Case-based data ethics to inspire an inclusive data science community

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Abstract

When Wellesley College, a liberal arts college for women, created a data science major in 2019, the approved proposal promised that students would learn about data ethics. None of our courses included data ethics at that time, though. This poster describes the case-based data ethics modules that have now been taught to groups of 25-80 students in a second-level applied statistics course, in person and remotely, and students' enthusiastic response to this material. In particular, a focus on the intersection between data science and race- and gender-based discrimination engaged a population of students who often lacked the confidence to speak up about technical course content but cared deeply about social justice. The students who seemed most inspired by this material went on to become data science majors, organize invited talks by data ethics researchers, and hold students-only roundtable discussions on the cultural significance of data.

Wellesley College
4-year private women's college in a Boston suburb

Second-level applied statistics course, with data science topics

Prerequisite is any of our intro stats courses

Course counts toward majors/minors in data science, statistics, math, psychology, economics, neuroscience, environmental studies

Summer version draws participants in the science and social science summer research program

Fall 2019: 45 students, in person
Summer 2020: 80 students, remote
Fall 2020: 25 students, remote
Summer 2021: 50 students, remote

Ethics in the first assignment, before we introduce ethics as its own topic:

Consider a research project that you have worked on or thought about recently.

- What is the target population?
- Briefly discuss any possible sources of selection bias.
- Briefly discuss any possible sources of non-response bias.
- ...
- Can you think of any ethical concerns related to this study?

Ethics in the final project:

Prompt didn't mention ethics, but students included the topic on their own.

For example:

Fall 2019 USCLAP winning project

Model to predict outcomes for dogs at an animal shelter

What are the consequences of developing such a model?

What is data ethics?

The students initially answer: confidentiality, privacy, data safety

What else is data ethics?

- consequences of reporting results data analyses or providing models, especially when analyses lean toward automation
- consequences of moving forward when assumptions are not met (ponder sampling bias, justification for drawing causal inference, modeling assumptions, visualizations…)
- the legacy of racism/eugenics in statistics
- current discussions about over-use of p-values
- ...

Data Ethics Assignment 1

The Ethical Data Scientist by Cathy O'Neil, published in *Slate* on Feb 4, 2016.

(a) Read “The ethical data scientist.” In your own words, explain the author’s argument that it would not be ethical to use race as a predictor for the homelessness project she worked on.

(b) Think of a different context where a predictor variable might be available, but it might not be ethical to use it.

(c) The author argues that data scientists are not paid to assess the effects of their algorithms. Choose one of the questions below, quoted from the article. List some positive and negative effects that an algorithm might have on people’s lives in that context.

“Do new-fangled social media algorithms encourage addictive gambling behavior?

“Do the teacher assessments encourage good teachers to stay in education?

“Does predictive policing improve long-term outcomes for the people targeted by their models?”

Data Ethics Assignment 2

Honesty and transparency are not enough by Andrew Gelman, published in *Chance* in 2017.

Ethical guidelines for statistical practice from the American Statistical Association, 2018.

(a) Read Andrew Gelman's article, "Honesty and transparency are not enough." Gelman refers to an "Excel error" by Reinhart and Rogoff. Google, read, and explain the mistake made by those authors.

(b) List some specific actions researchers can take that Gelman would label "honesty and transparency."

(c) What would Gelman like researchers to do in addition to acting in an honest and transparent way?

(d) Open the American Statistical Association's "Ethical guidelines for statistical practice." Note that clicking on the blue bars labeled "The ethical statistician:" expands sets of specific guidelines. Identify at least two guidelines that Gelman would call "honesty and transparency" and at least one guideline that address his desire for researchers to go beyond honesty and transparency.

Data Ethics Assignment 3

1. **Guardian article on Cambridge Analytica**
2. **Propublica article on risk assessment in criminal sentencing**
3. **NYTimes: Gender discrimination by an approval algorithm for Apple's credit card**
4. **NYTimes: Changes to the Census could make small towns disappear**
5. **NYTimes: Location tracking cell phones**
6. **NYTimes: Data protection**
7. **Washington Post: Racial bias in a medical algorithm favors white patients over sicker black patients, 10/24/2019 (no link for free access, use institutional credentials)**
8. **NPR: IBM discontinues facial recognition products**
9. **Ethics of digital contact tracing**
10. **NPR: Fired data scientist launches coronavirus dashboard**
11. **Harvard Business Review: Racial disparities in health care outcomes**
12. **Reuters: Amazon's recruiting tool that filtered out women's colleges**
13. **NY Times: Many trial volunteers got the placebo vaccine. Do they now deserve the real ones?**
14. **NY Times: An algorithm that grants freedom, or takes it away**

Next, read **Of oaths and checklists** by Patil, Mason, and Loukides, O'Reilly Blog, 2018

(a) Consider a research project that you have conducted or read about. Which of the suggested check-list items in "Of oaths and checklists" might apply to that project?

(b) For at least four of the example articles listed above, suggest and briefly discuss one or two check-list items that might have helped prevent the ethical problem described.

p-values

Practical v. statistical significance

Consider an experiment where villages in a developing country are randomly assigned to receive economic advice or not. The experiment is sponsored by a foundation interested in increasing the number of businesses operating in the country. Suppose that 3 of 5 villages (60%) receiving advice had new businesses open, and 1 of 5 villages (20%) without advice had new businesses open. The two-sided p-value from a t-test is 0.24. The foundation wants to know whether this intervention is worth pursuing further. Do you recommend that the foundation fund further study of this model for providing economic advice?

Continuing the example above: Suppose that you collect more data, and now 12,200 of 20,000 (61%) of villages receiving advice had new businesses open, and 12,000 of 20,000 (60%) of villages without advice had new businesses open. The two-sided p-value from a t-test is 0.04.The foundation wants to know whether they should invest in providing this sort of advice to villages, based on the data collected. Do you recommend that the foundation fund further study of this model for providing economic advice?

Further reading:

Moving to a world beyond $p<0.05$, Wasserstein, Schirm, and Lazar, *The American Statistician*, 2019

Psychology journal bans p-values, Woolston, *Nature*, 2015

For the first time this summer, the students noticed Fisher's history before I had a chance to discuss it

- *Was R.A. Fisher a supporter of eugenics? The source for the iris data set is from the 'Annals of Eugenics'. If so, it would be great to read more about this (and maybe about unethical uses of statistics) if you have any sources.*

Yes. In 2020, the Committee of the Presidents of Statistical Societies "retired" their most prominent award, which was named after Fisher, for this reason. This article discusses Fisher's history in more detail, as do these posts: one, two. There are important ongoing conversations about how statistics and other fields should handle the remaining influences of scholars who were actively racist and whose scholarly contributions were sometimes separate from but often intertwined with their racism. This issue is related to our discussion about p-values: it is interesting that the academic community is talking about de-emphasizing p-values at the same time that we are talking about handling the legacy of Fisher, who popularized p-values.

In this second-level statistics course, I think it is important for you to have a solid understanding of hypothesis testing and p-values not only because they are still the most popular approach to data analysis, but also because you can't fully engage in conversations about the appropriate role of p-values and how to handle Fisher's legacy without understanding the underlying concepts.

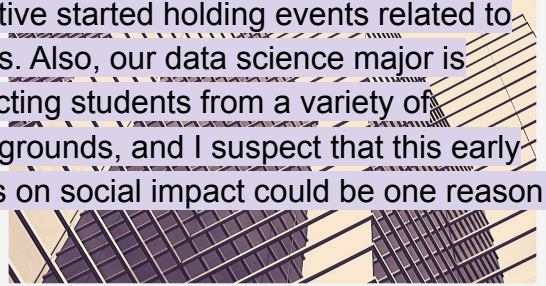
Graphics of the Day

Best practices for visualization are taught in this course by daily discussions of graphics submitted by students.

Understanding how graphics can mislead connects to conversations about ethics.

Why scientists need to be better at data visualization, Betsy Mason, *Knowable Magazine*, 2019

Students followed up! Students at this women's college who were first generation college students and/or from minority racial or ethnic groups seemed inspired by this material in a way that the technical course content had not previously inspired them. In the course evaluations, several students mentioned data ethics as a favorite topic and the campus Student Interdisplinary Data Initiative started holding events related to ethics. Also, our data science major is attracting students from a variety of backgrounds, and I suspect that this early focus on social impact could be one reason.



Data in Medicine Roundtable Discussion

Data + Medicine:
Discuss the role of data in medicine with passionate friends.

Develop insights regarding big data as future physicians, healthcare workers, scientists, and data scientists. Think critically about the excitement and ethics, in the company of thoughtful people like you! Prof. Pattanayak will be joining us to help guide discussion.

12/05/19
12:45-1:45 pm

Sci Modular Room 203

Wellesley's Student Interdisciplinary Data Initiative Presents

Social Science for Social Justice

A Talk With Cierra Robson, PhD Student at Harvard Kennedy

Join Cierra Robson, Associate Director of the JUST Data Lab, for a discussion regarding the intersection of data and social justice and stay for a Q&A session led by Nicole Ntim-Addae '20

APR 24TH • 12 PM TO 1:30 PM EST

REGISTER AT:
HTTPS://WELLESLEY.ZOOM.US/MEETING/REGISTER/TJYODEYHPJWQH9WFIULILXF7FHSDSMAVYAZZ

?'s: Contact bvigil@wellesley.edu with questions
Accommodations: For disability accommodations, contact Jim Wice, Director of Disability Services, (781) 283-2434, disabilityservices@wellesley.edu.

SIDI AND QAI PRESENT:

WHOSE DATA IS IT ANYWAY?

Culturally Significant Data and Its Importance

A JANUARY PROJECT ROUNDTABLE DISCUSSION

TUESDAY, JANUARY 19TH
1 PM EST

Register in advance for this meeting:
https://wellesley.zoom.us/meeting/register/tJIpfuGpqDovEtIBluBl17U0oRX8N8C6-yTP

?'s: Contact bvigil@wellesley.edu with questions
Accommodations: For disability accommodations, contact Jim Wice, Director of Disability Services, (781) 283-2434, disabilityservices@wellesley.edu.

The data ethics modules mentioned here are part of the publicly available online resources from Wellesley's Quantitative Analysis Institute.

QAI online resources

Data ethics 1

Data ethics 2

Data ethics 3

Practical v. statistical significance