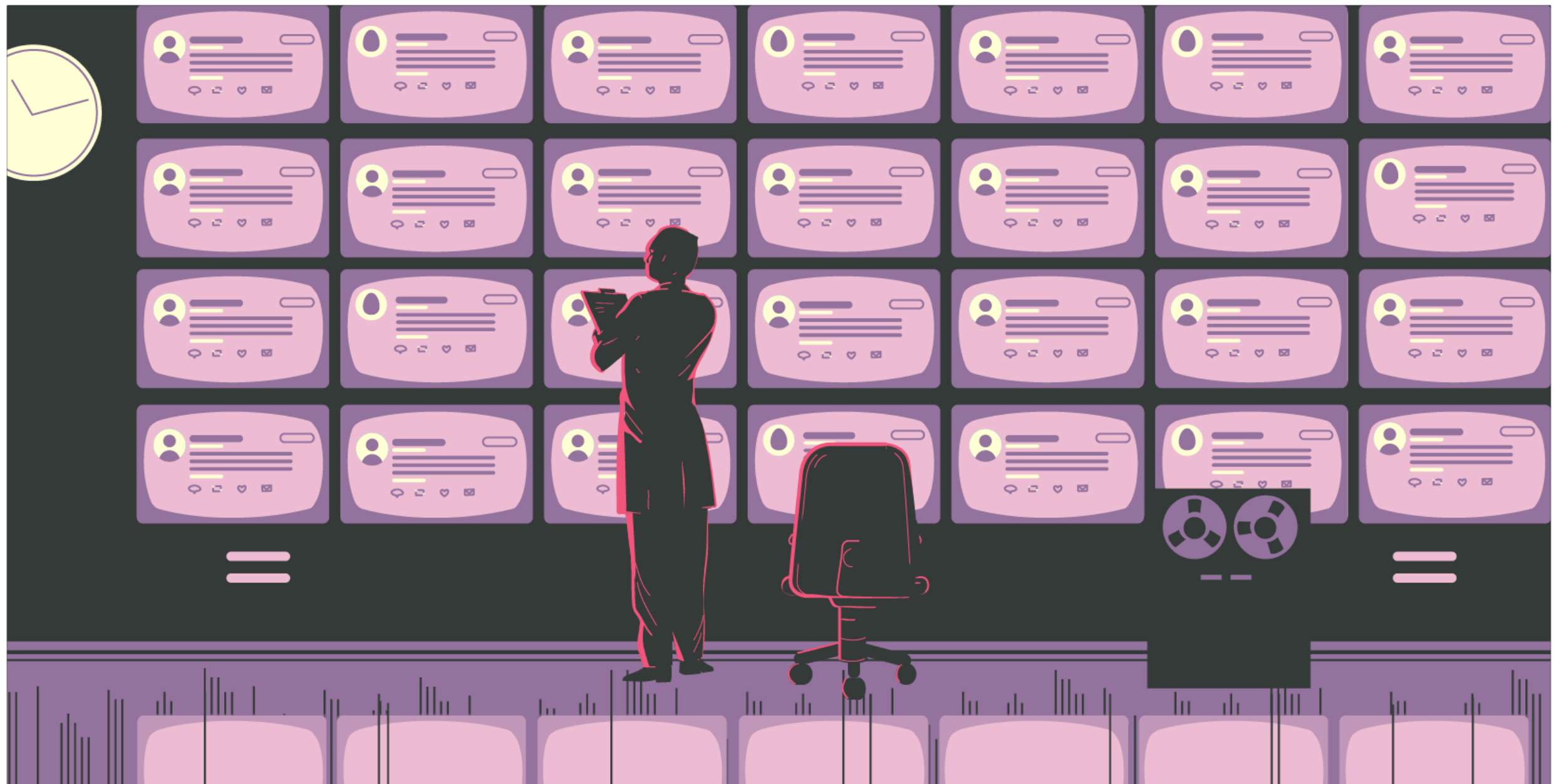




Data is People:

Ethics and Education for Data Science

stuff I do

- ▶ online communities & governance/law
- ▶ research ethics
- ▶ public perceptions of technology ethics
- ▶ ethical speculation in design
- ▶ computing ethics education
- ▶ marginalized online communities
- ▶ broadening participation in computing

things I'm going to talk about

- ▶ some* ethical controversies you've heard about
- ▶ some studies about data scraping
- ▶ my research ethics hill to die on, featuring “but the data is public”
- ▶ my ethics education hill to die on, featuring ethics integration across computing curriculum

* every time I give a talk like this there's more.

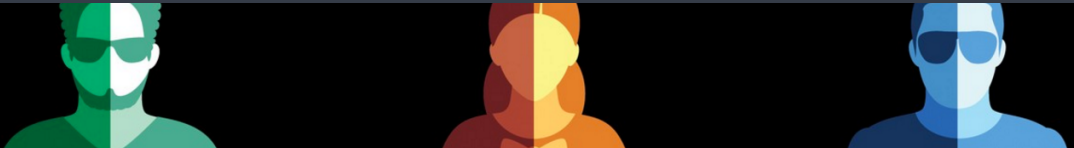
Q: What is “ethics” for a researcher?

WRONG A: What the IRB tells me I can do.

U.S. § 46.102

(f) **Human subject** means a living individual about whom an investigator (whether professional or student) conducting research obtains

- (1) Data through intervention or interaction with the individual, or
- (2) Identifiable private information.



70,000 OkCupid Users Just Had Their Data Published

WRITTEN BY JOSEPH COX

May 12, 2016 // 01:44 PM EST

TECHNOLOGY

YouTube Videos Are a Gold Mine for Health Researchers

“Digital exhaust” from online life could be transformed into health insights. Should it be?

SIDNEY FUSSELL SEP 9, 2019



REPORT / TECH / ARTIFICIAL INTELLIGENCE

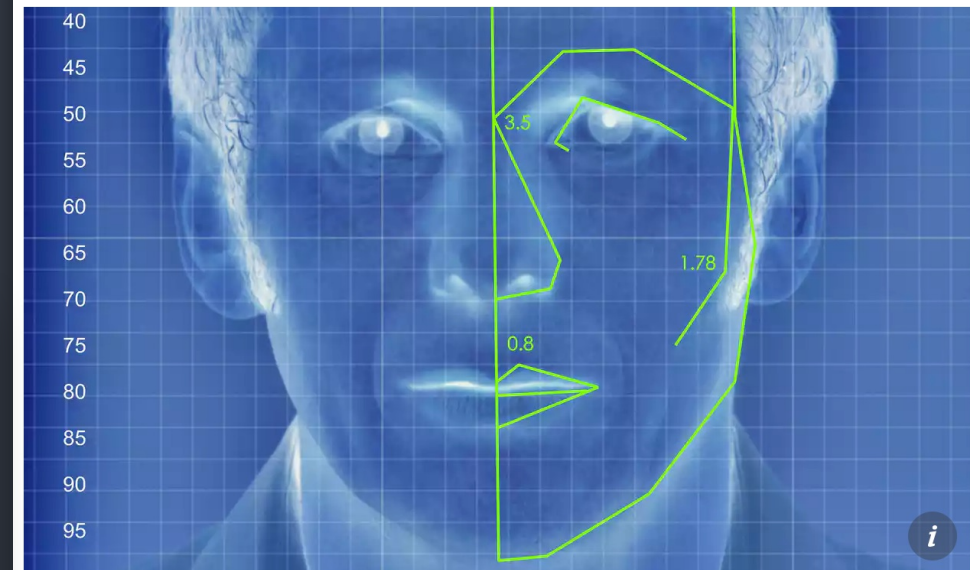
Transgender YouTubers had their videos grabbed to train facial recognition software

In the race to train AI, researchers are taking data first and asking questions later

By James Vincent | Aug 22, 2017, 10:44am EDT

New AI can guess whether you're gay or straight from a photograph

An algorithm deduced the sexuality of people on a dating site with up to 91% accuracy, raising tricky ethical questions



Artificial intelligence can accurately guess whether people are gay or straight based on photos of their faces, according to new research that suggests machines can have significantly better “gaydar” than humans.

- ▶ What defines “public” data?
- ▶ Is consent sometimes appropriate for use of public data?
- ▶ Is it acceptable for researchers to violate TOS? If research breaks TOS, are there additional oversights needed to mitigate risk?
- ▶ How do we account for user expectations even if we find them unreasonable?
- ▶ How do we address the use of stolen, leaked, or deleted data?
- ▶ What are proper anonymization practices for online data?
- ▶ Should we have shared expectations of ethical oversight?
- ▶ What precautions should we take for studying vulnerable populations online?
- ▶ What are our obligations to the communities we study?

How do you decide whether it's okay to collect data?

- ▶ Do the Terms of Service prohibit it?
- ▶ Is the data public?

How do you decide whether it's okay to collect data?

- ▶ **Do the Terms of Service prohibit it?**

- ▶ Is the data public?

Fiesler, C., Beard, N., and Keegan, B.C. No Robots, Scrapers, or Spiders: Legal and Ethical Regulation of Data Collection Methods in Social Media Terms of Service. ICWSM 2020.

[ABOUT](#)[BLOG](#)[FAQS](#)

Unauthorized Activities

When using the Services, you agree not to:

Create a handle for the purpose of preventing others from using that handle.

Sell or buy handles.

Impersonate another person in a manner that is intended to or does mislead, confuse or deceive

on without their express authorization and p

otherwise violate the legal rights of others.

We analyzed 116 of these.

Use racially or ethnically offensive language.

Discuss or incite illegal activity.

Post or share Submissions that contain pornography or graphic violence.

Post or share anything that exploits children or minors or that depicts cruelty to animals.

Post or share Submissions that violate any third party right, including any copyright, trademark or other intellectual property or statutory right.

Disseminate any unsolicited or unauthorized advertising, promotional materials, 'junk mail', 'spam', 'chain letters', or 'pyramid schemes'.

Use any robot, spider, crawler, scraper or other automated means to access the Services.

Take any action that imposes an unreasonable or disproportionately large load on our infrastructure.

Use or develop any third party applications that interact with the Services or Submissions without our permission.

Alter the opinions or comments posted by others on the Services.

Site	P	ND	NM	NA
About.Me			✓	✓
Academia.edu			✓	✓
aNobii	✓	✓		
AsianAve.com		✓		✓
aSmallWorld		✓	✓	✓
Bebo		✓		
Biip.no				
BlackPlanet				✓
Busuu		✓		
Buzznet		✓		
Cafemom				✓
Care2		✓		
CaringBridge			✓	✓
Classmates	✓		✓	✓
Cloob				✓
CouchSurfing				✓
Crunchyroll		✓		✓
Cyworld				
DailyStrength		✓		
Delicious	✓	✓		✓
DeviantArt		✓		
Diaspora		✓		
Dol2day				
douban				
Doximity	✓		✓	✓
Dreamwidth				
DXY.cn	✓			
English, baby!				
eToro				✓
Facebook	✓			✓
FetLife		✓		✓
FilmAffinity				
Filmow		✓		
Flickr		✓		✓
Flixster	✓	✓	✓	✓
Fotki				
Fotolog		✓		
Foursquare			✓	✓
Gaia Online		✓		✓

Site	P	ND	NM	NA
Gapyear	✓	✓	✓	
Gays.com				✓
Geni.com		✓		✓
Gentlemint				
GirlsAskGuys	✓			✓
Goodreads		✓		✓
Google+				
GovLoop			✓	✓
Grindr				✓
Habbo		✓		
hi5		✓		
Hub Culture				
Ibibo		✓		
Indaba Music	✓			
Inflenster		✓		
Instagram				✓
IRC-Galleria	✓			
italki.com	✓			
ItsMy/GameCloud				
Kaixin001				
Kiwibox		✓		✓
Last.fm		✓		✓
LibraryThing	✓			✓
LifeKnot				
LinkedIn	✓	✓	✓	✓
LinkExpats				✓
LiveJournal				✓
Meetup	✓			
mixi				
MocoSpace				
MouthShut				✓
MyHeritage	✓	✓	✓	✓
MyLife				✓
MySpace				✓
Nasza-klasa.pl		✓		✓
Netlog (Twoo)				
Nexopia				
Ning	✓	✓		✓
Partyflock		✓		

Site	P	ND	NM	NA
PatientsLikeMe	✓			✓
Pinterest		✓		✓
Plurk				
Quechup				
Quora	✓			✓
Qzone				✓
Raptr		✓		✓
Ravelry		✓		
Renren				
Reverbnation				✓
RoosterTeeth				
Sgrouples				✓
Sina Weibo	✓			
Skoob				
Skyrock		✓		
SoundCloud				✓
StudiVZ				✓
StumbleUpon	✓			✓
Tagged		✓		
TalkBizNow				✓
TermWiki		✓		
TravBuddy.com		✓		
Travellerspoint	✓	✓	✓	✓
Trombi				✓
Tuenti				
Tumblr			✓	✓
Twitter	✓			✓
Untappd		✓		✓
VampireFreaks				✓
Viadeo	✓			✓
VK		✓		✓
Wattpad		✓		✓
WriteAPrisoner				✓
Xanga		✓		
XING		✓		✓
Xt3				✓
Yammer				
Yelp		✓		✓
Total	24	47	14	63

Site	P	ND	NM	NA
About.Me			✓	✓
Academia.edu			✓	✓
aNobii	✓	✓		
AsianAve.com		✓		✓
aSmallWorld		✓	✓	✓
Bebo		✓		
Biip.no				
BlackPlanet				
Busuu				
Buzznet				
Cafemom				
Care2				
CaringBridge				
Classmates	✓			
Cloob				
CouchSurfing				
Crunchyroll				
Cyworld				
DailyStrength				
Delicious	✓			
DeviantArt				
Diaspora				
Dol2day				
douban				
Doximity	✓			
Dreamwidth				
DXY.cn	✓			
English, baby!				
eToro				
Facebook	✓			
FetLife				
FilmAffinity				
Filmow		✓		
Flickr		✓		✓
Flixster	✓	✓	✓	✓
Fotki				
Fotolog		✓		
Foursquare			✓	✓
Gaia Online		✓		✓

Site	P	ND	NM	NA
Gapyear	✓	✓	✓	
Gays.com				✓
Geni.com		✓		✓
Gentlemint				
GirlsAskGuys	✓			✓
Goodreads		✓		✓
Google+				
MyHeritage	✓	✓	✓	✓
MyLife				✓
MySpace				✓
Nasza-klasa.pl		✓		✓
Netlog (Twoo)				
Nexopia				
Ning	✓	✓		✓
Partyflock		✓		

Site	P	ND	NM	NA
PatientsLikeMe	✓			✓
Pinterest		✓		✓
Plurk				
Quechup				
Quora	✓			✓
Qzone				✓
Raptr		✓		✓
Wattpad		✓		✓
WriteAPrisoner				✓
Xanga		✓		
XING		✓		✓
Xt3				✓
Yammer				
Yelp		✓		✓
Total	24	47	14	63

Data collection provisions are extremely vague and highly inconsistent across sites.

Most data collection provisions are context-agnostic.

- ▶ What kind of data you're collecting
- ▶ What the expectations and norms of the users are
- ▶ Who you are
- ▶ What you're going to do with it

Fiesler, C., Beard, N., and Keegan, B.C. No Robots, Scrapers, or Spiders: Legal and Ethical Regulation of Data Collection Methods in Social Media Terms of Service. ICWSM 2020.

TOS-based decisions assume:

- ▶ Violating TOS is inherently unethical
- ▶ Violating TOS is the *only* thing that could make data collection unethical

Fiesler, C., Beard, N., and Keegan, B.C. No Robots, Scrapers, or Spiders: Legal and Ethical Regulation of Data Collection Methods in Social Media Terms of Service. ICWSM 2020.

How do you decide whether it's okay to collect data?

- ▶ Do the Terms of Service prohibit it?
- ▶ Is the data public?

How do you decide whether it's okay to collect data?

▶ Do the Terms of Service prohibit it?

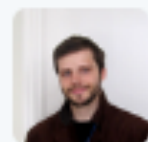
▶ **Is the data public?**



70,000 OkCupid Users Just Had Their Data Published

A student and a co-researcher of the dating site OkCupid have published data. And critics are questioning the data.

The situation is raising questions about whether the site is allowed to collect and use user data.



Emil OW Kirkegaard @KirkegaardEmil · May 8

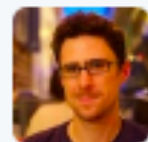
The OKCupid paper has now been submitted. This means that the dataset is now public! Enjoy! :) [openpsych.net/forum/showthre...](https://openpsych.net/forum/showthread.php?p=12345)



26



38



Ethan Jewett @esjewett · May 11

@KirkegaardEmil This data set is highly re-identifiable. Even includes usernames? Was any work at all done to anonymize it?



3



9

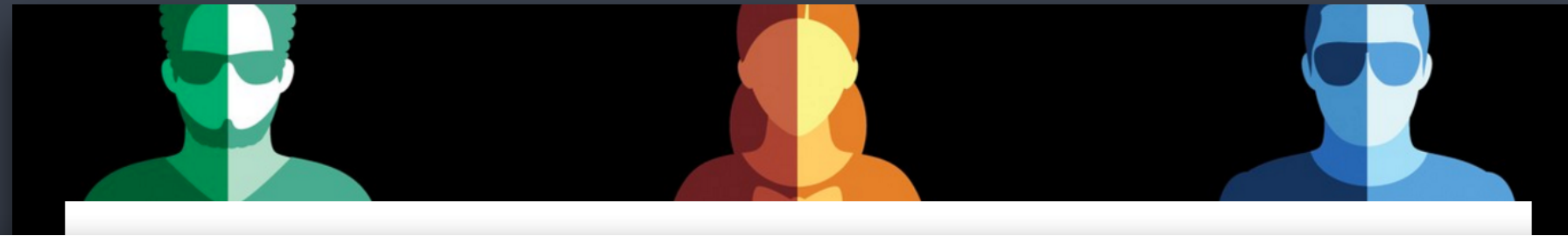


Emil OW Kirkegaard
@KirkegaardEmil



Follow

@esjewett No. Data is already public.



Ethics Inf Technol (2010) 12:313–325
DOI 10.1007/s10676-010-9227-5

“But the data is already public”: on the ethics of research in Facebook

Michael Zimmer

published data.

The situation is raising
allowed to collect en



Emil OW Kirkegaard
@KirkegaardEmil



 **Follow**

@esjewett No. Data is already public.

RQ: How do Twitter users feel about the use of their tweets in research?

Fiesler, C. & Proferes, N. “Participant” Perceptions of Twitter Research Ethics. *Social Media + Society* 4(1).

61% had no idea that researchers
use tweets in research

47% think researchers are not
permitted to without permission

Regardless of whether you want them to use your tweets specifically, do you think that researchers **should** be able to use tweets in research without permission?

35% “Yes”

65% “No”

“I would not want my tweets to be used in a study unless I was informed.”

“I would like to know if the research would serve a greater purpose.”

“If my tweets were being used in a large scale study, I really wouldn’t care. If anything was being personally picked out about me in a small study, I would care.”

How would you feel if a tweet of yours was used in a research study and...

	Very uncomfortable	Somewhat uncomfortable	Neither uncomfortable or comfortable	Somewhat comfortable	Very comfortable
... you were not informed at all?	35.1%	31.7%	16.4%	13.4%	3.4%
... you were informed about the use after the fact?	21.3%	29.1%	20.5%	22.0%	7.1%
... it was analyzed along with millions of other tweets?	2.6%	18.7%	25.5%	30.0%	23.2%
... it was analyzed along with only a few dozen tweets?	16.5%	30.3%	24.0%	20.2%	9.0%
... it was from your "protected" account?	54.9%	20.5%	13.8%	6.0%	4.9%
... it was a public tweet you had later deleted?	31.3%	32.5%	20.5%	10.4%	5.2%
... no human researchers read it, but it was analyzed by a computer program?	2.6%	14.3%	30.5%	32.3%	20.3%
... the human researchers read your tweet in order to analyze it?	9.7%	27.6%	25.0%	25.4%	12.3%
... the researchers also analyzed your public profile information, such as location and username?	32.2%	23.2%	21.0%	13.9%	9.7%
... the researchers didn't have any of your additional profile information?	4.9%	15.4%	25.1%	34.1%	20.6%
... your tweet was quoted in a published research paper, attributed to your Twitter handle?	34.3%	21.6%	21.6%	13.1%	9.3%
... your tweet was quoted in a published research paper, attributed anonymously?	9.0%	16.8%	26.5%	28.4%	19.4%

Data collection decisions **should not be** context-agnostic.

- ▶ What kind of data you're collecting
- ▶ What you're going to do with it
- ▶ Who you are
- ▶ What the expectations and norms of the users are

Fiesler, C. & Proferes, N. "Participant" Perceptions of Twitter Research Ethics. Social Media + Society 4(1).

“publicness” is not the only
context that matters.*

* my research ethics hill to die on

72% of PubMed articles using
Twitter data quoted at least one
tweet, leading to a Twitter user
84% of the time.

Ayers, John W., Theodore L. Caputi, Camille Nebeker & Mark Dredze. 2018. Don't quote me: Reverse identification of research participants in social media studies. *npj Digital Medicine* 1(1), p. 30.

What u eat for breakfast I'm hungry ?

10:12 AM - 19 Sep 2018

13 Retweets **225** Likes



50



13



225



please help me. being 19 and HIV positive is so hard. How can I eat well to be healthier if I can't afford food?

What about vulnerable communities?

“A Tumblr user was mentioned in an article recently without his permission, citing some posts he's made. Through this, his **identity has been revealed to a much broader audience...**”

“They can only be who they are online. They can't be who they are in real life because they would get thrown out of their houses or killed...I definitely know that **being outed for what you are and how you act** has caused problems.”

Dym, Brianna & Casey Fiesler. Ethical and Privacy Considerations for Research Using Online Fandom Data. *Transformative Works & Cultures*, 2020.

What about vulnerable communities?

“I think that there is definitely--people come into the community, they **parachute in**, they don't really look around, and they leave.”

Dym, Brianna & Casey Fiesler. Ethical and Privacy Considerations for Research Using Online Fandom Data. *Transformative Works & Cultures*, 2020.

TECHNOLOGY

YouTube Videos Are a Gold Mine for Health Researchers

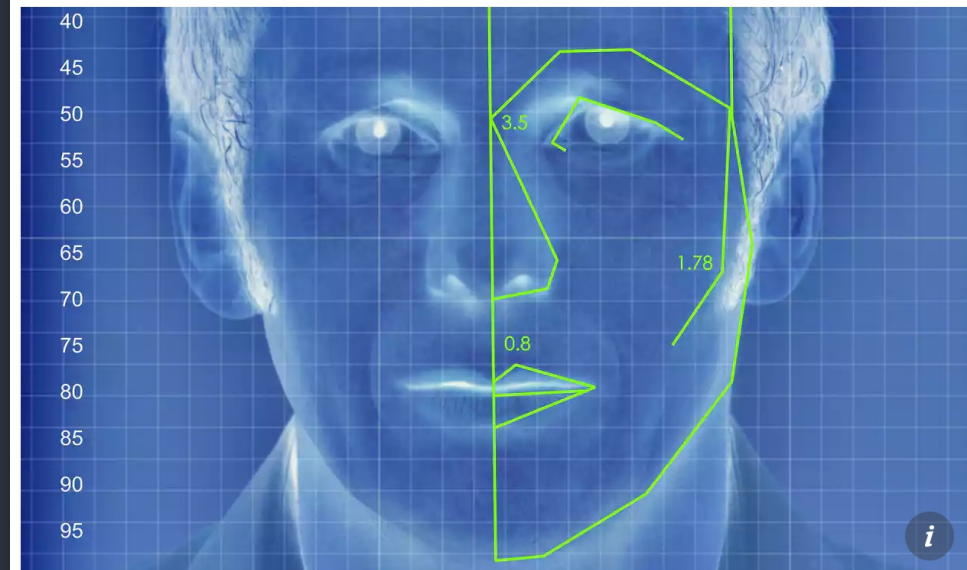
“Digital exhaust” from online life could be transformed into health insights. Should it be?

SIDNEY FUSSELL SEP 9, 2019



New AI can guess whether you're gay or straight from a photograph

An algorithm deduced the sexuality of people on a dating site with up to 91% accuracy, raising tricky ethical questions



Artificial intelligence can accurately guess whether people are gay or straight based on photos of their faces, according to new research that suggests machines can have significantly better “gaydar” than humans.

REPORT / TECH / ARTIFICIAL INTELLIGENCE

Transgender YouTubers had their videos grabbed to train facial recognition software

22

In the race to train AI, researchers are taking data first and asking questions later

By James Vincent | Aug 22, 2017, 10:44am EDT

Private traits and attributes are predictable from digital records of human behavior

On the other hand, the predictability of individual attributes from digital records of behavior may have **considerable negative implications**, because it can easily be applied to large numbers of people without obtaining their individual consent and without them noticing. Commercial companies, governmental institutions, or even one's Facebook friends could use software to infer attributes such as intelligence, sexual orientation, or political views that an individual may not have intended to share. One can imagine situations in which such predictions, even if incorrect, could pose a threat to an individual's well-being, freedom, or even life. Importantly, given the ever-increasing amount of digital traces people leave behind, it becomes difficult for individuals to control which of their attributes are being revealed. For example, merely avoiding explicitly homosexual content may be insufficient to prevent others from discovering one's sexual orientation.



Cambridge Analytica The Cambridge Analytica Files

Leaked: Cambridge Analytica's blueprint for Trump victory

Facebook gave data about 57bn friendships to academic

Exclusive: Former employee explains how presentation showed technique

ADAM ROGERS SCIENCE 03.25.18 07:00 AM

Mark Zuckerberg takes out full-page newspaper ads to say 'sorry' for Cambridge Analytica scandal

By Nicole Darrah | Fox News

THE CAMBRIDGE ANALYTICA DATA APOCALYPSE WAS PREDICTED IN 2007

Revealed: 50 million Facebook profiles harvested for Cambridge Analytica in major data breach

Cambridge Analytica active in elections, big data projects for years

KIM HJELMGAARD | USA TODAY
Updated 2:58 p.m. EDT Mar. 22, 2018

The shady data-gathering tactics used by Cambridge Analytica were an open secret to online marketers. I know, because I was one

Market researchers have used these tricks for years

By Alexandra Samuel | Mar 25, 2018, 1:19pm EDT

Zoombombing: Local government faces obscene attack on virtual meeting

Muscogee County School District students witness pornographic material during Zoom-bombing

'Zoombombing' City Hall: Online Harassment Surges As Public Meetings Go Virtual

Illinois student moons Zoom class, uses racial slur as learning goes remote **Students using Zoom for class, uses racial slur as learning goes remote** **Zoom bombing: Harassing behavior on atform**

CMS class interrupted with inappropriate behavior during 'zoom bombing'

Zoombombing: Local government faces obscene attack on virtual meeting

Muscogee County School District students witness pornographic material during Zoom-bombing

“The risks, the misuse, we never thought about that.”

- Zoom CEO

Illinois student moon Teaches, students using Zoom for class, uses racial slurs as learning goes remote e-learning see alarming behavior on platform

CMS class interrupted with inappropriate behavior during ‘zoom bombing’

Are you thinking about the possible **unintended consequences** of your work?

- ▶ for individuals (e.g., privacy violations, downstream harms)
- ▶ for communities (e.g., bias, discrimination)
- ▶ for science (e.g., public trust)
- ▶ for society (e.g., impacts on large social structures)
- ▶ due to bad actors (i.e., unintended uses)

Technical debt

is the implied cost of future bug fixes caused by choosing an easy solution now instead of a better approach that would take longer.

Ethical debt

is the implied cost of not considering social/ethical implications or harms now, assuming you can fix them after you find out what they are.

IDEAS | YONATAN ZUNGER

Computer science faces an ethics crisis. The Cambridge Analytica scandal proves it.

By Yonatan Zunger , March 22, 2018, 6:47 p.m.



“Software engineers continue to treat safety and ethics as specialties rather than as the foundation of all design.”

What Our Tech Ethics Crisis Says About the State of Computer Science Education

If you work in tech and you're not thinking about ethics, you're bad at your job



Casey Fiesler

Dec 5, 2018 · 9 min read

ethics is not just a specialization.*

* my ethics education hill to die on

is ethics an explicit part of university AI/ML/ data science classes?

School	Total ML related Courses	Ethics-Specific Courses	Technical Courses w/ Ethics	Courses without Ethics
A	9	1	4	4
B	13	4	1	8
C	9	3	0	6
D	7	0	2	5
E	11	1	2	8
F	8	1	1	6
G	13	1	2	10
H	9	0	2	7
I	11	2	0	9
J	17	0	3	14
K	8	1	0	7
L	8	0	1	7
M	8	0	1	7
N	9	0	1	8
O	9	0	1	8
P	10	0	1	9
Q	8	0	0	8
R	5	0	0	5
S	6	0	0	6
T	8	0	0	8
Total (# Courses)	186	14	22	150
Total (# Institutions)	20	8	13	20

Saltz, Jeffrey, Michael Skirpan, Casey Fiesler, Micha Gorelick, Tom Yeh, Robert Heckman, Neil Dewar, and Nathan Beard. "Integrating Ethics within Machine-learning Courses." *ACM Transactions on Computing Education (TOCE)* 19, no. 4 (2019): 32.

is ethics an explicit part of university AI/ML/ data science classes?

12% of technical courses included any mention of ethics, privacy, etc. in the course description or (when available) syllabus.

School	Total ML related Courses	Ethics-Specific Courses	Technical Courses w/ Ethics	Courses without Ethics
A	9	1	4	4
B	13	4	1	8
C	9	3	0	6
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E	11	1	2	8
F	11	1	1	9
G	13	1	2	10
H	9	0	2	7
I	11	0	0	9
J	11	0	0	14
K	8	1	0	7
L	8	0	1	7
M	8	0	1	7
N	8	0	1	7
O	9	0	1	8
P	10	0	1	9
Q	8	0	0	8
R	5	0	0	5
S	6	0	0	6
T	8	0	0	8
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C	9	3	0	6
D	7	0	2	5

More Than “If Time Allows”: The Role of Ethics in AI Education

Natalie Garrett
Information Science
University of Colorado
Boulder, CO USA
natalie.garrett@colorado.edu

Nathan Beard
Information Studies
University of Maryland
College Park, MD USA
nbeard@umd.edu

Casey Fiesler
Information Science
University of Colorado
Boulder, CO USA
casey.fiesler@colorado.edu

S	6	0	0	6
T	8	0	0	8
Total (# Courses)	186	14	22	150
Total (# Institutions)	20	8	13	20

Saltz, Jeffrey, Michael Skirpan, Casey Fiesler, Micha Gorelick, Tom Yeh, Robert Heckman, Neil Dewar, and Nathan Beard. "Integrating Ethics within Machine-learning Courses." *ACM Transactions on Computing Education (TOCE)* 19, no. 4 (2019): 32.

... the most glaring problem is that **proposed subject matter is not computer science**...the content of the 'strand' has no algorithms, no data structures, no mathematical analysis, neither software development nor software design, no computer science theory. In short the content is devoid of every standard element present in computer science research and education.

... **It's hard to imagine a computer scientist teaching these things.** ... Ethical and social concerns may be important, but as debating the morality of nuclear weapons is not doing physics, **discussing the social and ethical impact of computing is not doing computer science.**

the case for ethics integration

- ▶ emphasizes ethics as part of technical practice, not as a specialization or an add-on
- ▶ avoids isolating ethics from its context
- ▶ ensures that everyone who takes a technical class is exposed to ethics content

recommendations for ethics integration

- ▶ discussion of relevant current events
- ▶ modules developed in conjunction with experts
- ▶ explicit ethical components as part of projects/assignments
- ▶ use real-world datasets with social implications
- ▶ re-contextualizing existing assignments to include implicit ethical components
- ▶ start at the beginning

recommendations for ethics integration

Responsible Computer Science Challenge

*We must fundamentally reimagine the way
we train the tech industry's future leaders
during their undergraduate years.*

ResponsibleCS.org

[#ResponsibleCS](https://twitter.com/ResponsibleCS)

a partnership of



OMIDYAR NETWORK



SCHMIDT FUTURES

Craig Newmark Philanthropies

▶ **start at the beginning**

Tech Ethics Curricula: A Collection of Syllabi



Casey Fiesler

Jul 5, 2018 · 4 min read



COURSE TITLE	CODE	UNIVERSITY	DEPARTMENT
Algorithms and Society	EECS 395 and COMMST 395	Northwestern University	Computer Science and Communication Studies
Code and Power	LIS 500	University of Wisconsin - Madison	Information School
Designing Field Experiments at Scale	SOC 412	Princeton University	Sociology, Center for IT Policy
Digital Anthropology	ANTH 4020	University of Colorado Boulder	Continuing Education
Ethical and Policy Dimensions of Information, Technology, and New Media	INFO 4601/5601	University of Colorado Boulder	Information Science
Ethical and Social Implications of Data		Marquette University	Computer Science
Ethics in Business Analytics	ITAO 40510	University of Notre Dame	IT, Analytics, & Operations
Ethics in Data Science		University of Utah	Computer Science

<https://rb.gy/enfjbj>

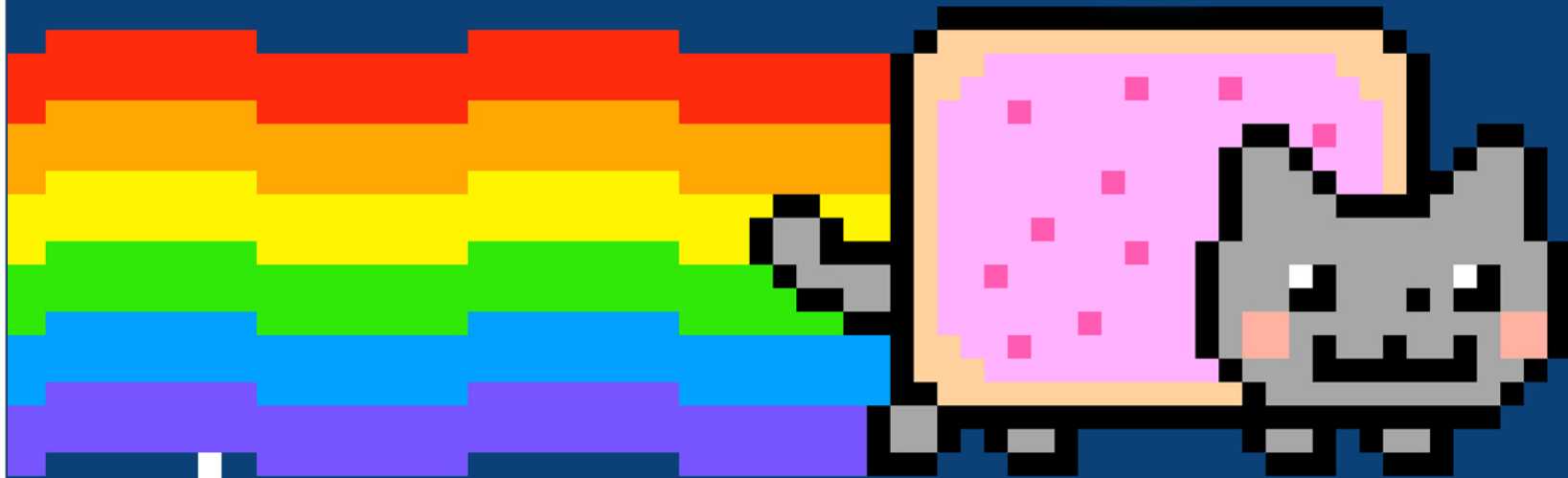
what do we teach when we teach tech ethics?

Casey Fiesler, Natalie Garrett,
and Nathan Beard. What Do
We Teach When We Teach
Tech Ethics?: A Syllabi
Analysis. SIGCSE 2020.

Topic	#
Law & Policy	66
Privacy & Surveillance	61
Philosophy/Ethical Theory	61
Inequality, Justice & Human Rights	59
AI & Algorithms	55
Societal & Environmental Impact	50
Civic Responsibility & Misinformation	32
Robots & AI	27
Professional Ethics	25
Work & Labor	23
Design Ethics	20
Cybersecurity	19
Research Ethics	16
Medical Ethics	12
Total Analyzed	115

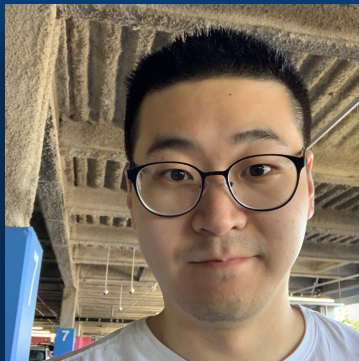
1. Data is people.
2. Ethical consideration comes first, not last.
3. No one is just an engineer.
4. Teach data science based on 1-3.

IRL Internet Rules Lab



Responsible Computer
Science Challenge

With Great Code Comes
Great Responsibility



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