CEN 5016: Software Engineering

Fall 2024

University of Central Florida

Dr. Kevin Moran

Week 9 - Class 1: Software Engineering Ethics

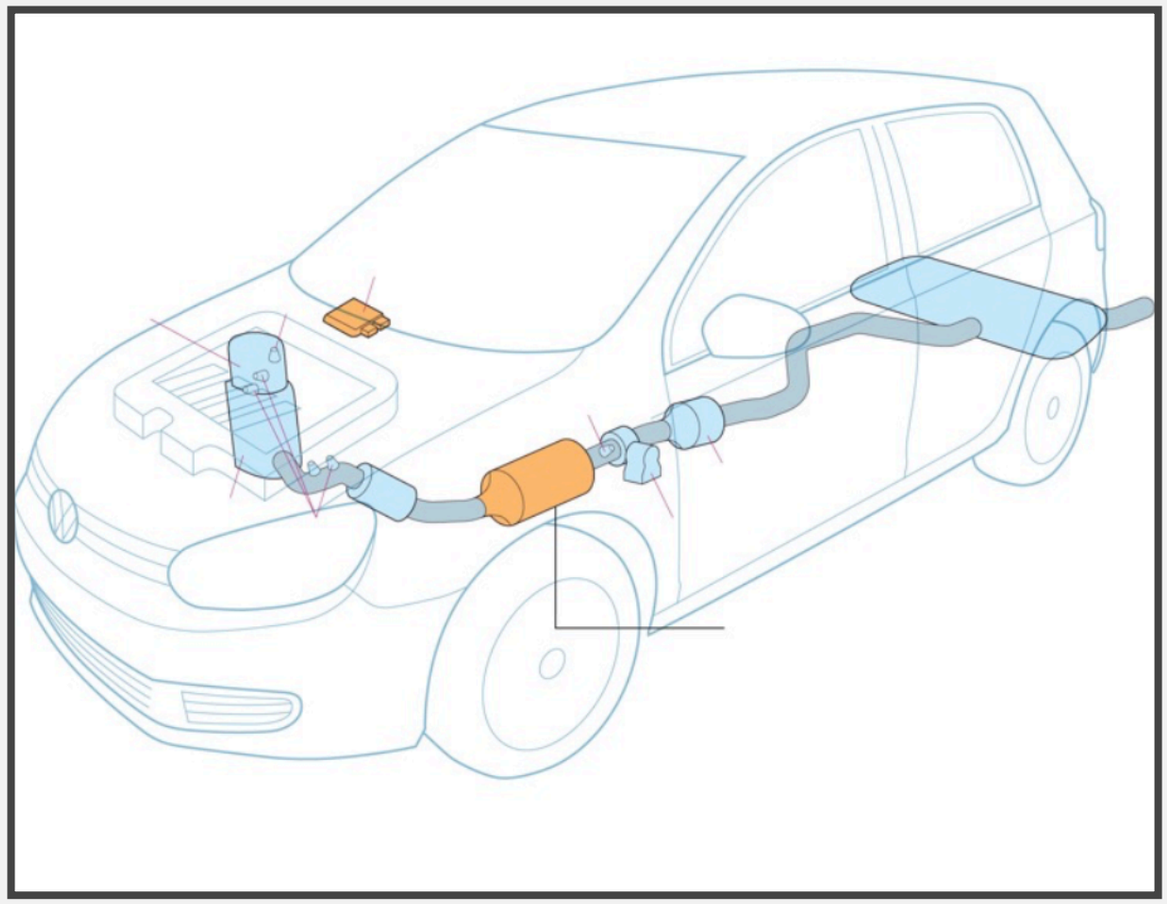
Administrivia

- *SDE Project Part 2*
  - Due Tuesday, October 22nd (updated deadline!)
  - I am working on Feedback from Checkpoint 1
    - If you have questions, please ask!

Ethics in Software Engineering

Volkswagen Scandal

- VW was caught cheating on emissions for Diesel engines

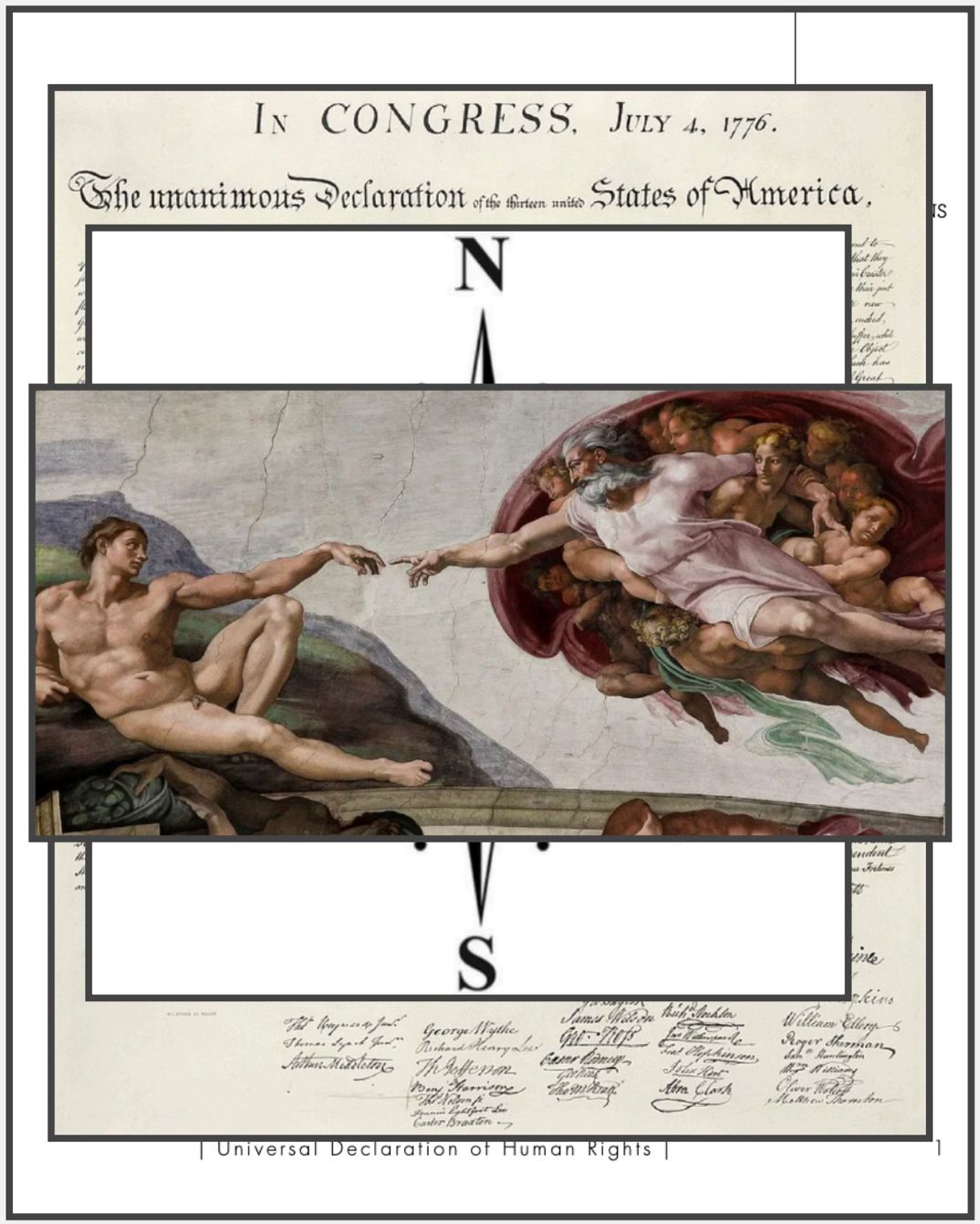


What is Human Flourishing?

- According to Harvard's Human flourishing program: Human flourishing is composed of five central domains: *happiness and life satisfaction, mental and physical health, meaning and purpose, character and virtue, and close social relationships.*

Why Talk About Human Flourishing?

- Universal Declaration of Human Rights: “All human beings are born free and equal in dignity and rights.”
- Declaration of Independence: “We hold these truths to be self-evident...”
- Internal Compass
- Faith



(Un)Ethical Situations

80

EA calls its loot boxes ‘surprise mechanics,’ says they’re used ethically

‘People like surprises,’ executive tells UK Parliament

By Ana Diaz | @AnaLikesPikachu | Jun 21, 2019, 9:10am EDT

SHARE

(Un)Ethical Situations

Domino's Would Rather Go to the Supreme Court Than Make Its Website Accessible to the Blind

Rather than developing technology to support users with disabilities, the pizza chain is taking its fight to the top

by Brenna Houck | @EaterDetroit | Jul 25, 2019, 6:00pm EDT

SHARE

(Un)Ethical Situations

Some airlines may be using algorithms to split up families during flights

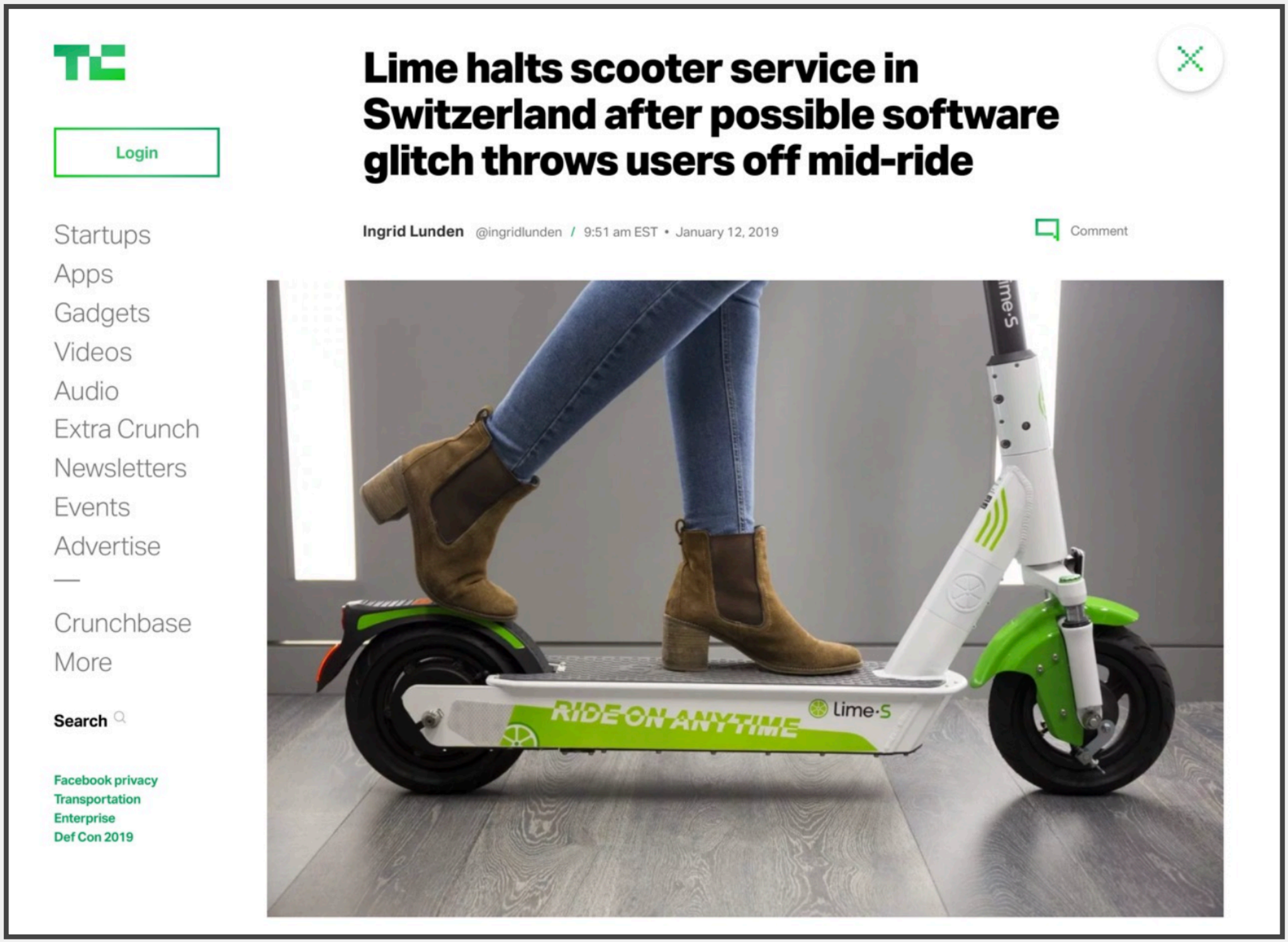
Your random airplane seat assignment might not be random at all.

By Aditi Shrikant | aditi@vox.com | Nov 27, 2018, 6:10pm EST

SHARE

Passengers boarding a Boeing aircraft of the low cost airline carrier Ryanair in Thessaloniki Macedonia Airport, Greece. | Nicolas Economou/NurPhoto/Getty Images

(Un)Ethical Situations



TC

Login

Startups
Apps
Gadgets
Videos
Audio
Extra Crunch
Newsletters
Events
Advertise
—
Crunchbase
More

Search

Facebook privacy
Transportation
Enterprise
Def Con 2019

Lime halts scooter service in Switzerland after possible software glitch throws users off mid-ride

Ingrid Lunden @ingridlunden / 9:51 am EST • January 12, 2019

Comment

(Un)Ethical Situations

Currently, the AI portrait generator has been trained mostly on portraits of people of European ethnicity. We're planning to expand our dataset and fix this in the future. At the time of conceptualizing this AI, authors were not certain it would turn out to work at all. This is close to state of the art in AI at the moment.

Sorry for the bias in the meanwhile. Have fun!

324 Retweets **65** Quote Tweets **1,243** Likes

Open Intellectual Property Concerns

- Was the data used to train these LLMs obtained illegally?
- Who owns the IP associated with LLM outputs?
- Should sensitive information be provided to LLMs?

ARTIFICIAL INTELLIGENCE / TECH / LAW

The lawsuit that could rewrite the rules of AI copyright

/ Microsoft, GitHub, and OpenAI are being sued for allegedly violating copyright law by reproducing open-source code using AI. But the suit could have a huge impact on the wider world of artificial intelligence.

ARTIFICIAL INTELLIGENCE / TECH / CREATORS

AI art tools Stable Diffusion and Midjourney targeted with copyright lawsuit

A collage of AI-generated images created using Stable Diffusion. Image: The Verge via Lexica

/ The suit claims generative AI art tools violate copyright law by scraping artists' work from the web without their consent.

By James Vincent, a senior reporter who has covered AI, robotics, and more for eight years at The Verge.

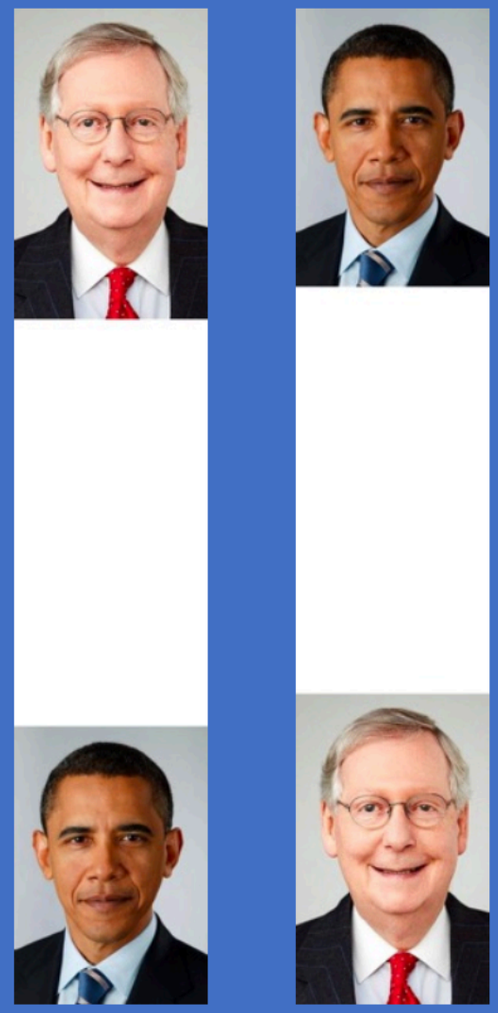
Jan 16, 2023, 6:28 AM EST | 27 Comments / 27 New

Whoops, Samsung workers accidentally leaked trade secrets via ChatGPT

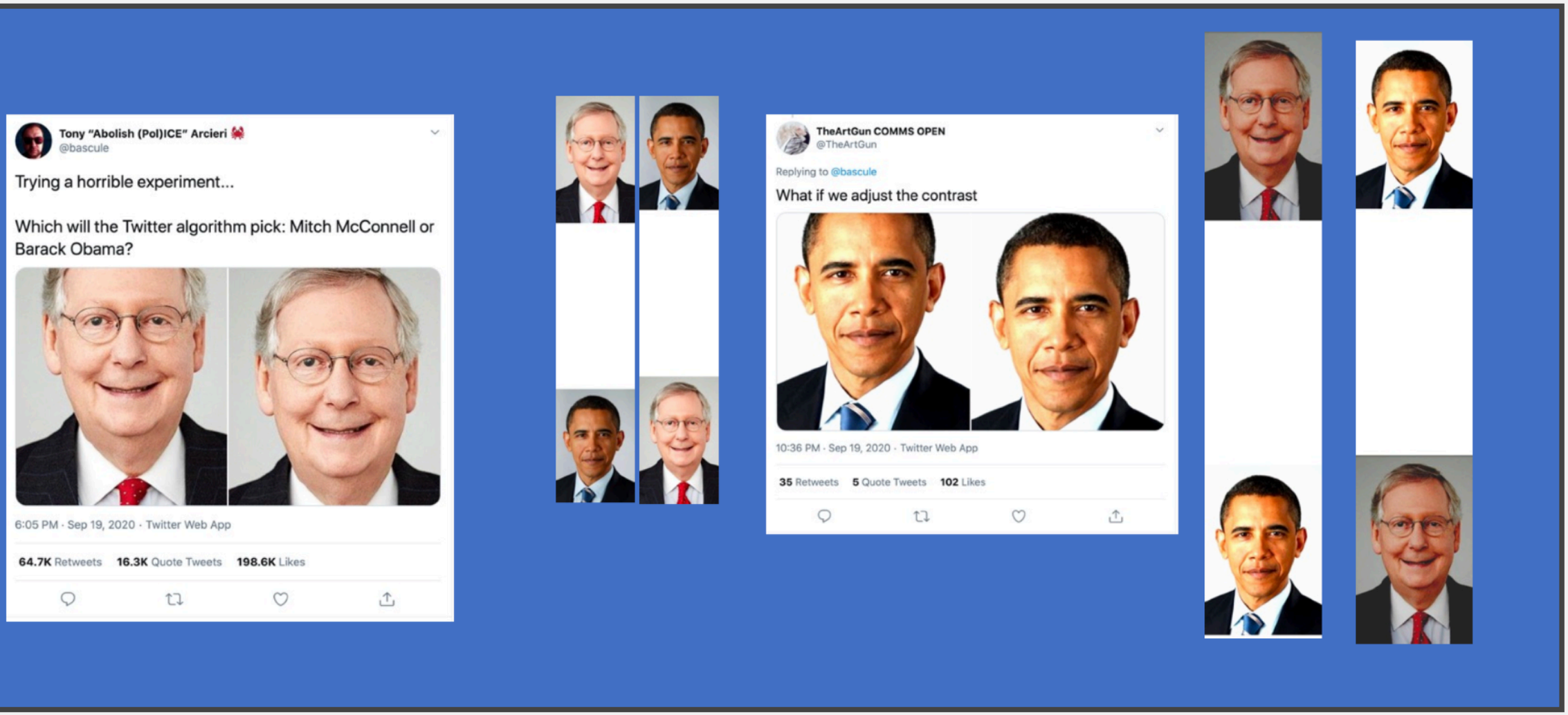
ChatGPT doesn't keep secrets.

By Cecily Mauran on April 6, 2023

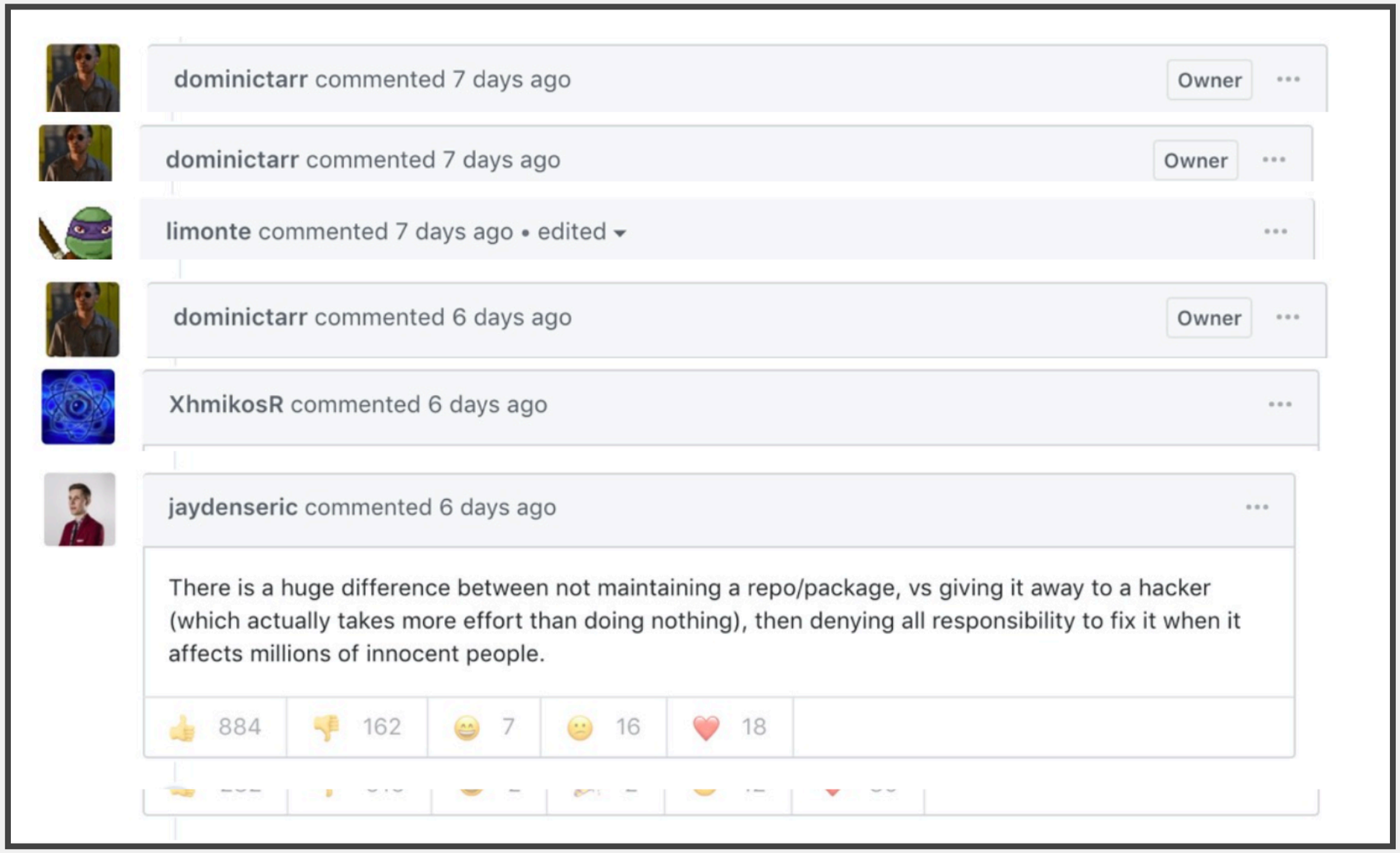
Twitter Cropping Photos



Twitter Cropping Photos



Open Source Maintainers



Self-Driving Cars

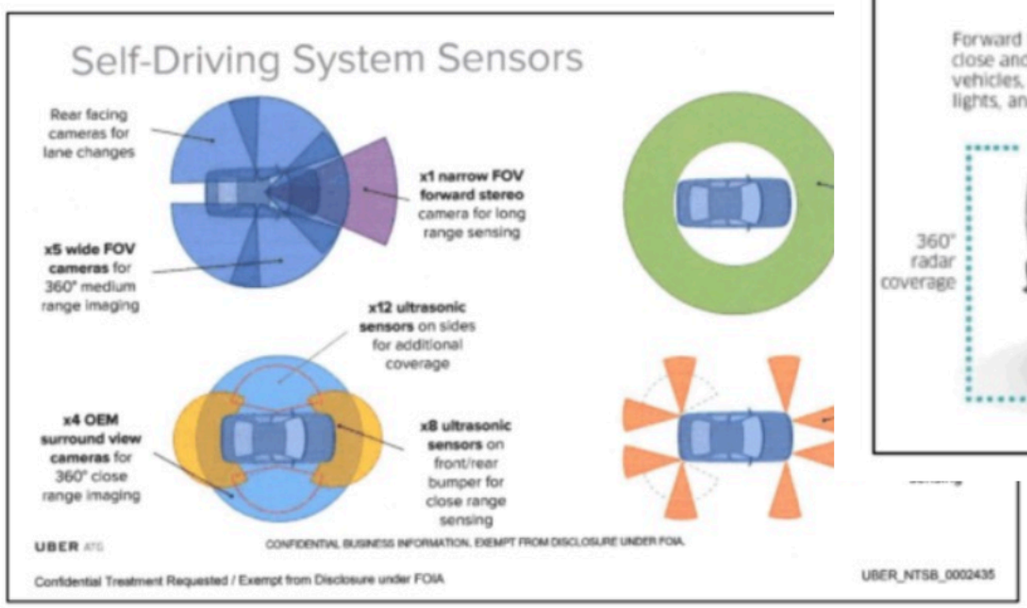
Uber self-driving car involved in fatal crash couldn't detect jaywalkers

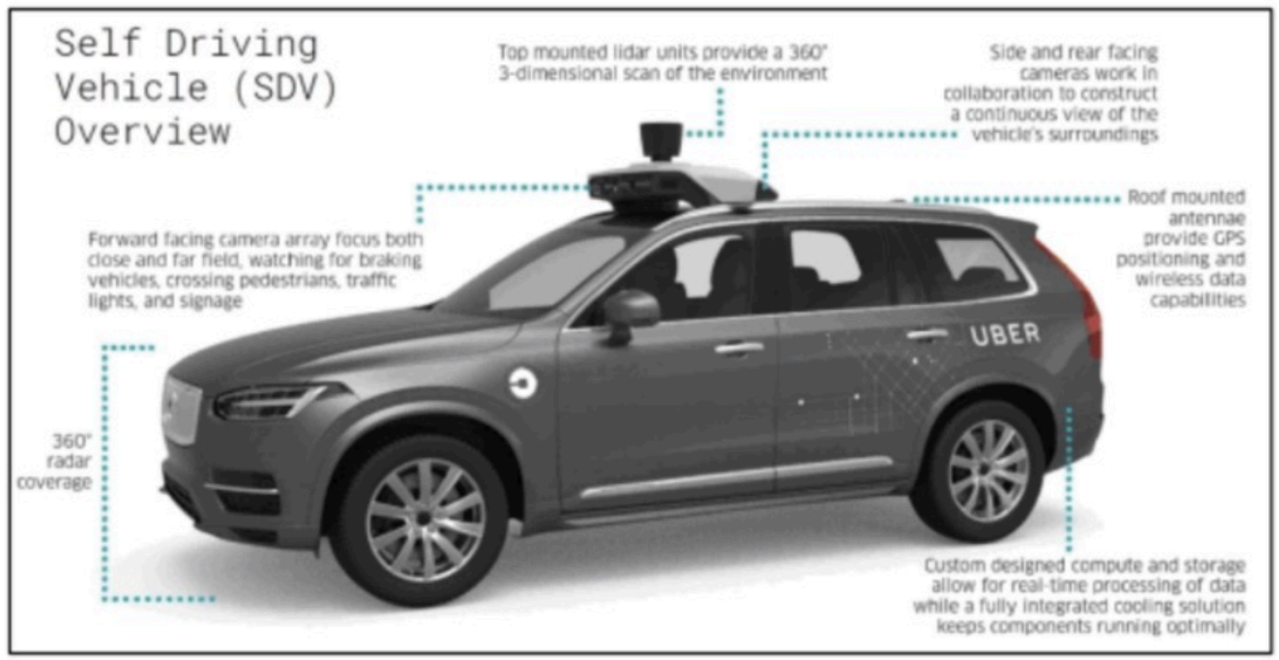
The system had several serious software flaws, the NTSB said.

Steve Dent, @stevetdent
11.06.19 in Transportation

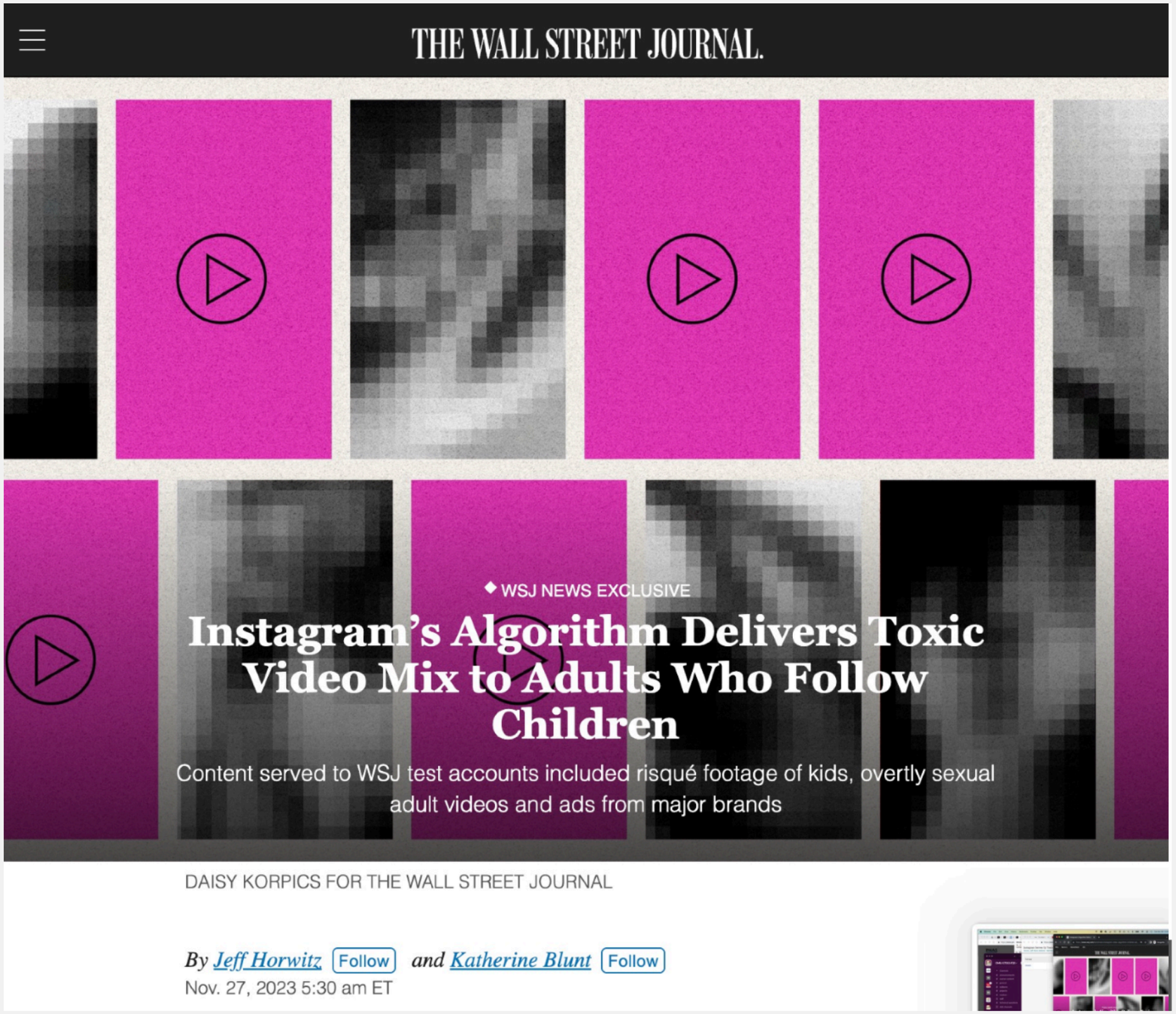
25
Comments

1131
Shares

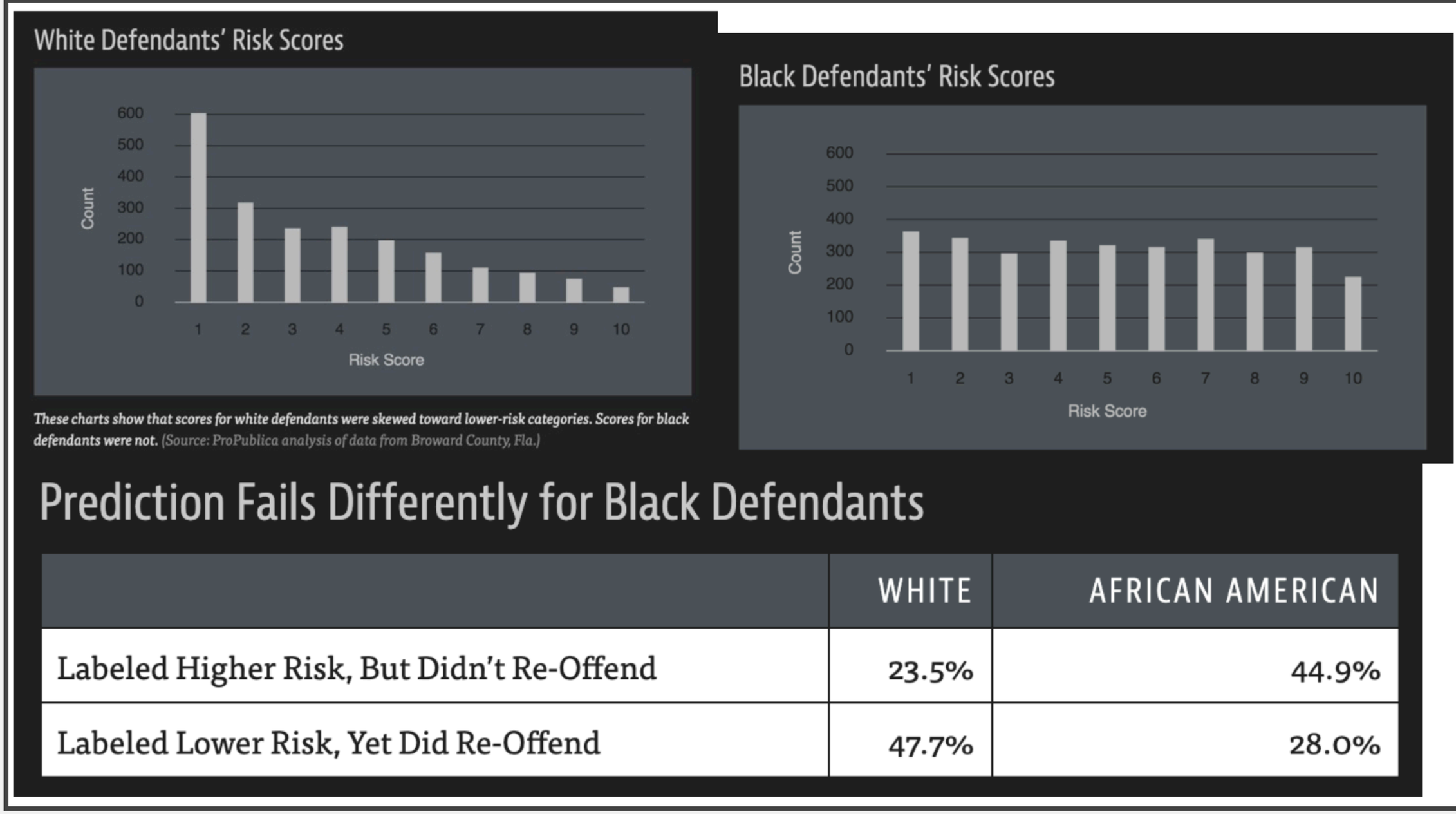




Recommendation Engines



Algorithmic Bias



These charts show that scores for white defendants were skewed toward lower-risk categories. Scores for black defendants were not. *(Source: ProPublica analysis of data from Broward County, Fla.)*

Prediction Fails Differently for Black Defendants

	WHITE	AFRICAN AMERICAN
Labeled Higher Risk, But Didn't Re-Offend	23.5%	44.9%
Labeled Lower Risk, Yet Did Re-Offend	47.7%	28.0%

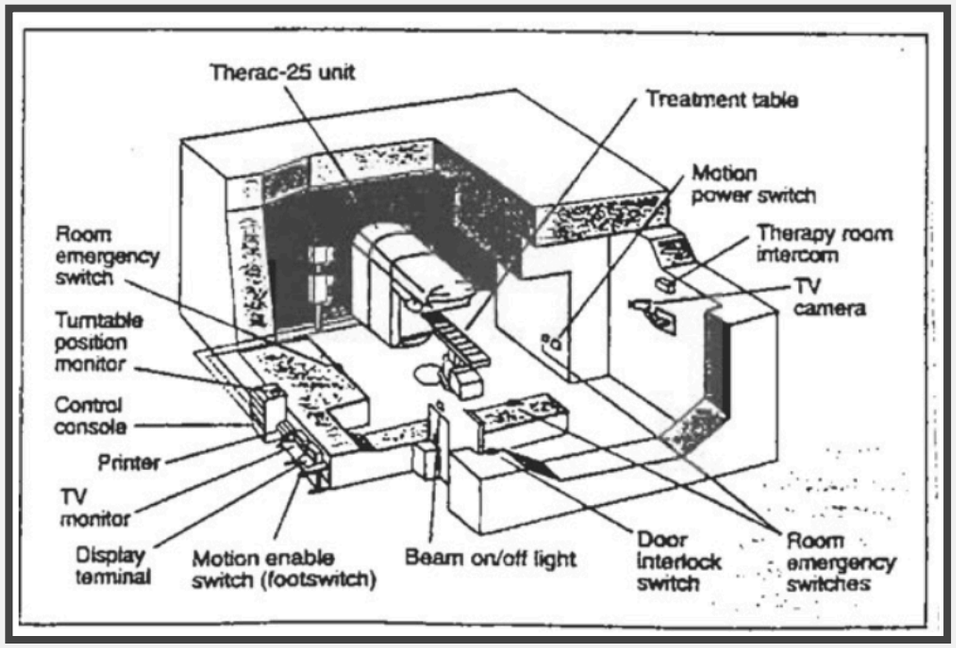
Algorithmic Bias

- Algorithms affect: Where we go to school
- Access to money
- Access to health care
- Receiving parole
- Possibility of Bail
- Risk Scores

These charts show that scores for white defendants were skewed toward lower-risk categories. Scores for black defendants were not. *(Source: ProPublica analysis of data from Broward County, Fla.)*

Therac-25

- Bug (race-condition) in software lead to at least 6 deaths
- Traced to:
  Lack of reporting bugs
- Lack of proper due diligence
  Engineers were overconfident, removed hardware locks
- Race condition of 8 seconds could lead to problems




```
PATIENT NAME: John
TREATMENT MODE: FIX          BEAM TYPE: E     ENERGY (KeV):      10

                             ACTUAL           PRESCRIBED
      UNIT RATE/MINUTE         0.000000         0.000000
      MONITOR UNITS          200.000000       200.000000
      TIME(MIN)                0.270000         0.270000

GANTRY ROTATION (DEG)          0.000000         0.000000         VERIFIED
COLLIMATOR ROTATION (DEG)    359.200000       359.200000         VERIFIED
COLLIMATOR X (CM)             14.200000        14.200000         VERIFIED
COLLIMATOR Y (CM)             27.200000        27.200000         VERIFIED
WEDGE NUMBER                   1.000000         1.000000         VERIFIED
ACCESSORY NUMBER               0.000000         0.000000         VERIFIED



DATE: 2012-04-16      SYSTEM: BEAM READY      OP.MODE: TREAT        AUTO
TIME: 11:48:58        TREAT: TREAT PAUSE                X-RAY     173777
OPR ID: 033-tfs3p     REASON: OPERATOR        COMMAND:
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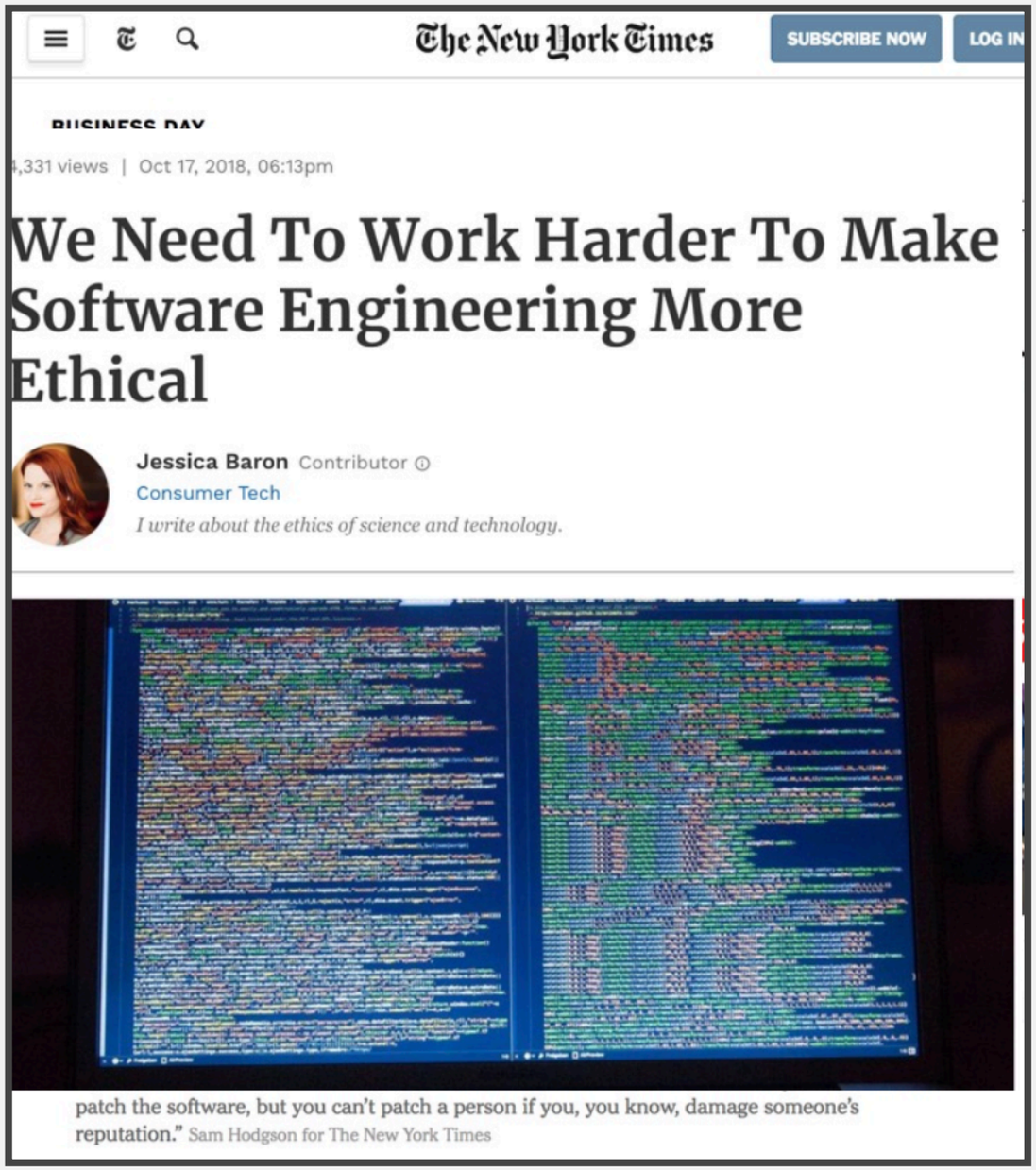
What can we do?



ACM Code of Ethics

- As an ACM member I will ….
  - Contribute to society and human well-being.
  - Avoid harm to others.
  - Be honest and trustworthy.
  - Be fair and take action not to discriminate.
  - Honor property rights including copyrights and patent.
  - Give proper credit for intellectual property.
  - Respect the privacy of others.
  - Honor confidentiality.

Code of Ethics

- Research shows that the code of ethics does not appear to affect the decisions made by software developers.

Does ACM's Code of Ethics Change Ethical Decision Making in Software Development?

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ABSTRACT

Ethical decisions in software development can substantially impact end-users, organizations, and our environment, as is evidenced by recent ethics scandals in the news. Organizations, like the ACM, publish codes of ethics to guide software-related ethical decisions. In fact, the ACM has recently demonstrated renewed interest in its code of ethics and made updates for the first time since 1992. To better understand how the ACM code of ethics changes software-

The first example is the Uber versus Waymo dispute [26], in which a software engineer at Waymo took self-driving car code to his home. Shortly thereafter, the engineer left Waymo to work for a competing company with a self-driving car business, Uber. When Waymo realized that their own code had been taken by their former employee, Waymo sued Uber. Even though the code was not apparently used for Uber's competitive advantage, the two companies settled the lawsuit for $245 million dollars.

Challenge

- How do we apply ethics to a field (Software Engineering) that is changes so often?
- Remember the Dominos case? The ADA law was written before the first website (1990)
- To handle this uncertainty about the future, let's focus on three questions we can ask to remind ourselves to focus on promoting human flourishing.

How to Tackle This?

- Three questions to promote human flourishing
- 1.Does my software respect the humanity of the users?
- 2.Does my software amplify positive behavior, or negative behavior for users and society at large?
- 3.Will my software's quality impact the humanity of others?

Question One

- 1.Does my software respect the humanity of the users?

Humane Design Guide

https://www.humanetech.com/

Humane Design Guide (Alpha Version)

Use this worksheet to identify opportunities for Humane Technology.

Product or feature:
Value proposition:
Measure of success:

What are Human Sensitivities?

Human Sensitivites are instincts that are often vulnerable to new technologies.

Human Sensitivity	We are inhibited when	What inhibits	We are supported when	Opportunity to improve
Emotional What we feel in our body and in our physical health.	We are stressed, low on sleep, afraid or emotionally exhausted.	• Artificial scarcity • Urgency signalling • Constant monitoring • Optimizing for screentime	Design engenders calm, balance, safety, pauses and supports circadian rhythms.	High / Low
Attention How and where we focus our attention.	Attention is physiologically drawn, overwhelmed or fragmented.	• Constant context switching • Many undifferentiated choices • Fearful information • No stopping cues (e.g. infinite scroll) • Unnecessary movement	Enabled to bring more focus and mindfulness.	
Sensemaking How we integrate what we sense with what we know.	Information is fear-based, out of context, confusing, or manipulative.	• Facts out of context • Over-personalized filters • Equating virality with credibility • Deceptive authority (ads vs. content)	Enabled to consider, learn, express and feel grounded.	
Decisionmaking How we align our actions with our intentions.	Intentions and agency are not solicited nor supported.	• Avatars to convey authority • Stalking ads and messages • Push content models • Serving preference over intent	Enabled to gain agency, purpose, and mobilization of intent.	
Social Reasoning How we understand and navigate our personal relationships.	Status, relationships or self-image are manipulated.	• Quantified social status • Viral sharing • Implied obligation • Enabling impersonation	Enabled to connect more safely and authentically with others.	
Group Dynamics How we navigate larger groups, status, and shared understanding.	Excluded, divided or mobilized through fear.	• Suppressing views and nuance • Enabling ad hominem or hate speech • Enabling viral outrage • Lack of agreed-upon norms	Enabled to develop a sense of belonging and cooperation.	

[Center for Humane Technology] www.humanetech.com

Now rank the sensitivities 1-6 based on what you now see as the largest opportunities for Humane Design. Then use the second sheet to develop an action statement.

Humane Design Guide

https://www.humanetech.com/

- Provides a template for considering a piece of software, and asking questions to help us arrive at a “humane design”

- Consider 6 human sensitivities: Emotional, Attention, Sense making, Decision making, Social Reasoning, and Group Dynamics

Human Sensitivity	We are inhibited when	What inhibits	We are supported when	Opportunity to improve
Attention How and where we focus our attention.	Attention is physiologically drawn, overwhelmed or fragmented.	• Constant context switching • Many undifferentiated choices • Fearful information • No stopping cues (e.g. infinite scroll) • Unnecessary movement	Enabled to bring more focus and mindfulness.	

Humane Design Guide

https://www.humanetech.com/

- After analysis step, develop plan of action:
- 1. In what ways does your product/feature currently engage Human Sensitivities?
- 2. How might your product/feature support or elevate human sensitivities?
- 3. Action Statement

GenderMag

https://www.gendermag.org

Abby Jones[1]

You can edit anything in blue print

- 28 years old
- Employed as an Accountant
- Lives in Cardiff, Wales

Abby has always liked music. When she is on her way to work in the morning, she listens to music that spans a wide variety of styles. But when she arrives at work, she turns it off, and begins her day by scanning all her emails first to get an overall picture before answering any of them. (This extra pass takes time but seems worth it.) Some nights she exercises or stretches, and sometimes she likes to play computer puzzle games like Sudoku

Background and skills

Abby works as an accountant. She is comfortable with the technologies she uses regularly, but she just moved to this employer 1 week ago, and their software systems are new to her.

Abby says she's a "numbers person", but she has never taken any computer programming or IT systems classes. She likes Math and knows how to think with numbers She writes and edits spreadsheet formulas in her work.

In her free time, she also enjoys working with numbers and logic. She especially likes working out puzzles and puzzle games, either on paper or on the computer

Motivations and Attitudes

- ***Motivations***: Abby uses technologies to accomplish her tasks. She learns new technologies if and when she needs to, but prefers to use methods she is already familiar and comfortable with, to keep her focus on the tasks she cares about.
- ***Computer Self-Efficacy***: Abby has low confidence about doing unfamiliar computing tasks. If problems arise with her technology, she often blames herself for these problems. This affects whether and how she will persevere with a task if technology problems have arisen.
- ***Attitude toward Risk:*** Abby's life is a little complicated and she rarely has spare time. So she is risk averse about using unfamiliar technologies that might need her to spend extra time on them, even if the new features might be relevant. She instead performs tasks using familiar features, because they're more predictable about what she will get from them and how much time they will take.

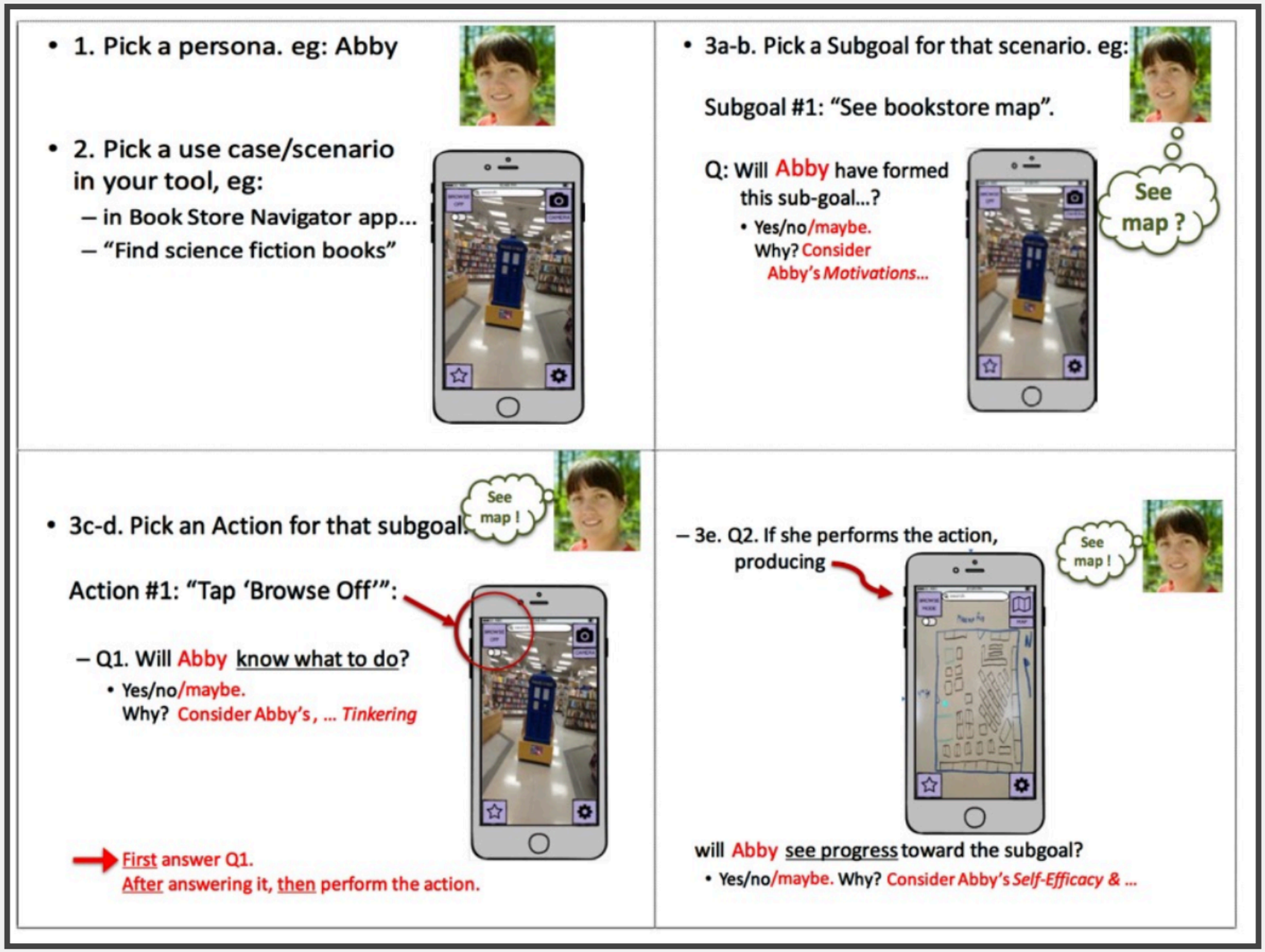
How Abby Works with Information and Learns:

- ***Information Processing Style:*** Abby tends towards a *comprehensive information processing style* when she needs to more information. So, instead of acting upon the first option that seems promising, she gathers information comprehensively to try to form a complete understanding of the problem before trying to solve it. Thus, her style is "burst-y"; first she reads a lot, then she acts on it in a batch of activity.
- ***Learning: by Process vs. by Tinkering***: When learning new technology, Abby leans toward process-oriented learning, e.g., tutorials, step-by-step processes, wizards, online how-to videos, etc. She doesn't particularly like learning by tinkering with software (i.e., just trying out new features or commands to see what they do), but when she does tinker, it has positive effects on her understanding of the software.

[1] Abby represents users with motivations/attitudes and information/learning styles similar to hers. For data on females and males similar to and different from Abby, see http://eusesconsortium.org/gender/gender.php

GenderMag

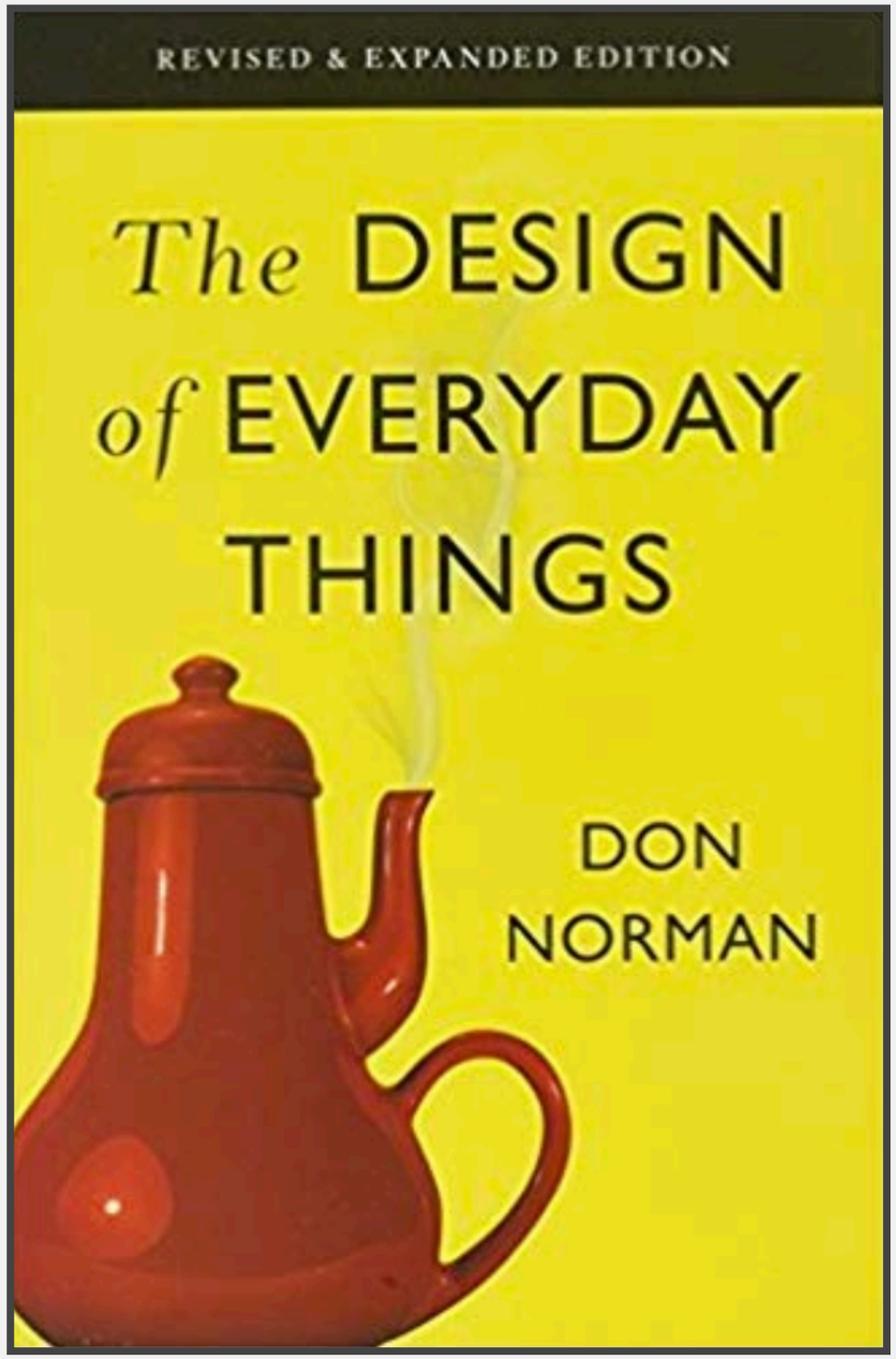
https://www.gendermag.org



User-Centered Design

Agile

- User-centered design tries to optimize the product around how *users can, want, or need to use the product*, rather than forcing the users to change their behavior to *accommodate the product.*



Question Two

- 2.Does my software amplify positive or negative behavior for users and society at large?

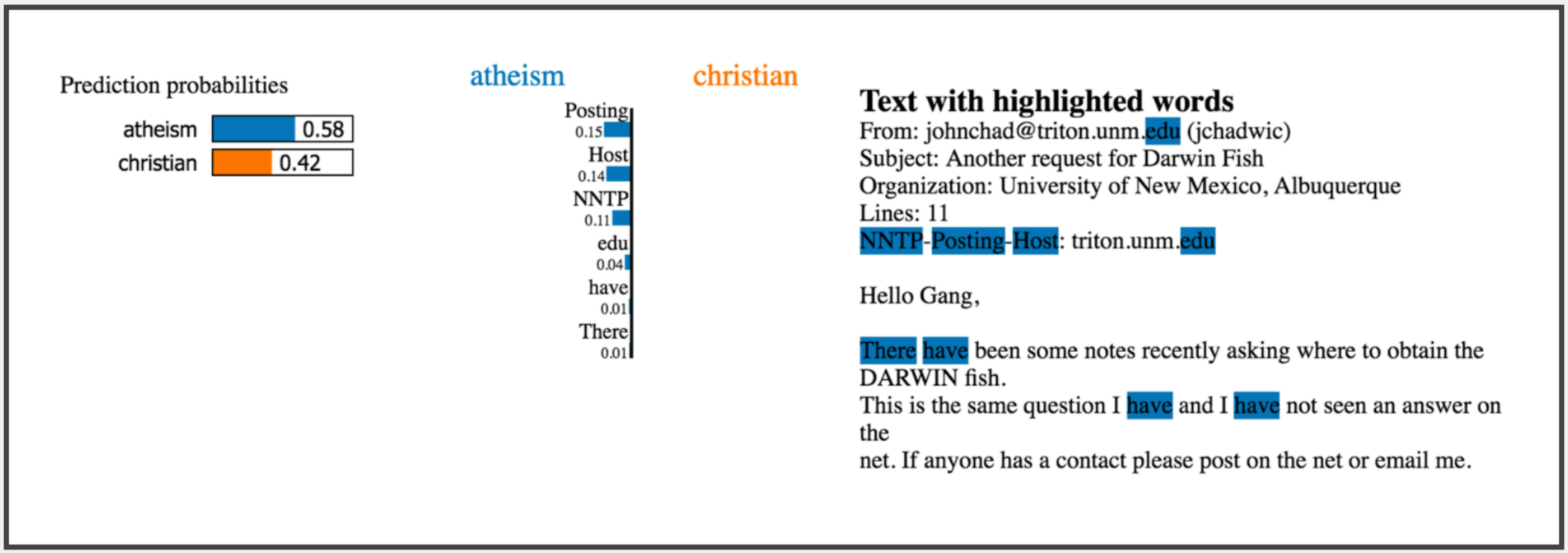
Dog vs. Wolf

(a) Husky classified as wolf (b) Explanation

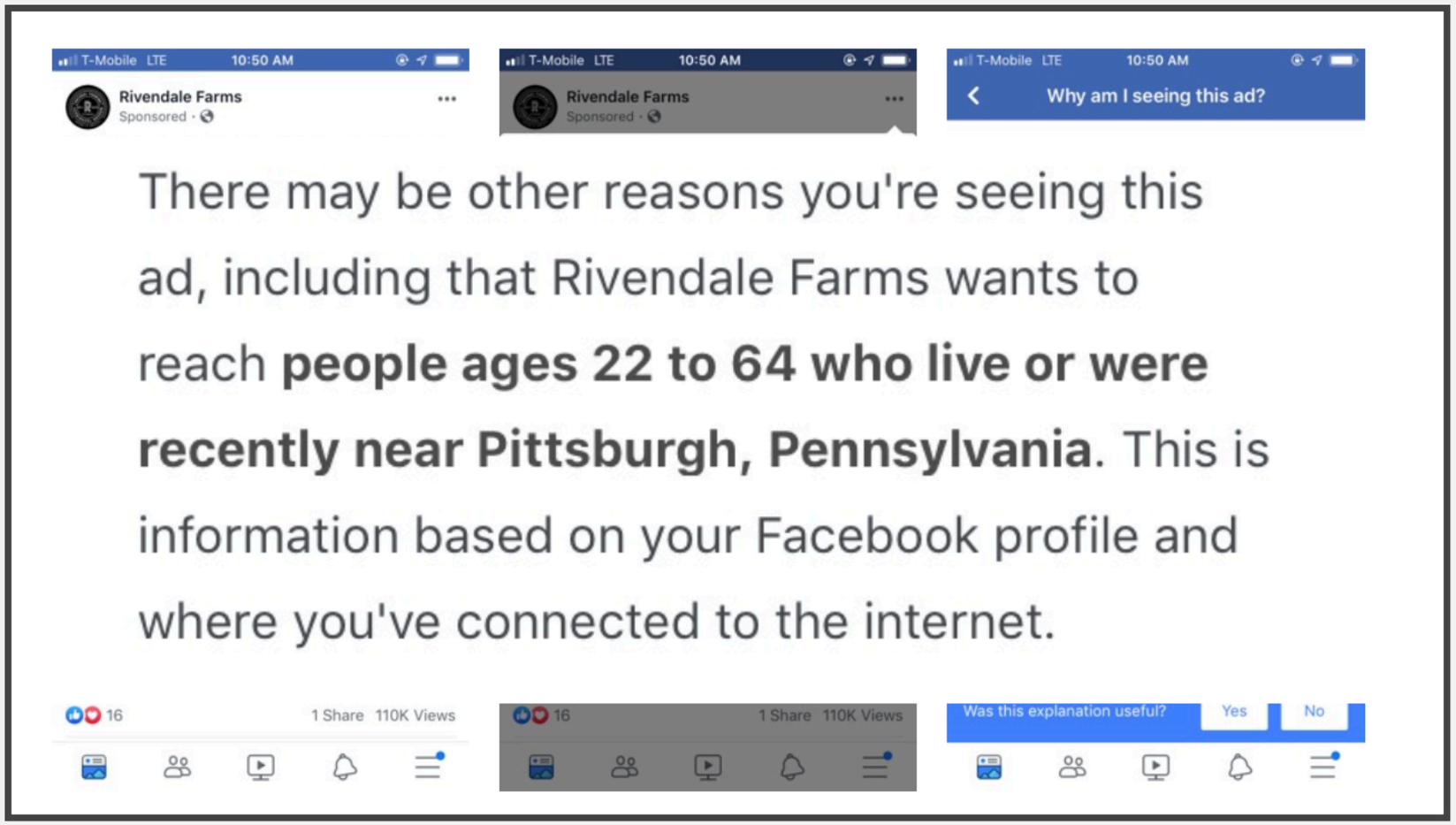
Figure 11: Raw data and explanation of a bad model's prediction in the "Husky vs Wolf" task.

	Before	After
Trusted the bad model	10 out of 27	3 out of 27
Snow as a potential feature	12 out of 27	25 out of 27

Local Interpretable Model-Agnostic Explanations(LIME)



Explain "Why" to Customers



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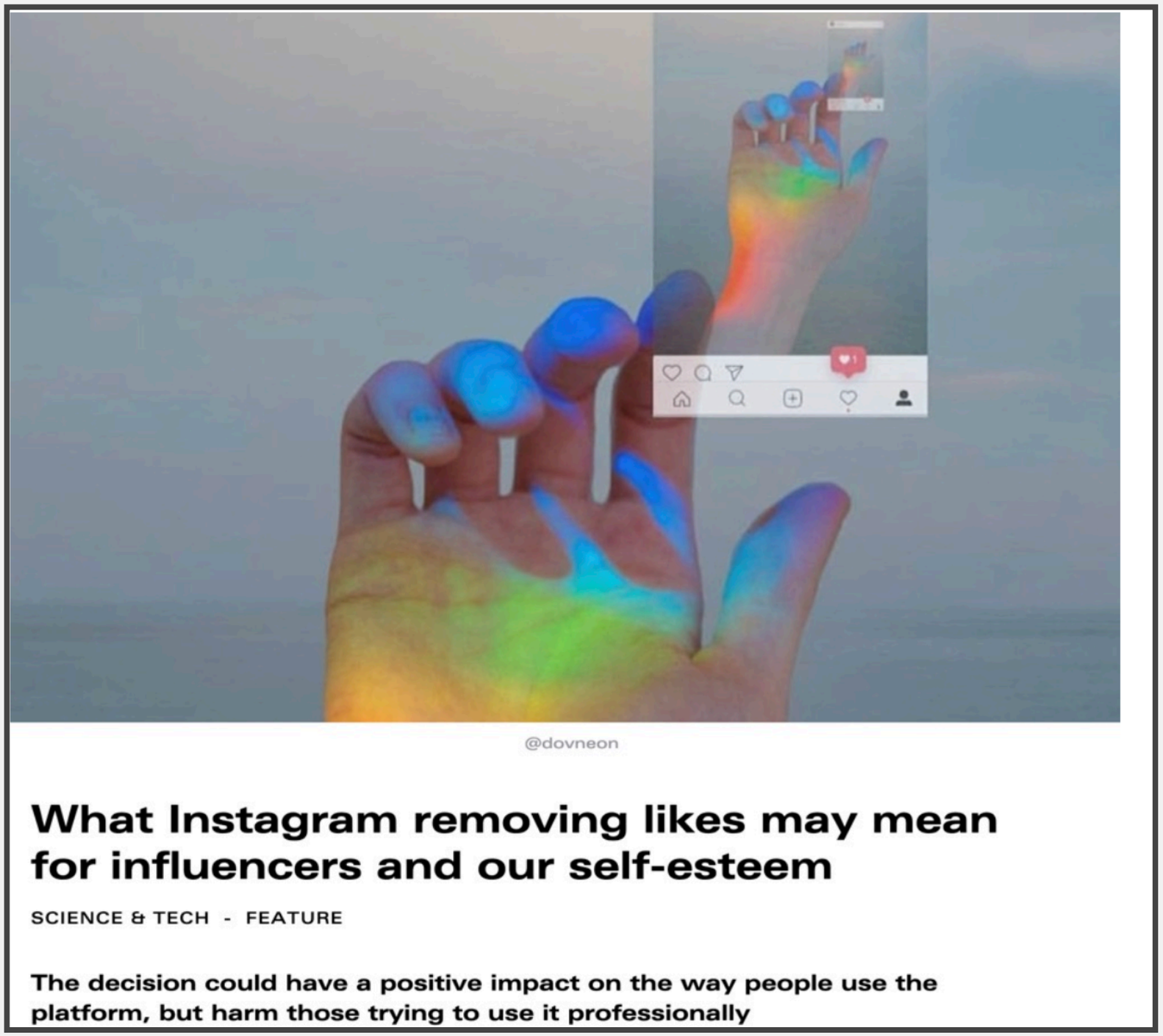


@dovneon

What Instagram removing likes may mean for influencers and our self-esteem

SCIENCE & TECH - FEATURE

The decision could have a positive impact on the way people use the platform, but harm those trying to use it professionally

Anil Dash on How to Prevent Abuse

- You should have real humans dedicated to monitoring and responding to your community.
- You should have community policies about what is and isn't acceptable behavior.
- Your site should have accountable identities.
- You should have the technology to easily identify and stop bad behaviors.
- You should make a budget that supports having a good community, or you should find another line of work.

Deon

- https://github.com/drivendataorg/deon

deon

tests passing | codecov 97% | pypi v0.2.2 | conda-forge v0.2.2

> Read more about `deon` on the project homepage

An ethics checklist for data scientists

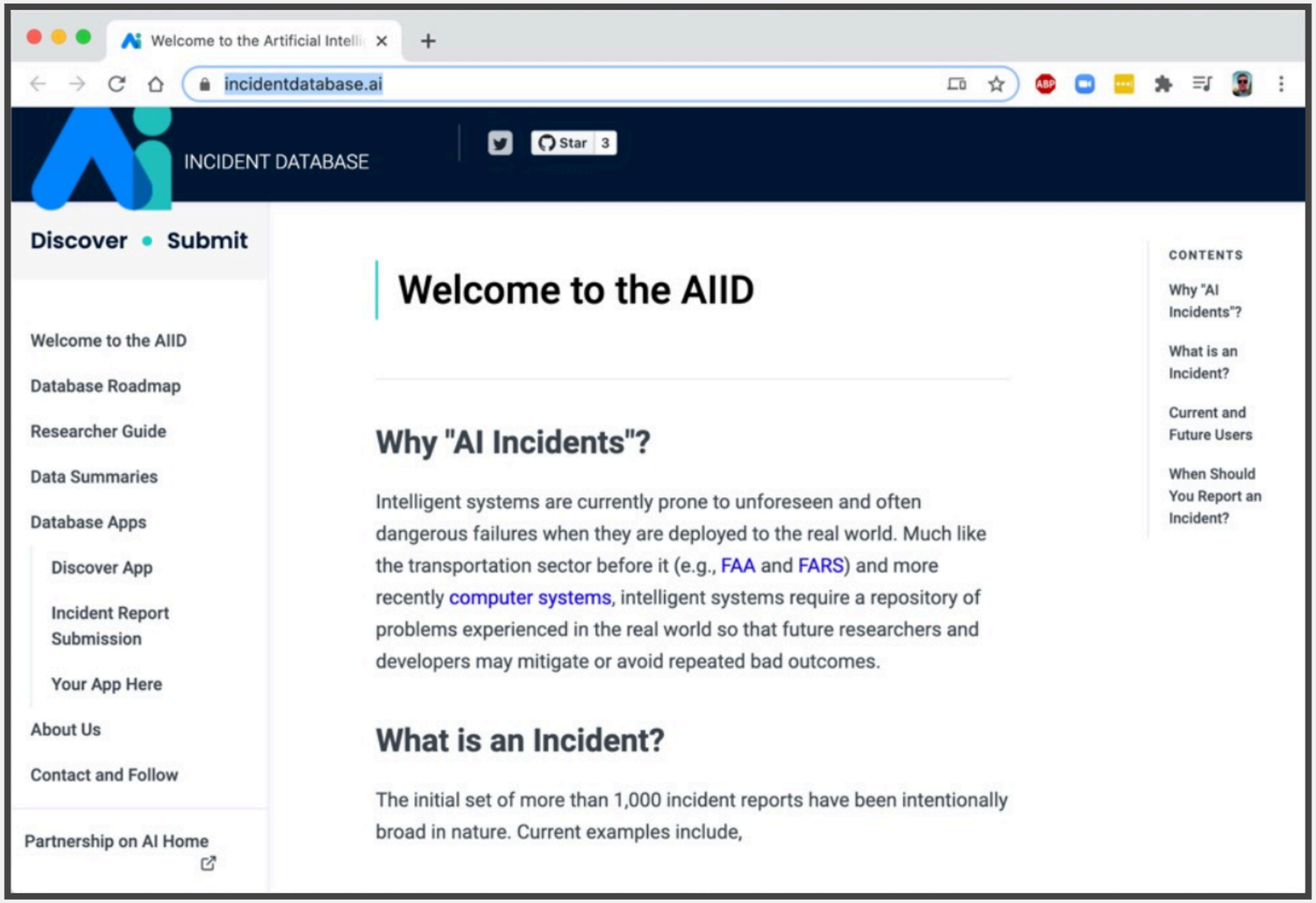
`deon` is a command line tool that allows you to easily add an ethics checklist to your data science projects. We support creating a new, standalone checklist file or appending a checklist to an existing analysis in many common formats.

δέον • (déon) [n.] (*Ancient Greek*) wikitionary

> Duty; that which is binding, needful, right, proper.

AI Incident Database

- https://github.com/drivendataorg/deon



Question Three

- 3. Will my software's quality impact the humanity of others?

Software Quality

- Quality has long been considered

Quality attributes [edit]

Notable quality attributes include:

- accessibility
- accountability
- accuracy
- adaptability
- administrability
- affordability
- agility [Toll] (see Common Subsets below)
- auditability
- autonomy [Erl]
- availability
- compatibility
- composability [Erl]
- configurability
- correctness
- credibility
- customizability
- debugability
- degradability
- determinability
- demonstrability
- dependability
- deployability
- discoverability [Erl]
- distributability
- durability
- effectiveness
- efficiency
- evolvability
- extensibility
- failure transparency
- fault-tolerance
- fidelity
- flexibility
- inspectability
- installability
- integrity
- interchangeability
- interoperability [Erl]
- learnability
- localizability
- maintainability
- manageability
- mobility
- modifiability
- modularity
- observability
- operability
- orthogonality
- portability
- precision
- predictability
- process capabilities
- producibility
- provability
- recoverability
- relevance
- reliability
- repeatability
- reproducibility
- resilience
- responsiveness
- reusability [Erl]
- robustness
- safety
- scalability
- seamlessness
- self-sustainability
- serviceability (a.k.a. supportability
- securability
- simplicity
- stability
- standards compliance
- survivability
- sustainability
- tailorability
- testability
- timeliness
- traceability
- transparency
- ubiquity
- understandability
- upgradability
- vulnerability
- usability

Engineering Ethics

- Ethics applies and is formalized in many professional fields: medical, legal, business, and engineering.

- The first codes of engineering ethics were formally adopted by American engineering societies in 1912-1914. In 1946 the National Society of Professional Engineers (NSPE) adopted their first formal Canons of Ethics.

Engineering Ethics

- “hold paramount safety, health and welfare of the public”
- Citigroup Center, Designed by Structural engineer William LeMessurier
- Followed calculations required by building codes
- Civil Engineering student Diane Hartley realized there was a problem
- Tests showed that winds needed to bring it down would happen every 55 years

Professional Ethics

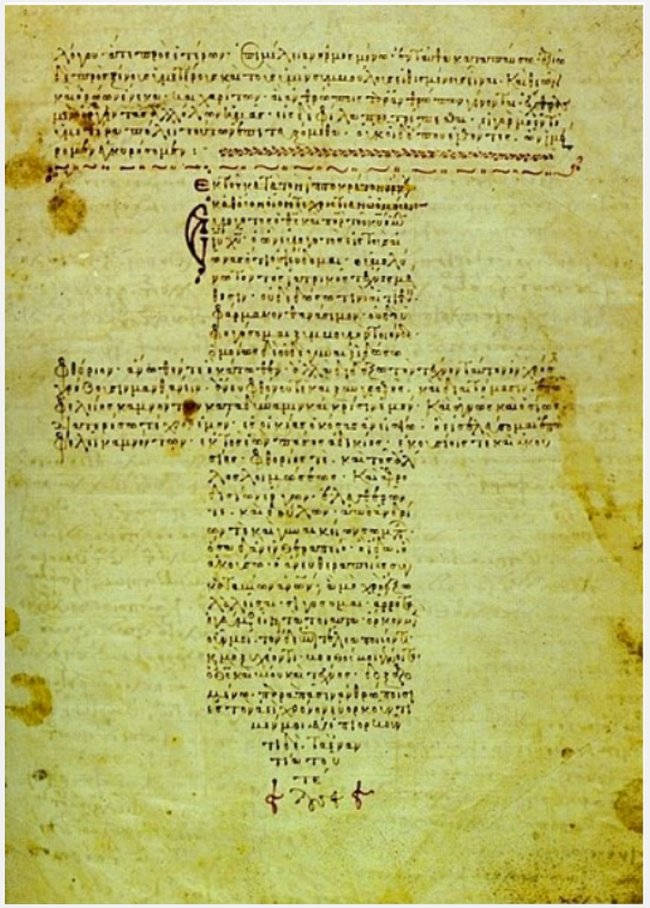
- Professional ethics encompass the personal, and corporate standards of behavior expected by professionals.

- First three “professions”

-Divinity,
-Law
-Medicine

Medicine - Intrinsic

- Hippocratic Oath ~450 BC
- “Do no Harm”



Law- Extrinsic

- Bar regulates behavior Oath to follow rules Malpractice

Legal Malpractice

- Not every mistake is legal malpractice. For malpractice to exist:

- Attorney must handle a case inappropriately due to negligence or with intent to harm And cause damages to a client

Discussion: What Should We Do???

A Charge to You!

These questions are the ***start*** of the ***conversation***, but as technology evolves, we must be ***vigilant*** to ensure we are promoting human flourishing