

SC 205N **On Bullshit: Identifying Bias and Falsehood**

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In the Information Age we are all bombarded by claims and data about everything from the planets orbiting Jupiter to the nature of sexuality. Politicians rage against rigged elections and fake news. Studies show that various foods are bad, then good, then bad for your health. This is bullshit, that is, statements used for aims other than to convey accurate information. The course will discuss the variety of ways bullshit infects reasoning, data analysis and the process of scientific investigation. The concept of bullshit and its epistemological and moral consequences begins the course. Then we look for where in the world bullshit is found: advertising, social media, and spurious correlation. Statistical tricks, graphic wizardry, and manipulation of large data sets form central topics for analysis. It is essential to understand and evaluate the processes by which these data are produced in order to determine which claims are warranted. Problems with publication bias and data replication are serious concerns in validating current scientific studies. A review of methods and justification for the results produced by scientific research in all its various forms is needed to determine which claims are genuinely supportable. Finally, tools for assessing sources and refuting bullshit in media and other contexts will be considered. Students from all backgrounds will be challenged to integrate material from unfamiliar domains. Science students will need to give reasons for accepting non-empirical claims, and humanities students must assess the value of quantitative analysis. After taking the course, students should be able detect bullshit in their everyday lives and combat it.

This course was inspired by and adapted from the course [*Calling Bullshit*](#), developed by University of Washington professors Carl Bergstrom and Jevin West. We are grateful for their dedication to bullshit eradication and their kind permission to join the fight.

Course Objectives

After this course, you will be able to:

- Recognize the fine line between bullshit and lies
- Figure out precisely *why* a particular bit of bullshit is bullshit
- Explain to someone else why a claim is bullshit
- Persuade your crystals-and-homeopathy aunt or casually racist uncle why bullshit is problematic
- Determine when calling bullshit is a good idea and when it's not

Assessment

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|------------------------|---|
| Blog posts 10% | Self-reflection on your susceptibility to bullshit at the beginning and end of the course |
| Assignments 25% | Weekly written and analytical tasks to hone bullshit detection skills (best 10 of 11) |
| Exams 55% | 4 Unit Exams for 15% each (best 3 of 4), Final Cumulative Exam 10% |
| Attendance 10% | If present at 10 or more pop quizzes. |
| Extra credit | Up to 10% total from any combination of: <ul style="list-style-type: none">- find a mistake in an exam that requires re-grading (5%)- exam questions for the final that are used (5%)- if class participation in SRTEs is over 85% (everyone gets 2%) |

Grading scale

A 100-93, A- 92-90, B+ 89-87, B 86-83, B- 82-80, C+ 79-77, C 76-70, D 69-60

Academic integrity

Penn State defines academic integrity as the pursuit of scholarly activity in an open, honest and responsible manner. All students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts (Faculty Senate Policy 49-20).

Dishonesty of any kind will not be tolerated in this course. Dishonesty includes, but is not limited to, cheating, plagiarizing, fabricating information or citations, facilitating acts of academic dishonesty by others, having unauthorized possession of examinations, submitting work of another person or work previously used without informing the instructor, or tampering with the academic work of other students. Students who are found to be dishonest will receive academic sanctions and will be reported to the University's Judicial Affairs office for possible further disciplinary sanction.

Any questions regarding academic integrity can be directed to Robin Robinson (rmb3@psu.edu) in the Undergraduate office of Liberal Arts, 865-2545.

Academic freedom

The faculty member is entitled to freedom in the classroom in discussing his/her subject. The faculty member is, however, responsible for the maintenance of appropriate standards of scholarship and teaching ability. It is not the function of a faculty member in a democracy to indoctrinate his/her students with ready-made conclusions on controversial subjects. The faculty member is expected to train students to think for themselves, and to provide them access to those materials which they need if they are to think intelligently. Hence, in giving instruction upon controversial matters the faculty member is expected to be of a fair and judicial mind, and to set forth justly, without supersession or innuendo, the divergent opinions of other investigators.

No faculty member may claim as a right the privilege of discussing in the classroom controversial topics outside his/her own field of study. The faculty member is normally bound not to take advantage of his/her position by introducing into the classroom provocative discussions of irrelevant subjects not within the field of his/her study. [University Policy HR64; Approved November 27, 1950; Revised January 30, 1987]

Disability access

Penn State welcomes students with disabilities into the University's educational programs. If you have a disability-related need for reasonable academic adjustments in this course, contact Student Disability Resources (814-863-1807). For further information regarding policies, rights and responsibilities please visit the Student Disability Resources website: <http://equity.psu.edu/student-disability-resources>. Instructors should be notified as early in the semester as possible regarding the need for reasonable accommodations.

Extended Absences: During your enrollment at Penn State, unforeseen challenges may arise. If you ever need to miss an extended amount of class in such a circumstance, please notify your professor so you can determine the best course of action to make up missed work. If your situation rises to a level of difficulty you cannot manage on your own with faculty support, reach out to the Student Care & Advocacy office by phone at [\(814-863-2020\)](tel:814-863-2020) or email them at StudentCare@psu.edu. Office hours are Monday-Friday, 8 a.m. to 5 p.m.

Schedule and readings

Each of the lectures will explore one specific facet of bullshit. For each week, a set of required readings are assigned. See the schedule for specific dates and an overview of assignments. For some weeks, supplementary readings are also provided for those who wish to delve deeper.

Week 1. Introduction to bullshit. What is bullshit? Distinguishing bullshit from humbug, lies, and speculation. The difficulty of countering bullshit: Brandolini's [Bullshit Asymmetry Principle](#).

- Harry Frankfurt (1986) On Bullshit. *Raritan Quarterly Review* 6(2)

Supplementary readings

- G. A. Cohen (2002) Deeper into Bullshit. *Contours of Agency: Themes from the Philosophy of Harry Frankfurt*.
- Philip Eubanks and John D. Schaeffer (2008) A kind word for bullshit: The problem of academic writing. *College Composition and Communication* 59(3): 372-388

Assignment: Self-assessment blog – how good are you at spotting bullshit?

Week 2. Kinds of bullshit. Truth, like liberty, requires eternal vigilance. How do you spot bullshit in the wild? Numbers can be source of truth, or they can generate quantities of bullshit. Polls, weights, surveys. Identifying premises, conclusions, looking at relations among claims.

- Anthony Donoghue (2018) *Statistics & the Media*, Chapter 3
- Peverill Squire (1988) Why the 1936 Literary Digest Poll Failed, *The Public Opinion Quarterly*, Vol. 52: 125-133.
- Robert J. Fogelin & Walter Sinnott-Armstrong (2015) *Understanding Arguments*, The Language of Argument, 41-46.

Assignment: Practice quiz

Week 3. Spotting bullshit. Science as a bullshit detector. Finding a hypothesis, supporting evidence, and conclusion.

- Carl Sagan 1996 The Fine Art of Baloney Detection. *The Demon-Haunted World*, Chapter 12, 189-206.
- Case study: [99% caffeine-free](#)

EXAM 1

Week 4. Causality One common source of bullshit arises when people ignore, deliberately or otherwise, the fact that [correlation is not causation](#). The consequences can be [hilarious](#), but this confusion can also be used to mislead. Samples, randomized experiments, [Milton Friedman's thermostat](#).

- Anthony Donoghue (2018) *Statistics & the Media*, Chapter 1
- Robert Matthews (2000) Storks deliver babies ($p=0.008$). *Teaching Statistics* 22:36-38
- Sherry Seethaler (2009) *Lies, Damned Lies, and Science*, Chapter 5
- Case study: [Traffic improvements](#)

Supplementary reading

- For context see John Aldrich (1995) Correlations genuine and spurious and yule. *Statistical Science* 10:364-376.

Assignment: Case study in coffee drinking

Week 5. What are the odds? Judging probability is a risky business, and that increases the chances of bullshit by a significant degree. Heuristics, Bayes rule, decisions under ignorance, Gambler's fallacy.

- Robert J. Fogelin & Walter Sinnott-Armstrong (2001) *Understanding Arguments*, Taking Chances, Chapter 10.
- Case studies: [Musicians and mortality](#), [Track records](#)

Assignment: Practice quiz

Week 6. Sweet talk. Lots of bullshit sounds BEAUTIFUL and THE BEST EVER, but it's still bullshit. Rhetorical devices and fallacies for perfuming the manure.

- Jeff McLaughlin (2014) *How to think critically*, Fallacies, Chapter 6.
- Robert J. Fogelin & Walter Sinnott-Armstrong (2015) *Understanding Arguments*, Language of Argument, 47-57.

Assignment: Practice quiz

Week 7.

EXAM 2

Data visualization. Data graphics can be powerful tools for understanding information, but they can also be powerful tools for misleading audiences. The Lie Factor, data and design variation, optical illusions, clunky grids, and graphical ducks.

- Edward Tufte (1983) *The Visual Display of Quantitative Information* Chapter 2 (Graphical integrity) and Chapter 5 (Chartjunk: vibrations, grids, and ducks).
- Tools and tricks: [Misleading axes](#), & [Proportional Ink](#)

Assignment: Chart analysis

Week 8. Fooled me once. The human mind is designed to be biased. Survival is about doing the same thing in the future that was helpful in the past. Obviously, though, this strategy can fail. Confirmation bias, implicit bias, and predictable irrationality. How not to be fooled twice.

- Nordell, Jessica (2017) Is this how discrimination ends? *The Atlantic*.
- Devine, Patricia (2016) Interventions to reduce racial bias. *youtube*.
- *Project Implicit*. Take the implicit bias test.
- Donath, Judith (2016) Why fake news stories thrive online. *CNN Opinion*.
- Brian Feldman (2017) Google's dangerous identity crisis. *New York Magazine*

Supplementary reading

- Cornelia Dean (2017) *Making Sense of Science: Separating Substance from Spin*. 13-29.

Assignment: Find an example of bias, post link and explanation.

Week 9. Publication bias. Even a community of competent scientists all acting in good faith can generate a misleading scholarly record when journals prefer to publish positive results over negative ones. In a provocative and hugely influential 2005 paper, epidemiologist John Ioannides argued that *publication bias* has created a situation in which most published scientific results are probably false. As a result, it's not clear that one can safely rely on the results of some random study reported in the scientific literature, let alone on BuzzFeed. Funding pressure, p-value, p-hacking, and power poses.

- Anthony Donoghue (2018) *Statistics & the Media*, Chapters 2 & 10.

Supplementary reading

- John Ioannidis (2005) Why most published scientific results are false. *PLOS Medicine* 2:e124.

Assignment: Practice quiz

Week 10.

EXAM 3

Social media and fake news. Where do we find bullshit? Why news media provide bullshit. Why social media provide ideal conditions for the growth and spread of bullshit. Rather than providing the wide dissemination of reliable information, the internet provides sectarian echo chambers and a serious assault on the very notion of fact.

- Factcheck.org: How to spot fake news
- Gordon Pennycook et al. (2015) On the reception and detection of pseudo-profound bullshit. *Judgement and Decision Making* 10:549-563

Supplementary reading

- [Adrian Chen](#) The Agency. *New York Times Magazine* June 7, 2015.
- Adrien Friggeri et al. (2014) Rumor Cascades. Proceedings of the Eighth International AAAI Conference on Weblogs and Social Media
- [Eric Weiskott](#) Before 'Fake News' Came False Prophecy, *The Atlantic Monthly* Dec. 27, 2016.

Assignment: TBD

Week 11. 99% agree. Distribution, deviation, mean, median. How to assess variation and probability in statistical relations. If the chance of dying next year is 80% less for students in the Bullshit class, should you absolutely not drop?

- Anthony Donoghue (2018), *Statistics & the Media*, Chapters 4 & 5.
- Case study: [Food stamp fraud](#)

Assignment: Practice quiz

Week 12. Selling science. Increasing pressure to make science ‘relevant’ has led scientists and journalists to sensationalize scientific results in the media. These distortions are compounded when a third report is based on the news article rather than the study itself. Then your friend reads the report and posts about it on Facebook. This situation may be more like an infectious disease than bullshit, but it is still very bad.

- Jevin West (2014) How to improve the use of metrics: learn from game theory. *Nature* 465:871-872.

- Peter Lawrence (2014) The mismeasurement of science. *Current Biology* 17:R583-585.
- Cliodhna O'Connor and Helene Joffe (2014) Gender on the Brain: A Case Study of Science Communication in the New Media Environment. *PLOS ONE* 9, no. 10: e110830.

Assignment: TBD

Week 13. Big data. When does any old algorithm work given enough data, and when is it garbage in, garbage out? Use and abuse of machine learning. Misleading metrics.

- danah boyd and Kate Crawford (2011) Six Provocations for Big Data. *A Decade in Internet Time: Symposium on the Dynamics of the Internet and Society*.
- David Lazer et al. (2014) The Parable of Google Flu: Traps in Big Data Analysis. *Science* 343:1203-1205.
- Cathy O'Neil (2016) *Weapons of Math Destruction* Crown Press. 1-13.

Assignment: Practice quiz

Week 14. The ethics of calling bullshit. Where is the line between deserved criticism and targeted harassment? Is it, as one prominent scholar argued, “methodological terrorism” to call bullshit on a colleague's analysis? What if you use social media instead of a peer-reviewed journal to do so? How about calling bullshit on a whole field that you know almost nothing about? Pubpeer. Principles for the ethical calling of bullshit. Differences between being a hard-minded skeptic and being a domineering jerk.

- Alan Sokal (1996) A physicist experiments with cultural studies. *Lingua Franca* 6:62-64.
- Robert Service (2014) Nano-Imaging Feud Sets Online Sites Sizzling. *Science* 343:358.
- Michael Blatt (2016) Vigilante Science. *Plant Physiology* 169:907-909.

Supplementary reading

- [Susan Fiske \(2016\)](#) Mob Rule or Wisdom of Crowds? *APS Observer*. Also read commentaries [\[1\]](#) and [\[2\]](#).
- Jennifer Ruark (2017) Anatomy of a hoax. *Chronicle of Higher Education*.

EXAM 4

Week 15. Refuting bullshit. Refuting bullshit requires different approaches for different audiences. What works for a quantitatively-skilled professional scientist won't always convince your casually racist uncle on facebook, and vice versa.

- John Cook and Stephan Lewandowsky (2012) *The Debunking Handbook*.
- Craig Bennett et al. (2009) Neural correlates of interspecies perspective taking in the post-mortem Atlantic Salmon: An argument for multiple comparisons correction. *Journal of Serendipitous and Unexpected Results* (1): 1–5.
- Case study: [Gender gap in 100 m times](#)

Assignment: Final self-assessment blog – 3 things learned in the course

FINAL EXAM