online lectures, interactive class discussions, and small group lab activities. Individual quizzes and lab assignments to be completed each week in addition to a final project to be due in the final week of classes.
2. **Learning Outcomes** By the end of the course, students should be able to:
  - a) Provide a concise history of (the philosophy of) cognitive science
  - b) Describe the core assumptions of major historical and current approaches/frameworks of cognitive science
  - c) To build simple models corresponding to each major framework/approach of cognitive science (Turing Machines, neural networks, simulations)
  - d) Critically evaluate the major approaches/frameworks, including:
    - Conceptually analyzing cognitive science research using philosophical tools
    - Using experimental evidence to support philosophical arguments within each framework/ approach of cognitive science

## Format and Procedures

Course modules will consist of synchronous online lectures, interactive class discussions, and small group lab activities. Individual quizzes and lab assignments to be completed each week in addition to a final project to be due in the final week of classes.

1. We have a lot of material to cover in six short weeks. To make the most of our time, each day will be split into lectures (roughly the first half of each day) and interactive labs, group, and/or full class activities (roughly second half of each day).
  - **Lectures** will be primarily instructor-led, with graded response questions to be answered by students in the zoom chat. Lectures and response questions will be uploaded on catcourses after lecture each day for students who have to miss a lecture here and there. **Attendance is mandatory**, but not graded.
  - **Lab and Activities** will be primarily student-led, with graded reflections to be answered on catcourses. To facilitate open discussion, this portion of the class will not be recorded or uploaded on catcourses. **Participation is mandatory**, but not graded.

## Norms and Expectations

Our class will meet through the Zoom online conference system. Our success as an online class will depend on the same commitment we all bring to the physical classroom.

1. We will adopt the same rules and norms of physical classroom when we are in the zoom classroom (take notes; participate by asking and answering questions; wear classroom-ready clothing). For everyone's benefit, join the course in a quiet place whenever possible. Mute your microphone unless you are speaking. Turn on your video whenever possible during Labs and Activities. Close browser tabs not required for participating in class.
2. The success of an inclusive classroom relies on the participation, support, and understanding of you and your peers. In our course interactions, all students are welcome regardless of race/ethnicity, gender identities, gender expressions, sexual orientation, socio-economic status, age, disabilities, religion, regional background, Veteran status, citizenship status, nationality and other diverse identities that we each bring to class.

## Course Requirements

1. **Quizzes** will be open on catcourses immediately after class each Wednesday, covering the material covered in that week (for a total of six quizzes). Quizzes are 10-15 questions with a one hour time limit. Quizzes will remain open from Wednesday until Friday at 11:59pm. Two attempts will be allowed for each quiz, the average over each attempt will be recorded for the final quiz score.
2. **Response Questions and Reflections**
  - **Graded Response Questions** will be answered in the zoom chat each lecture and will have immediate instructor feedback. Students who miss lecture will have an opportunity to answer response questions on the Recap Response Questions discussion board post on catcourses until 11:59pm the day of the lecture that was missed for full credit. **Students who answered the response question during class on zoom do not have to answer the response question in the Recap & Response Question discussion board post.**
  - **Graded Reflections** will be completed at the end of each course meeting via a discussion board on catcourses that opens fifteen minutes before class ends (12:05pm) and closes fifteen minutes after class ends (12:35pm). **Reflection discussion boards will be reopened after class on Wednesday, and late reflections may be submitted until Friday at 11:59pm for full credit.**
3. **Lab Assignments** consist of screencasts that will be due each Wednesday at 11:59pm. Each screencast will be a short video of you explaining a concept covered that week alongside a simple model or simulation. Late screencasts can be submitted until each Friday at 11:59pm for full credit.
4. **The Final Project** will be due on the final day of classes. The project will consist of a student chosen "learning by teaching" assignment. Students can choose any medium you like to present *an original argument based on any framework/approach covered in this class* to someone with no philosophical or cognitive science background. Further details forthcoming.

# Grading Procedure

Grading distribution over the four components above is as follows:

- Six Quizzes (30%)
- Daily Response Questions & Reflections (20%)
- Six Lab Assignments (30%)
- Final Project (20%)
  1. Project Brainstorming w/ Labmates (5%)
  2. Project Proposal and Agreement w/ Instructor (5%)
  3. Project Draft & Peer Feedback w/ Labmates (5%)
  4. Final Project (5%)
    - \*Note - intermediate deadlines 1 and 3 are completed in groups, but each stage of the project is graded individually

# Course Schedule

Note: Assignments will be linked in the *module* for each week, and can also be found in the *assignments* tab on catcourses. Course readings can be found in the *files* tab, and most readings are accessible from the university library. Occasionally a required reading is found elsewhere online, in which case the url will be linked in the *module* for that week. A full list of all course readings, required and supplemental, is provided below this schedule. This course was crafted to provide a broad and diverse background into the philosophy of cognitive science, drawing from resources such as the Diversity Reading List in philosophy (<https://diversityreadinglist.org/about/>). Diversity Metrics for this course can be found at the end of this document.

Wk	Day	Topics/major concepts covered	Readings (Required & Supplemental)	Assessment
1	M 5/24	Introductions; Course Expectations	<b>Required:</b> None <b>Supplemental:</b> Van Cleave – Introduction to Logic and Critical Thinking	Response Question Reflection
	T 5/26	Philosophy &/of Cognitive Science	<b>Required:</b> van Gelder, 1998 <b>Supplemental:</b> Brook, 2009	Response Question Reflection
	W 5/27	Meat Machines	<b>Required:</b> Bisson 1991 “They’re made of Meat” ; Clark, 2001 “Mindware: Introduction”; Titchener, 1912 “Prolegomena” <b>Supplemental:</b> Simon & Kaplan 1988 “Foundations of Cognitive Science”	Response Question <b>ScreenCast - Initial Practice Quiz #1</b>
2	M 5/31		Memorial Day Holiday – No Meeting	
	T 6/1	Behaviorism	<b>Required:</b> Watson, 1913 <b>Supplemental:</b> Robertson, 2018 “The 21st Century Skinner Box”	Response Question Reflection
	W 6/2	Cognitive Revolution	<b>Required:</b> Chomsky, 1967 <b>Supplemental:</b> xxx	Response Question <b>ScreenCast - Classical/ Operant Conditioning Quiz #2</b>
3	M 6/7	Origins of AI; Turing Machines	<b>Required:</b> Turing, 1950 “Computing Machinery and Intelligence”; Sterrett, 2001 “Turing’s Two Tests for Intelligence” <b>Supplemental:</b> xxx	Response Question Reflection <b>Project - Peer Brainstorming</b>
	T 6/8	Computationalism/ Functionalism	<b>Required:</b> Pylyshyn, 1980 “Computation and cognition: issues in the foundations of cognitive science” <b>Supplemental:</b> Marr 1982	Response Question Reflection
	W 6/9	Strong/Weak AI	<b>Required:</b> Dreyfus, 1974; Strong AI readings (selections from different texts) <b>Supplemental:</b> McClelland, Rumelhart, Hinton, 1987 (PDP Ch1)	Response Question <b>ScreenCast - Turing Machine Quiz #3</b>
4	M 6/14	Connectionism & Neural Networks	<b>Required:</b> Yoshimi, Tosi 2021; Fodor & Pylyshyn, 1988 <b>Supplemental:</b> Rich, de Haan, Wareham, van Rooij, 2021	Response Question Reflection <b>Project - Proposal</b>
	T 6/15	Cybernetics & Autonomous Systems	<b>Required:</b> Brooks 1990; Drayson, 2017 <b>Supplemental:</b> Hurley 2001	Response Question Reflection
	W 6/16	Embodied Cognition	<b>Required:</b> Anderson 2005 <b>Supplemental:</b> Orego, 2018 (Medium)	Response Question <b>ScreenCast - IAC Network Quiz #4</b>
5	M 6/21	Dynamical Systems	<b>Required:</b> Clark (chapter 7) <b>Supplemental:</b> Favela, 2020	Response Question Reflection <b>Project - Peer Feedback</b>
	T 6/22	Extended Cognition	<b>Required:</b> Clark & Chalmers 1998 <b>Supplemental:</b> xxx	Response Question Reflection
	W 6/23	Predictive Processing/ Bayesian Brain	<b>Required:</b> Wiese & Metzinger, 2017; Series & Sprevak, 2014 <b>Supplemental:</b> xxx	Response Question <b>ScreenCast - Dynamical Systems Quiz #5</b>
6	M 6/28		Juneteenth Holiday (observed) – No Meeting	
	T 6/29	Evolution + Game Theory	<b>Required:</b> Cosmides & Tooby 2013 <b>Supplemental:</b> xxx	Response Question Reflection <b>Final Project - Deadline</b>
	W 6/30	Evolution & Comparative Cognition	<b>Required:</b> Shettleworth, 2012 <b>Supplemental:</b> Hurley, 2003	Response Question <b>ScreenCast - Prisoners Dilemma Quiz #6</b> <b>Project Presentations</b>

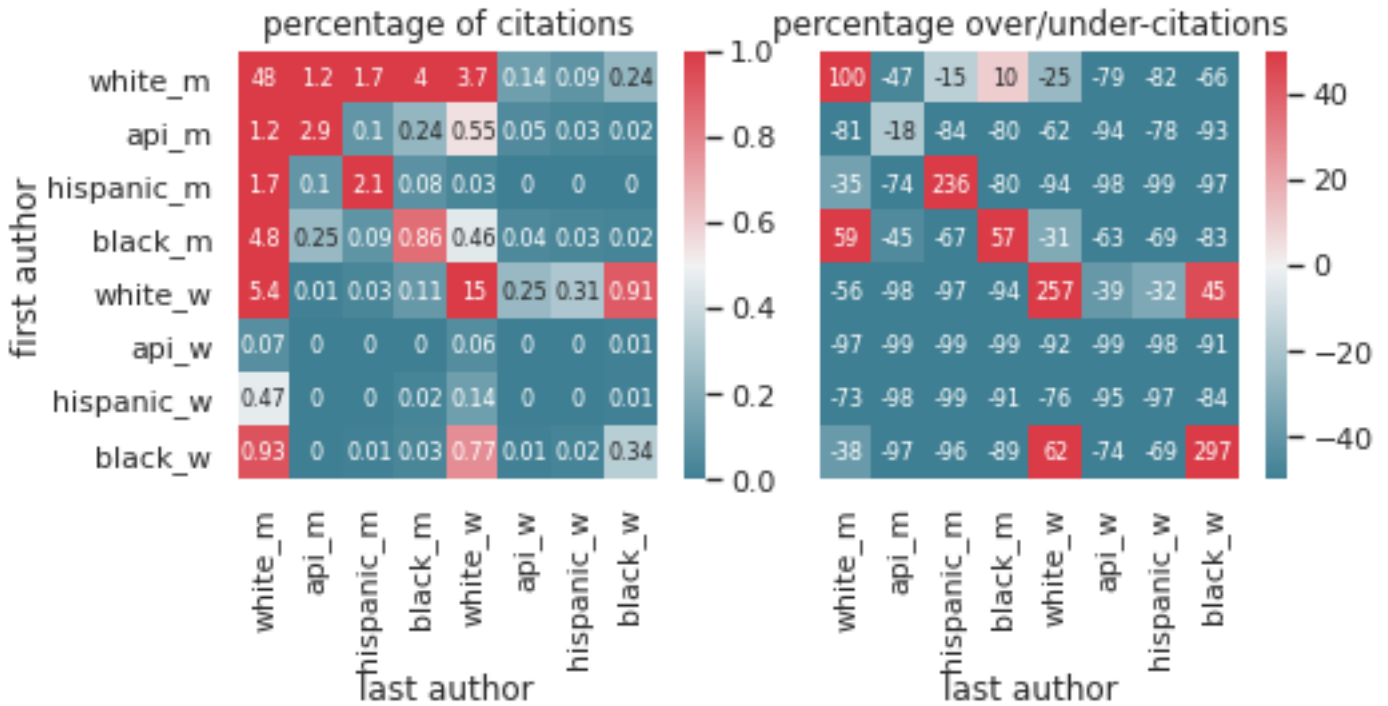
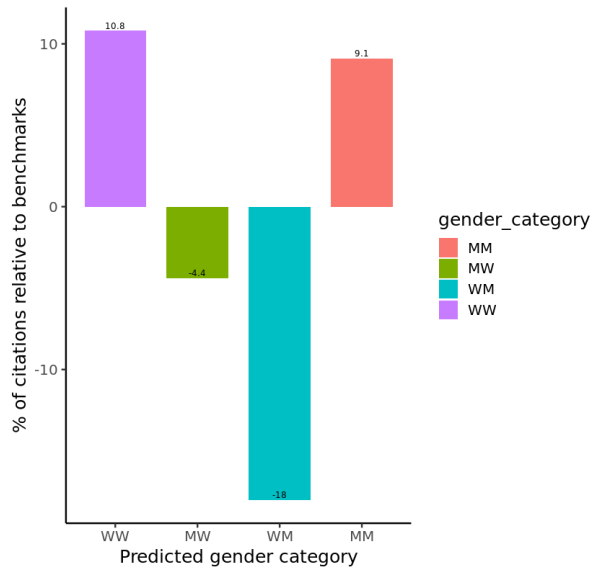
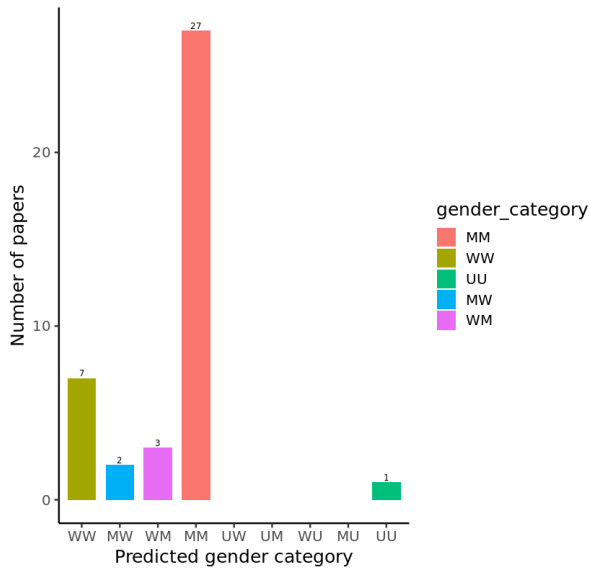
## Course Readings

- [1] Tim Van Gelder. The roles of philosophy in cognitive science. *Philosophical Psychology*, 11(2):117–136, 1998.
- [2] Andrew Brook. Introduction: Philosophy in and philosophy of cognitive science, 2009.
- [3] Edward B Titchener. Prolegomena to a study of introspection. *The American Journal of Psychology*, 23(3):427–448, 1912.
- [4] Terry Bisson. They’re made of meat, 1991.
- [5] Andy Clark. *Mindware: An introduction to the philosophy of cognitive science*. Oxford University Press, 2000.
- [6] Matthew J Van Cleave. Introduction to logic and critical thinking version 1.3. 2018.
- [7] Herbert A Simon and Craig Kaplan. Foundations of cognitive science: overview. 1988.
- [8] John B Watson. Psychology as the behaviorist views it. *Psychological review*, 20(2):158, 1913.
- [9] Ronald Robertson. The twenty-first century skinner box, 2018.
- [10] Noam Chomsky. *A review of BF Skinner’s” verbal behavior”*. na, 1996.
- [11] Alan M Turing. *Computing machinery and intelligence*. MIT Press Cambridge, MA, 1950.
- [12] Susan G Sterrett. Turing’s two tests for intelligence. In *The turing test*, pages 79–97. Springer, 2003.
- [13] Zenon W Pylyshyn. Computation and cognition: Issues in the foundations of cognitive science. *Behavioral and Brain Sciences*, 3(1):111–132, 1980.
- [14] David Marr. *Vision : a computational investigation into the human representation and processing of visual information*. W.H. Freeman, San Francisco, 1982.
- [15] Shakir Mohamed. Marr’s levels of analysis, 2013.
- [16] Hubert L. Dreyfus. Artificial intelligence. *The Annals of the American Academy of Political and Social Science*, 412:21–33, 1974.
- [17] William Ramsey. Eliminative Materialism. In Edward N. Zalta, editor, *The Stanford Encyclopedia of Philosophy*. Metaphysics Research Lab, Stanford University, Fall 2021 edition, 2021.
- [18] David Cole. The Chinese Room Argument. In Edward N. Zalta, editor, *The Stanford Encyclopedia of Philosophy*. Metaphysics Research Lab, Stanford University, Winter 2020 edition, 2020.
- [19] Margaret A Boden. Escaping from the chinese room. 1988.
- [20] J Chalmers David. Absent qualia, fading qualia, dancing qualia. *Conscious Experience*, 1996.
- [21] Anatoly Dneprov. *The Game*. 1961.
- [22] Paul M Churchland. Eliminative materialism and the propositional attitudes. In *Contemporary Materialism*, pages 166–185. Routledge, 2002.
- [23] Justin Weinberg. Did a story about a computer made of humans scoop searle’s ”chinese room” by 20 years?, 2019.
- [24] James L McClelland, David E Rumelhart, and Geoffrey E Hinton. The appeal of parallel distributed processing. *MIT Press, Cambridge MA*, pages 3–44, 1986.
- [25] Jeff Yoshimi and Zoë Tosi. Neural networks in cognitive science, 2021.
- [26] Jerry A Fodor and Zenon W Pylyshyn. Connectionism and cognitive architecture: A critical analysis. *Cognition*, 28(1-2):3–71, 1988.
- [27] Patricia Rich, Ronald de Haan, Todd Wareham, and Iris van Rooij. How hard is cognitive science? 2021.
- [28] Rodney A Brooks. Elephants don’t play chess. *Robotics and autonomous systems*, 6(1-2):3–15, 1990.

- [29] Zoë Drayson. What is action-oriented perception? 2017.
- [30] Susan Hurley. Perception and action: Alternative views. *Synthese*, 129(1):3–40, 2001.
- [31] Michael Anderson. How to study the mind: An introduction to embodied cognition. 2005.
- [32] Lawrence Shapiro and Shannon Spaulding. Embodied Cognition. In Edward N. Zalta, editor, *The Stanford Encyclopedia of Philosophy*. Metaphysics Research Lab, Stanford University, Winter 2021 edition, 2021.
- [33] Brad Orego. An intro to embodied cognition and how it relates to user-centered design, 2018.
- [34] Luis H Favela. Dynamical systems theory in cognitive science and neuroscience. *Philosophy Compass*, 15(8):e12695, 2020.
- [35] Andy Clark and David Chalmers. The extended mind. *analysis*, 58(1):7–19, 1998.
- [36] Wanja Wiese and Thomas Metzinger. Vanilla pp for philosophers: A primer on predictive processing. 2017.
- [37] Peggy Seriès and Mark Sprevak. From intelligent machines to the human brain. In *Philosophy and the Sciences for Everyone*, pages 96–112. Routledge, 2014.
- [38] Leda Cosmides and John Tooby. Evolutionary psychology: New perspectives on cognition and motivation. *Annual review of psychology*, 64:201–229, 2013.
- [39] Sara Shettleworth. *Fundamentals of Comparative Cognition*. Oxford University Press, 2012.
- [40] Susan Hurley. Animal action in the space of reasons. *Mind & Language*, 18(3):231–257, 2003.

## Summer 2021 Diversity Metrics

Recent work in several fields of science has identified a bias in citation practices such that papers from women and other minority scholars are under-cited relative to the number of such papers in the field [Div1, Div2, Div3, Div4, Div5, Div6, Div7, Div8, Div9]. Here I sought to proactively consider choosing references that reflect the diversity of the field in thought, form of contribution, gender, race, ethnicity, and other factors. First, I obtained the predicted gender of the first and last author of each reference by using databases that store the probability of a first name being carried by a woman [Div5, Div10]. By this measure (and excluding self-citations), my syllabus contains 17.7% woman(first)/woman(last), 5.51% man/woman, 8.01% woman/man, and 68.79% man/man. This method is limited in that a) names, pronouns, and social media profiles used to construct the databases may not, in every case, be indicative of gender identity and b) it cannot account for intersex, non-binary, or transgender people. Second, we obtained predicted racial/ethnic category of the first and last author of each reference by databases that store the probability of a first and last name being carried by an author of color [Div11, Div12]. By this measure (and excluding self-citations), our references contain 7.19% author of color (first)/author of color(last), 8.96% white author/author of color, 11.36% author of color/white author, and 72.49% white author/white author. This method is limited in that a) names and Florida Voter Data to make the predictions may not be indicative of racial/ethnic identity, and b) it cannot account for Indigenous and mixed-race authors, or those who may face differential biases due to the ambiguous racialization or ethnicization of their names. I look forward to future work that could help to better understand how to support equitable practices in science.



Below is further information for the benchmark used by the Diversity Statement Code and Notebook. While this benchmark may not necessarily be the most apt benchmark for a course such as this, it does provide at least a general comparison for the citation diversity of this philosophy of cognitive science course relative to high impact journals in the related scientific field of neuroscience.

For the top 5 neuroscience journals (Nature Neuroscience, Neuron, Brain, Journal of Neuroscience, and Neuroimage), the expected gender proportions in reference lists as reported by Dworkin et al. [Div13] are 58.4% for man/man, 9.4% for man/woman, 25.5% for woman/man, and 6.7% for woman/woman. Expected proportions were calculated by randomly sampling papers from 28,505 articles in the 5 journals, estimating gender breakdowns using probabilistic name classification tools, and regressing for relevant article variables like publication date, journal, number of authors, review article or not, and first-/last-author seniority. See Dworkin et al.[Div13] for more details. Using a similar random draw model regressing for relevant variables, the expected race proportions in reference lists as reported by Bertolero et al. were 51.8% for white/white, 12.8% for white/author-of-color, 23.5% for author-of-color/white, and 11.9% for author-of-color/author-of-color.

## Diversity Statement and Code Notebook Citations

- [Div1] Sara McLaughlin Mitchell, Samantha Lange, and Holly Brus. Gendered citation patterns in international relations journals. *International Studies Perspectives*, 14(4):485–492, 2013.
- [Div2] Michelle L Dion, Jane Lawrence Sumner, and Sara McLaughlin Mitchell. Gendered citation patterns across political science and social science methodology fields. *Political Analysis*, 26(3):312–327, 2018.
- [Div3] Neven Caplar, Sandro Tacchella, and Simon Birrer. Quantitative evaluation of gender bias in astronomical publications from citation counts. *Nature Astronomy*, 1(6):0141, 2017.
- [Div4] Daniel Maliniak, Ryan Powers, and Barbara F Walter. The gender citation gap in international relations. *International Organization*, 67(4):889–922, 2013.
- [Div5] Jordan D. Dworkin, Kristin A. Linn, Erin G. Teich, Perry Zurn, Russell T. Shinohara, and Danielle S. Bassett. The extent and drivers of gender imbalance in neuroscience reference lists. *bioRxiv*, 2020.
- [Div6] Maxwell A. Bertolero, Jordan D. Dworkin, Sophia U. David, Claudia López Lloreda, Pragya Srivastava, Jennifer Stiso, Dale Zhou, Kafui Dzirasa, Damien A. Fair, Antonia N. Kaczkurkin, Bianca Jones Marlin, Daphna Shohamy, Lucina Q. Uddin, Perry Zurn, and Danielle S. Bassett. Racial and ethnic imbalance in neuroscience reference lists and intersections with gender. *bioRxiv*, 2020.
- [Div7] Xinyi Wang, Jordan D. Dworkin, Dale Zhou, Jennifer Stiso, Emily B Falk, Danielle S. Bassett, Perry Zurn, and David M. Lydon-Staley. Gendered citation practices in the field of communication. *Annals of the International Communication Association*, 2021.
- [Div8] Paula Chatterjee and Rachel M Werner. Gender disparity in citations in high-impact journal articles. *JAMA Netw Open*, 4(7):e2114509, 2021.
- [Div9] Jacqueline M Fulvio, Ileri Akinnola, and Bradley R Postle. Gender (im)balance in citation practices in cognitive neuroscience. *J Cogn Neurosci*, 33(1):3–7, 2021.
- [Div10] Dale Zhou, Eli J. Cornblath, Jennifer Stiso, Erin G. Teich, Jordan D. Dworkin, Ann S. Blevins, and Danielle S. Bassett. Gender diversity statement and code notebook v1.0, February 2020.
- [Div11] Anurag Ambekar, Charles Ward, Jahangir Mohammed, Swapna Male, and Steven Skiena. Name-ethnicity classification from open sources. In *Proceedings of the 15th ACM SIGKDD international conference on Knowledge Discovery and Data Mining*, pages 49–58, 2009.
- [Div12] Gaurav Sood and Suriyan Laohaprapanon. Predicting race and ethnicity from the sequence of characters in a name. *arXiv preprint arXiv:1805.02109*, 2018.
- [Div13] Jordan D Dworkin, Kristin A Linn, Erin G Teich, Perry Zurn, Russell T Shinohara, and Danielle S Bassett. The extent and drivers of gender imbalance in neuroscience reference lists. *Nature neuroscience*, 23(8):918–926, 2020.