**DCS 105 Calling Bull: Data Literacy and Information Science**

Course Description: Our world is rife with misinformation. This course is designed to hone digital citizenship skills. It is about “calling bullshit”: spotting, dissecting, and publicly refuting false claims and inferences based on quantitative, statistical, and computational analysis of data. Students explore case studies in policy and science and dissect the “who, what, where, when, why, and how” of bullshit propagation. Examples include election misinformation, interpreting health risk, facial recognition algorithms, and science communication. Students practice visualizing data; interpreting scientific claims; and spotting misinformation, fake news, causal fallacies, and statistical traps. In doing so, the course offers an introduction to programming with R for data analysis and visualization.

| **Week** | **Discussion Questions**  | **Reading**  |
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| **Part I: The 5 Ws of Bullshit** |
| **Week 1**: Sept 4**Intro to Course** | Introduction to BullshitFrom Week 1. Introduction to bullshit by Bergstrom and West at [callingbullshit.org](https://callingbullshit.org/). Concepts and categories of bullshit. The art, science, and moral imperative of calling bullshit. As you are reading, think about a definition of bullshit. What is bullshit, what isn't bullshit? Where might you see it? How do you know? | For Friday:1. Use Perusall to annotate scoring information and guidelines <https://ph.ucsd.edu/resources/scoring-details.pdf>
2. And annotate an example sheet <https://public.perusall.com/downloads/scoring-examples.pdf>
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| **Week 2:**Sept 11**Spotting a wild bull** | How do we spot bullshit in the wild? What do we do when we encounter it? What tactics can we employ? Why is it important to detect bullshit? Monday’s reading focuses on the definition of bullshit (BS) and the vast issue of BSWednesday’s reading attempts to model scientific approaches to breaking down BSAdditional optional readings on Wednesday focus on the details of detecting BS data with simple analyses.  | For Monday1. Frankfurt, Harry G. On Bullshit. Princeton University Press, 2005. JSTOR, <https://doi.org/10.2307/j.ctt7t4wr>.
2. Nicoulaud, Guillaume. “BlogSpot - Spontaneous Order and Brandolini's law.” *BlogSpot*, July 08,2014, <https://ordrespontane.blogspot.com/2014/07/brandolinis-law.html>.

For Wednesday1. Sagan, Carl. “The Fine Art of Baloney Detection” The Demon-Haunted World, Random House, Inc. 1995. <https://www.inf.fu-berlin.de/lehre/pmo/eng/Sagan-Baloney.pdf>
2. Bergstrom, Carl, and Jevin West. “Foodstamp Fraud Case Study.” CallingBullshit, 2017, <https://callingbullshit.org/case_studies/case_study_foodstamp_fraud.html>

Additional further optional reading1. Heathers, James. “The GRIM test - a method for evaluating published research.” Medium. May 23, 2016. <https://jamesheathers.medium.com/the-grim-test-a-method-for-evaluating-published-research-9a4e5f05e870>
2. Newcomb, Simon. “Note on the Frequency of Use of the Different Digits in Natural Numbers.” *American Journal of Mathematics*, vol. 4, no. 1, 1881, pp. 39–40. *JSTOR*, <https://doi.org/10.2307/2369148>
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| **Week 3:**Sept 18**Open Science** | Monday’s podcast focuses on Open Science as a tool for keeping the integrity of informationWednesday’s reading prepares students for the [Caffeine Free Case Study](https://callingbullshit.org/case_studies/case_study_caffeine_free.html) by Carl Bergstrom and Jevin West. | Readings for Monday:1. Bahlai, Christie, Catto, Rebecca, & Mulvey, Bridget, hosts. “An Absolutely Irreproducible conversation with Nicole Nelson.” How Do You Know? Episode 10. October 2022. <https://open.spotify.com/episode/5hnNe8a5qFXXhIPPdxEXDS?si=bHQjuX5ETtSj_m1JRfm4Fg&nd=1&dlsi=fabb2d6be14d48cd>

Readings for Wednesday’s Lab1. Bergstrom, Carl, and Jevin West. “99.9% Caffeine-free Case Study.” CallingBullshit, 2017, <https://callingbullshit.org/case_studies/case_study_caffeine_free.html>
2. Introduction to the related lab: Diaz Eaton, C., Bergstrom, C., West, J. (2020). “[Calling Bull Case Study — 99.9% Caffeine-free with R](http://dx.doi.org/10.25334/4FN8-YV27). [Calling Bull - a resource sharing and teaching community](https://qubeshub.org/groups/callingbull)”, QUBES Educational Resources. [doi:10.25334/4FN8-YV27](http://dx.doi.org/10.25334/4FN8-YV27)
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| **Part II: How to lie with data** |
| **Week 4:**Sept 25**It’s a trap!** | How can statistics be used to mislead viewers? What is a statistical trap? What is the Will Rogers phenomenon? Attached to Mammograms case study.  | Readings for Monday:1. Bergstrom, Carl, and Jevin West. “Musicians and Mortality Case Study.” CallingBullshit, 2017, <https://callingbullshit.org/case_studies/case_study_musician_mortality.html>
2. Feinstein AR, Sosin DM, Wells CK. The Will Rogers phenomenon. Stage migration and new diagnostic techniques as a source of misleading statistics for survival in cancer. N Engl J Med. 1985 Jun 20;312(25):1604-8. doi: 10.1056/NEJM198506203122504.

Readings for Wednesday’s Lab:1. Diaz Eaton, C., Kriegler, S. (2024). [Prosecutor’s Fallacy and Mammograms Case Study. Calling Bull - a resource sharing and teaching community](http://dx.doi.org/10.25334/S8FS-7H21), QUBES Educational Resources. [doi:10.25334/S8FS-7H21](http://dx.doi.org/10.25334/S8FS-7H21)
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| **Week 5:**Oct 2**Causation vs Correlation** | Correlation, causation, and alternative explanationsHow was the development of statistics motivated by social context? How did the development of legitimate statistical techniques serve to legitimize “bullshit” science? Why is “race science” bullshit? What are some of the branches/commons techniques used in this “bullshit science”? | Readings for Monday:1. Excerpt about what correlation is from: <https://www.investopedia.com/terms/c/correlationcoefficient.asp>
2. Quick, Tom. “The making of a new race in the early twentieth century Imperial imaginary.” The Historical Journal 63.5 (2020): 1231–1256. DOI: <https://doi.org/10.1017/S0018246X20000047>

Optional Readings1. Bergstrom, Carl, and Jevin West. “Traffic Improvements and Government Waste Case Study.” CallingBullshit, 2017, <https://callingbullshit.org/case_studies/case_study_traffic_improvements.html>

Readings for Wednesday’s lab1. Matthews, R. (2000). Storks Deliver Babies (p= 0.008). Teaching Statistics, 22(2), 36-38. <https://doi.org/10.1111/1467-9639.00013>
2. Diaz Eaton, C. (2020). [Case Study - Storks vs Babies](http://dx.doi.org/10.25334/MS64-ZB24). [Calling Bull - a resource sharing and teaching community](https://qubeshub.org/groups/callingbull), QUBES Educational Resources. [doi:10.25334/MS64-ZB24](http://dx.doi.org/10.25334/MS64-ZB24)
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| **Week 6:**Oct 9**WM(ath)D** | What is AI and Machine Learning? How do our biases affect CS research? How can we interrogate results from ML and AI more broadly? How can we improve our practices? | Readings for Monday:1. Bergstrom, Carl, and Jevin West. “Criminal Machine Learning Case Study” CallingBullshit, 2017, <https://callingbullshit.org/case_studies/case_study_criminal_machine_learning.html>
2. Bergstrom, Carl, and Jevin West. “Machine Learning about sexual orientation? Case Study” CallingBullshit, 2017, <https://callingbullshit.org/case_studies/case_study_ml_sexual_orientation.html>
3. Caliskan, A., Bryson, J. J., & Narayanan, A. (2016). Semantics derived automatically from language corpora contain human-like biases. ArXiv. <https://doi.org/10.1126/science.aal4230>
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| **Week 7:**Oct 16**Responsible AI** | How do AI large language models assist in coding and software development? What are the ethical implications of relying on AI for coding tasks? What arguments do the authors make regarding the connection between LLMs and the generation of BS? What are the societal impacts of widespread AI-generated content that may be misleading or inaccurate? | Readings for Monday:1. Maxwell, Thomas. “GitHub Copilot, Based on OpenAI's Codex, Helps Boost Productivity.” Business Insider, 6 March 2023, <https://www.businessinsider.com/codex-github-copilot-chatgpt-openai-productivity-2023-3>
2. Bergstrom, Carl T., and Brandon Ogbunu. “ChatGPT Isn't 'Hallucinating.' It's Bullshitting.” Undark Magazine, 6 April 2023, <https://undark.org/2023/04/06/chatgpt-isnt-hallucinating-its-bullshitting/>.
3. Bender, Emily.” On the Dangers of Stochastic Parrots: Can Language Models Be Too Big?” FAccT '21: Proceedings of the 2021 ACM Conference on Fairness, Accountability, and Transparency. March 2021. Pages 610–623 <https://doi.org/10.1145/3442188.3445922>
4. "Doomed To Be Replaced: Is AI Art Theft?" YouTube, uploaded by Splar Sands, 27 Jan. 2023. <https://www.youtube.com/watch?v=nIRbN52PA0o&t=1s>
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| **Week 8:**Oct 23**Data viz** | What are the key takeaways about early data visualizations? How did Du Bois communicate data and insights? How can visualizations be misleading? What are good practices for creating a visualization? What is the principle of proportional ink? How does senescence display itself through data? This also includes instructions for the Track and Field Case study.  | Readings for Monday:1. Forrest, Jason. "How W.E.B. Du Bois Used Data Visualization to Confront Prejudice in the Early 20th Century." Tableau, 20 Feb. 2019, [www.tableau.com/blog/how-web-du-bois-used-data-visualization-confront-prejudice-early-20th-century](http://www.tableau.com/blog/how-web-du-bois-used-data-visualization-confront-prejudice-early-20th-century).
2. Bergstrom, C., & West, J. 2017. Visualization - Misleading Axes on Graphs. Calling Bullshit. <https://callingbullshit.org/tools/tools_misleading_axes.html>
3. Bergstrom, C., & West, J. 2017. Visualization - The Principle of Proportional Ink. <https://callingbullshit.org/tools/tools_proportional_ink.html>

Readings for Wednesday’s Lab:1. Bergstrom, Carl, and Jevin West. “World Records as measures of senescence Case Study” CallingBullshit, 2017, <https://callingbullshit.org/case_studies/case_study_track_records.html>
2. Diaz Eaton, C., Bergstrom, C., West, J. (2020). [Case Study — World records as measures of senescence or randomness](http://dx.doi.org/10.25334/S10Y-9N69). [Calling Bull - a resource sharing and teaching community](https://qubeshub.org/groups/callingbull), QUBES Educational Resources. [doi:10.25334/S10Y-9N69](http://dx.doi.org/10.25334/S10Y-9N69)
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| **Part III: The Bullshit Ecosystem** |
| **Week 9:**Oct 30**It’s significant!** | How can we have good science practices with good intentions, but still have wrong things published? How can science be hijacked by others for their own gains? What are the stakes?  | Readings for Monday:1. Ioannidis JPA (2022) Correction: Why Most Published Research Findings Are False. PLOS Medicine 19(8): e1004085. <https://doi.org/10.1371/journal.pmed.1004085>
2. David Michaels and Celeste Monforton, 2005: Manufacturing Uncertainty: Contested Science and the Protection of the Public’s Health and EnvironmentAmerican Journal of Public Health 95, S39\_S48, <https://doi.org/10.2105/AJPH.2004.043059>
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| **Week 10:**Nov 6**It’s everyone’s fault** | How do you know that something is legitimate? What does it mean to be predatory? Is science immune to bullshit? What are the impacts?  | Readings for Monday:1. Bergstrom, Theodore C., et al. "Evaluating Big Deal Journal Bundles." Proceedings of the National Academy of Sciences, vol. 111, no. 26, 2014, pp. 9425-9430, <https://doi.org/10.1073/pnas.1403006111>
2. Edwards, Marc A., and Siddhartha Roy. "Academic Research in the 21st Century: Maintaining Scientific Integrity in a Climate of Perverse Incentives and Hypercompetition." Environmental Engineering Science, vol. 34, no. 1, 2017, pp. 51-61, <https://doi.org/10.1089/ees.2016.0223>
3. Bergstrom, C., & West, J. 2017.” How Do you Know a Paper is Legit?” <https://callingbullshit.org/tools/tools_legit.html>
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| **Week 11:**Nov 13**FAKE** | What about the broader fake news ecosystem? | Readings for Monday:1. Pick one of these NYT Investigative Journalism features:
	1. Higgins, Andrew, et al. "Inside a Fake News Sausage Factory: ‘This Is All About Income’." The New York Times, 25 Nov. 2016, [www.nytimes.com/2016/11/25/world/europe/fake-news-donald-trump-hillary-clinton-georgia.html](http://www.nytimes.com/2016/11/25/world/europe/fake-news-donald-trump-hillary-clinton-georgia.html).
	2. "OPERATION INFEKTION: Russian Disinformation: From Cold War to Kanye." The New York Times, 12 Nov. 2018, Video Documentary Series. [www.nytimes.com/2018/11/12/opinion/russia-meddling-disinformation-fake-news-elections.html](http://www.nytimes.com/2018/11/12/opinion/russia-meddling-disinformation-fake-news-elections.html).
	3. Chen, Adrian. "The Agency." The New York Times, 2 Jun. 2015, [www.nytimes.com/2015/06/07/magazine/the-agency.html](http://www.nytimes.com/2015/06/07/magazine/the-agency.html).
2. Kiely, Eugene, and Lori Robertson. "How to Spot Fake News." FactCheck.Org A Project of The Annenberg Public Policy Center, 18 Nov. 2016, [www.factcheck.org/2016/11/how-to-spot-fake-news/](http://www.factcheck.org/2016/11/how-to-spot-fake-news/).
3. Websites Hit A 'Gold Mine' In Fake News New York Times (1923-); Nov 26, 2016; ProQuest Historical Newspapers: The New York Times pg. A1 <https://go.gale.com/ps/i.do?id=GALE%7CA471516496&sid=sitemap&v=2.1&it=r&p=AONE&sw=w&userGroupName=anon%7E508388f9&aty=open-web-entry>
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| **November Break 18 - 26** |
| **Part IV: The Bull is in your Court** |
| **Week 12:**Nov 27**Refuting Bullshit** | How does this work inform your approach for the final project? How can you be a good digital citizen? What things do you think are important, what do you want to learn more about?  | Reading for Monday:1. Stephan Lewandowsky, John Cook, Ullrich Ecker, Dolores Albarracin, Michelle Amazeen, P. Kendou, D. Lombardi, E. Newman, G. Pennycook, E. Porter, D. Rand, D. Rapp, J. Reifler, J. Roozenbeek, P. Schmid, C. Seifert, G. Sinatra, B. Swire-Thompson, S. van der Linden, E. Vraga, T. Wood, M. Zaragoza. "The Debunking Handbook 2020." <https://doi.org/10.17910/b7.1182>

Readings for Wednesday - a choice (A, B, C)1. Option A: A Physicist decides to expose cultural studies as "fake."
	1. Sokal, A. D. (1996a). A Physicist Experiments with Cultural Studies. Lingua Franca, 4. <http://www.physics.nyu.edu/faculty/sokal/lingua_franca_v4/lingua_franca_v4.html>
	2. Ruark, Jennifer. "Bait and Switch - How the Physicist Alan Sokal Hoodwinked a Group of Humanists and Why, 20 Years Later, It Still Matters." The Chronicle of Higher Education, 1 Jan. 2017, [www.chronicle.com/article/bait-and-switch/](http://www.chronicle.com/article/bait-and-switch/).
2. Option B: Psychology researcher, Dr. Fiske, says that calling out her study methodology was bullying.
	1. Fiske, Susan. “Mob Rule or Wisdom of Crowds? APS Observer preliminary draft.” 2016 <https://datacolada.org/wp-content/uploads/2016/09/Fiske-presidential-guest-column_APS-Observer_copy-edited.pdf>
	2. Lakens, Daniel. "Why Scientific Criticism Sometimes Needs to Hurt." Danielle Atkins BlogSpot, 19 Sept. 2016, [daniellakens.blogspot.com/2016/09/why-scientific-criticism-sometimes.html](http://daniellakens.blogspot.com/2016/09/why-scientific-criticism-sometimes.html).
	3. Gelman, Andrew. "What Has Happened down Here Is the Winds Have Changed." Statistical Modeling, Causal Inference, and Social Science: Columbia University, 21 Sept. 2016, [statmodeling.stat.columbia.edu/2016/09/21/what-has-happened-down-here-is-the-winds-have-changed/](http://statmodeling.stat.columbia.edu/2016/09/21/what-has-happened-down-here-is-the-winds-have-changed/).
3. Option C Mathematics. In this case a mathematics professor at Williams College with little statistical experience decides to analyze 2020 election data, “finds fraud”, and writes a certified testimony.
	1. Wold, Samuel. “Professor Steven Miller issues legal statement suggesting PA ballot irregularities; conclusions repudiated by statisticians, political scientists.” The Williams Record. 25 Nov. 2020. <https://williamsrecord.com/434506/news/professor-of-mathematics-steven-miller-issues-legal-statement-suggesting-ballot-irregularities-in-pa-conclusions-repudiated-by-statisticians-and-political-scientists/>
	2. Miller, Steven J. “Expert Report on PA Mail-In Ballots”. Case 4:20-cv-02078-MWB; Document 200-1. 21 Nov. 2020 .<https://williamsrecord.com/wp-content/uploads/2020/11/Attachment-A.pdf>
	3. Pachter, Lior. "Williams Math Professor Investigating Voter Fraud in Pennsylvania Finds No Evidence." Bits of DNA Reviews and Commentary on Computational Biology by Lior Pachter, 22 Nov. 2020, [liorpachter.wordpress.com/2020/11/22/williams-math-professor-investigating-voter-fraud-in-pennsylvania-finds-no-evidence/](http://liorpachter.wordpress.com/2020/11/22/williams-math-professor-investigating-voter-fraud-in-pennsylvania-finds-no-evidence/).
	4. De Veaux, Richard. "A Rebuttal to Steven Miller’S “REPORT ON PA GOP MAIL-IN BALLOT REQUESTS”." The Williams Record, 25 Nov. 2020, [williamsrecord.com/435109/opinions/a-rebuttal-to-steven-millers-report-on-pa-gop-mail-in-ballot-requests/](http://williamsrecord.com/435109/opinions/a-rebuttal-to-steven-millers-report-on-pa-gop-mail-in-ballot-requests/).
	5. De Veaux, Richard, et al. “The Steven Miller Controversy: A Personal Perspective” AMSTATNEWS The Membership Magazine of the American Statistical Association. 1 Feb 2021. <https://magazine.amstat.org/blog/2021/02/01/miller-controversy-perspective/>
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| **Week 13:**Dec 4**Put it all together** | What does public trust in science have to to with BS? What are the real impacts of bullshit, misinformation, and disinformation? How do we know these impacts, scientifically? What is our responsibility to reduce harm of BS? As good humans, as digital citizens, and/or as scientists (or at least those who are completing their QR or SR requirement)?How does this course fit into understanding and acting on that responsibility? | Impacts:1. Friggeri, A., Adamic, L., Eckles, D., & Cheng, J. (2014). Rumor Cascades. Proceedings of the International AAAI Conference on Web and Social Media, 8(1), 101-110. <https://doi.org/10.1609/icwsm.v8i1.14559>
2. Forati, Amir M., and Rina Ghose. "Geospatial Analysis of Misinformation in COVID-19 Related Tweets." Applied Geography, vol. 133, 2021, p. 102473, <https://doi.org/10.1016/j.apgeog.2021.102473>.
3. Hopf Henning, Krief Alain, Mehta Goverdhan and Matlin Stephen A. 2019 “Fake science and the knowledge crisis: ignorance can be fatal.” R. Soc. Open Sci.6190161 <http://doi.org/10.1098/rsos.190161>
4. ISTE (n.d.). ISTE Standards: For Students. International Society for Technology in Education. 2023 <https://iste.org/standards/students>
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| **Dec 12-15****Final Exam week** |  |  |