

# Ethics

Claire Le Goues

**Michael Hilton**

# Administrivia

- Homework 2b status?

# Learning goals

- Awareness of ethical issues in software engineering
- Reflection on decision making
- Questions to ask when evaluating the ethics of software
- Starting points to dig deeper

# Volkswagen Scandal

VW was caught cheating on emissions for Diesel engines

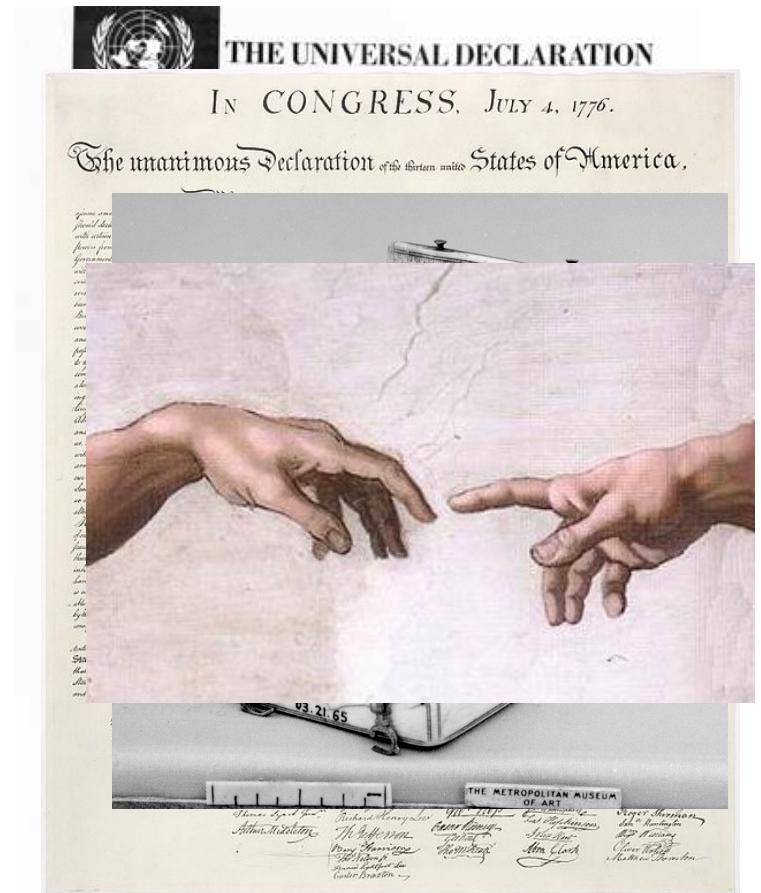


# What is Human Flourishing?

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 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



# Open Source Maintainers

The screenshot shows a sequence of comments on a GitHub pull request. On the left, there is a vertical column of profile pictures for each commenter. The comments are as follows:

- dominictarr** commented 7 days ago (Owner)
- dominictarr** commented 7 days ago (Owner)
- limonte** commented 7 days ago • edited ▾ (Owner)
- dominictarr** commented 6 days ago (Owner)
- XhmikosR** commented 6 days ago (Owner)
- jaydenseric** commented 6 days ago (Owner)

Below the comments, a text box contains a critical message:

There is a huge difference between not maintaining a repo/package, vs giving it away to a hacker (which actually takes more effort than doing nothing), then denying all responsibility to fix it when it affects millions of innocent people.

At the bottom, there are reaction counts and a horizontal bar:

|           |         |     |      |      |      |
|-----------|---------|-----|------|------|------|
| 拇指 up 884 | 拇指下 162 | 笑 7 | 哭 16 | 心 18 | 其他 0 |
|-----------|---------|-----|------|------|------|

9

# 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



# Airlines

## 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

f t  SHARE



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

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# 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



# xing.com search for “Brand Strategist”

| Search query     | Work experience | Education experience | Profile views | Candidate | Xing ranking |
|------------------|-----------------|----------------------|---------------|-----------|--------------|
| Brand Strategist | 146             | 57                   | 12992         | male      | 1            |
| Brand Strategist | 327             | 0                    | 4715          | female    | 2            |
| Brand Strategist | 502             | 74                   | 6978          | male      | 3            |
| Brand Strategist | 444             | 56                   | 1504          | female    | 4            |
| Brand Strategist | 139             | 25                   | 63            | male      | 5            |
| Brand Strategist | 110             | 65                   | 3479          | female    | 6            |
| Brand Strategist | 12              | 73                   | 846           | male      | 7            |
| Brand Strategist | 99              | 41                   | 3019          | male      | 8            |
| Brand Strategist | 42              | 51                   | 1359          | female    | 9            |
| Brand Strategist | 220             | 102                  | 17186         | female    | 10           |

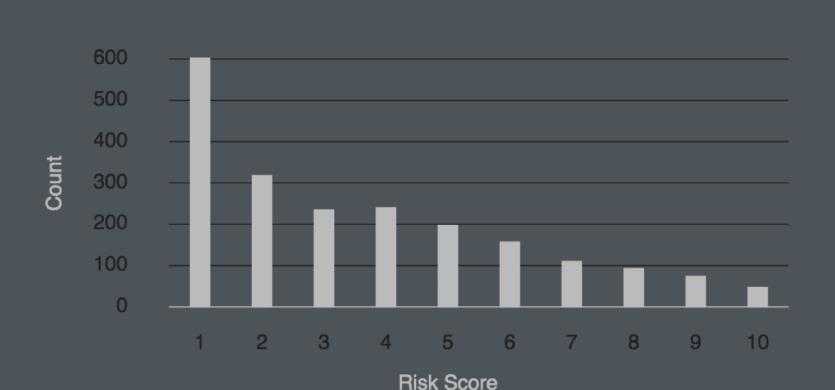
Lahoti, Preethi, Krishna P. Gummadi, and Gerhard Weikum. “iFair: Learning Individually Fair Data Representations for Algorithmic Decision Making.” 2019 IEEE 35th

International Conference on Data Engineering (ICDE) (2019)

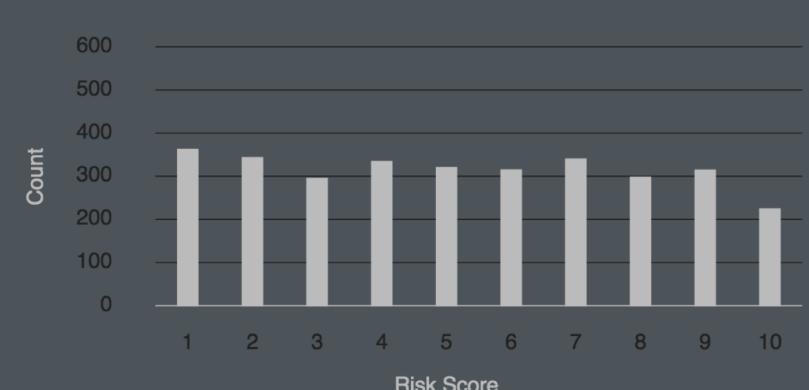
Carnegie Mellon University

School of Computer Science

White Defendants' Risk Scores



Black Defendants' Risk Scores



## 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

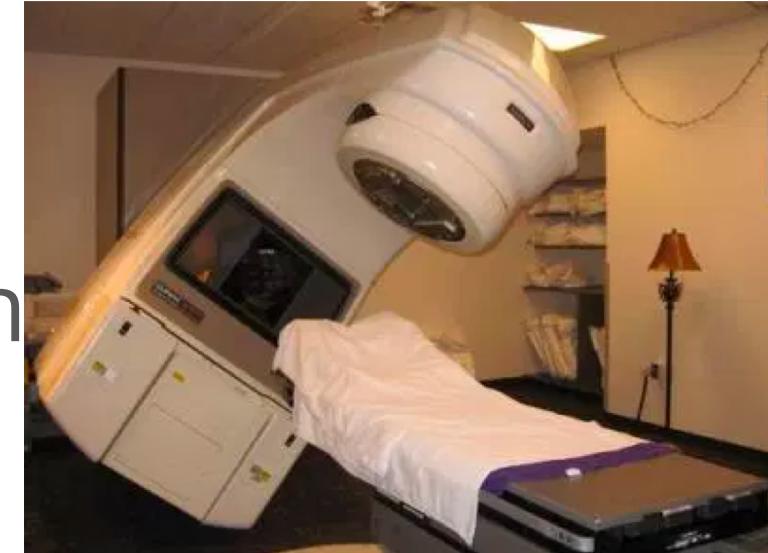
Bug in software lead to at least 6 deaths

Traced to:

Lack of reporting bugs

Lack of proper due diligence

Engineers were overconfident



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Opin](#)

# Software body

[OLGA V. MACK](#) @

BUSINESS DAY

4,331 views | Oct 17, 2018, 06:13pm

# We Need To Work Harder To Make Software Engineering More Ethical

**Jessica Baron** Contributor [i](#)

Consumer Tech

*I write about the ethics of science and technology.*

patch the software, but you can't patch a person if you, you know, damage someone's reputation." Sam Hodgson for The New York Times

US edition ▾

n

it ethics

READ



to fool AI with magic

# Code of Ethics



Association for  
Computing Machinery

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?

Andrew McNamara

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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.

# 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?

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

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

Lets consider some tools and processes...

# Humane Design Guide

<http://humanetech.com>

## Humane Design Guide (Alpha Version)

| Use this worksheet to identify opportunities for Humane Technology.                       |  | What are Human Sensitivities?   |  |   |
|---|--|---|--|---|
| Product or feature:   |  | <p><b>Human Sensitivities</b> are instincts that are often vulnerable to new technologies.</p>  |  |   |
| Value proposition:  |  |   |  |   |
| Measure of success:   |  |   |  |   |
| Human Sensitivity   | We are inhibited when  | What inhibits   | We are supported when  | Opportunity to improve  |
| <b>Emotional</b><br>What we feel in our body and in our physical health.                  | We are stressed, low on sleep, afraid or emotionally exhausted.        | <ul style="list-style-type: none"><li>• Artificial scarcity</li><li>• Urgency signalling</li><li>• Constant monitoring</li><li>• Optimizing for screentime</li></ul>  | Design engenders calm, balance, safety, pauses and supports circadian rhythms. |    |
| <b>Attention</b><br>How and where we focus our attention.                                 | Attention is physiologically drawn, overwhelmed or fragmented.         | <ul style="list-style-type: none"><li>• Constant context switching</li><li>• Many undifferentiated choices</li><li>• Fearful information</li><li>• No stopping cues (e.g. infinite scroll)</li><li>• Unnecessary movement</li></ul> | Enabled to bring more focus and mindfulness.                                   |    |
| <b>Sensemaking</b><br>How we integrate what we sense with what we know.                   | Information is fear-based, out of context, confusing, or manipulative. | <ul style="list-style-type: none"><li>• Facts out of context</li><li>• Over-personalized filters</li><li>• Equating virality with credibility</li><li>• Deceptive authority (ads vs. content)</li></ul>                             | Enabled to consider, learn, express and feel grounded.                         |    |
| <b>Decisionmaking</b><br>How we align our actions with our intentions.                    | Intentions and agency are not solicited nor supported.                 | <ul style="list-style-type: none"><li>• Avatars to convey authority</li><li>• Stalking ads and messages</li><li>• Push content models</li><li>• Serving preference over intent</li></ul>  | Enabled to gain agency, purpose, and mobilization of intent.                   |   |
| <b>Social Reasoning</b><br>How we understand and navigate our personal relationships.     | Status, relationships or self-image are manipulated.                   | <ul style="list-style-type: none"><li>• Quantified social status</li><li>• Viral sharing</li><li>• Implied obligation</li><li>• Enabling impersonation</li></ul>  | Enabled to connect more safely and authentically with others.                  |  |
| <b>Group Dynamics</b><br>How we navigate larger groups, status, and shared understanding. | Excluded, divided or mobilized through fear.                           | <ul style="list-style-type: none"><li>• Suppressing views and nuance</li><li>• Enabling ad hominem or hate speech</li><li>• Enabling viral outrage</li><li>• Lack of agreed-upon norms</li></ul>                                    | Enabled to develop a sense of belonging and cooperation.                       |  |

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

<http://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  |
|---|--|---|--|---|
| <b>Attention</b><br>How and where we focus our attention. | Attention is physiologically drawn, overwhelmed or fragmented. | <ul style="list-style-type: none"><li>Constant context switching</li><li>Many undifferentiated choices</li><li>Fearful information</li><li>No stopping cues (e.g. infinite scroll)</li><li>Unnecessary movement</li></ul> | Enabled to bring more focus and mindfulness. |  |

Identify Opportunities to improve

# Humane Design Guide

<http://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://gendermag.org>

Abby Jones<sup>1</sup>



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.

<sup>1</sup>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

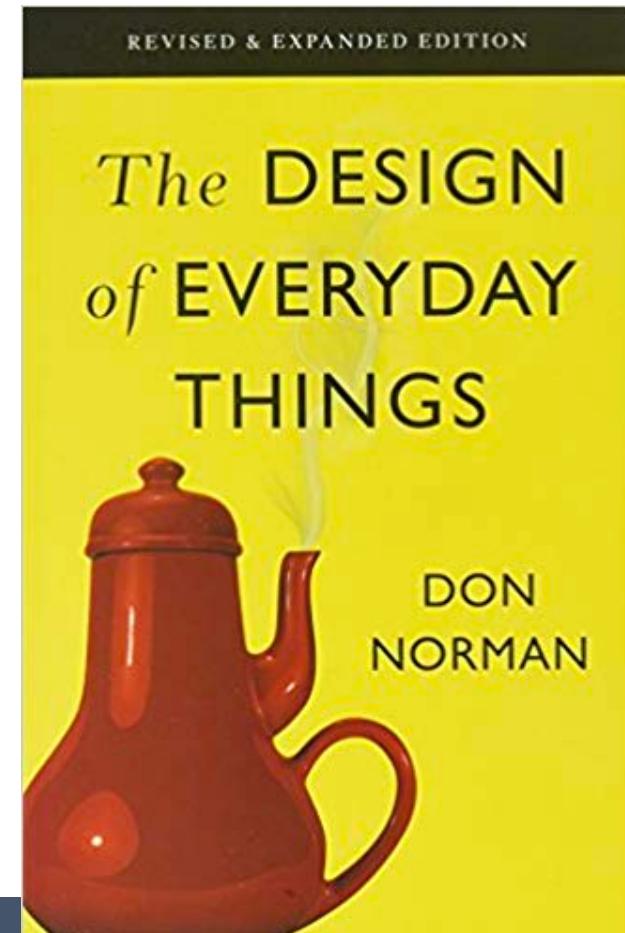
<https://gendermag.org>

|  |   |   |  |
|--|---|---|--|
| <ul style="list-style-type: none"><li>1. Pick a persona. eg: Abby</li><li>2. Pick a use case/scenario in your tool, eg:<ul style="list-style-type: none"><li>– in Book Store Navigator app...</li><li>– “Find science fiction books”</li></ul></li></ul> | <br>  | <ul style="list-style-type: none"><li>3a-b. Pick a Subgoal for that scenario. eg:</li></ul>   | <br>Subgoal #1: “See bookstore map”.<br><p>Q: Will <b>Abby</b> have formed this sub-goal...?<br/>• Yes/no/maybe.<br/>Why? Consider <b>Abby's Motivations...</b></p>  |
| <ul style="list-style-type: none"><li>3c-d. Pick an Action for that subgoal.</li></ul>   | <br>Action #1: “Tap ‘Browse Off’”:<br><ul style="list-style-type: none"><li>– Q1. Will <b>Abby</b> know what to do?<ul style="list-style-type: none"><li>• Yes/no/maybe.<br/>Why? Consider <b>Abby's ... Tinkering</b></li></ul></li></ul> <p>First answer Q1.<br/>After answering it, then perform the action.</p>  | <ul style="list-style-type: none"><li>3e. Q2. If she performs the action, producing</li></ul> | <br>will <b>Abby</b> see progress toward the subgoal?<br>• Yes/no/maybe. Why? Consider <b>Abby's Self-Efficacy &amp; ...</b>  |

# User Centered Design

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**.

-Wikipedia



# Agile

## User Cer

## Agile cus

### Manifesto for Agile Software Development

We are uncovering better ways of developing software by doing it and helping others do it.

Through this work we have come to value:

Individuals and interactions over processes and tools

Working software over comprehensive documentation

Customer collaboration over contract negotiation

## Customer collaboration over contract negotiation

On the right, we value the items on the left more.

Kent Beck  
Mike Beedle  
Arie van Bennekum  
Alistair Cockburn  
Ward Cunningham  
Martin Fowler

James Grenning  
Jim Highsmith  
Andrew Hunt  
Ron Jeffries  
Jon Kern  
Brian Marick

Robert C. Martin  
Steve Mellor  
Ken Schwaber  
Jeff Sutherland  
Dave Thomas

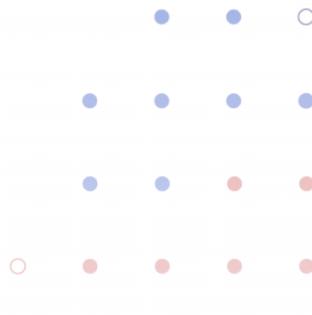
**2.Does my software amplify  
positive or negative behavior for  
users and society at large?**

# What if...

<https://pair-code.github.io/what-if-tool/>

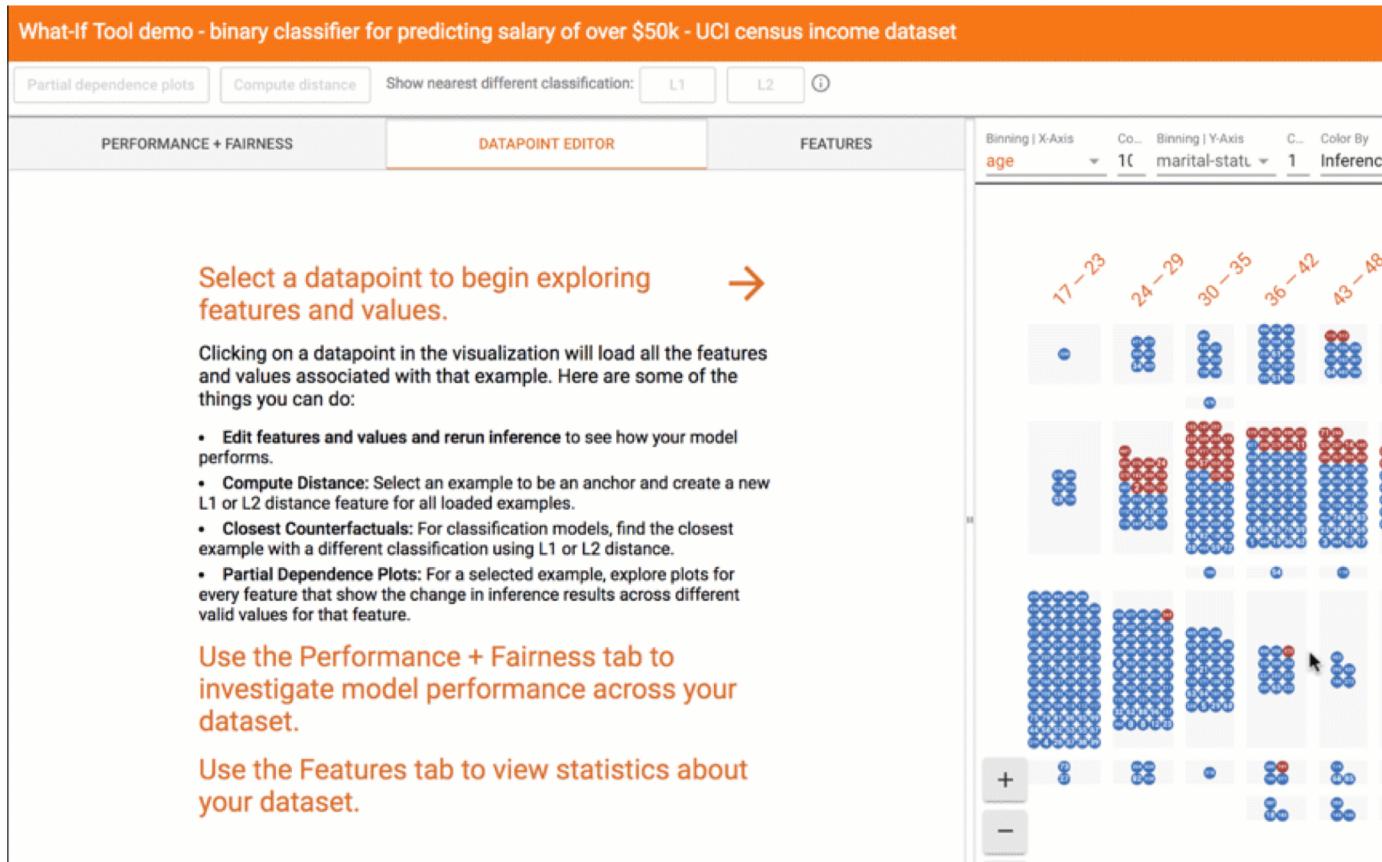
# What If...

you could inspect a machine learning model,  
with minimal coding required?

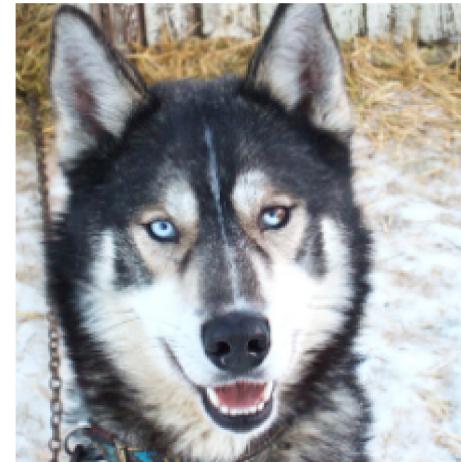


# What if...

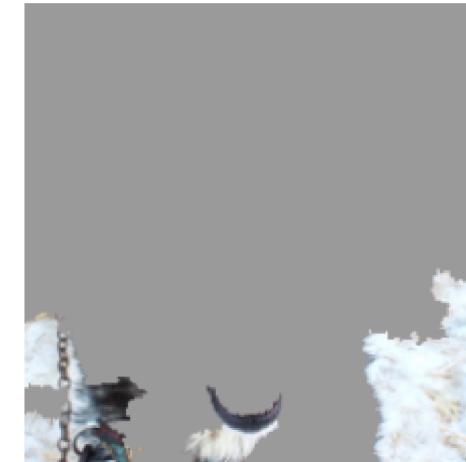
<https://pair-code.github.io/what-if-tool/>



# Dog vs Wolf



(a) Husky classified as wolf

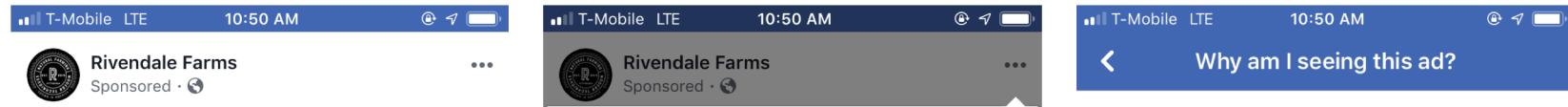


(b) Explanation

**Figure 11: Raw data and explanation of a bad model’s prediction in the “Husky vs Wolf” task.**

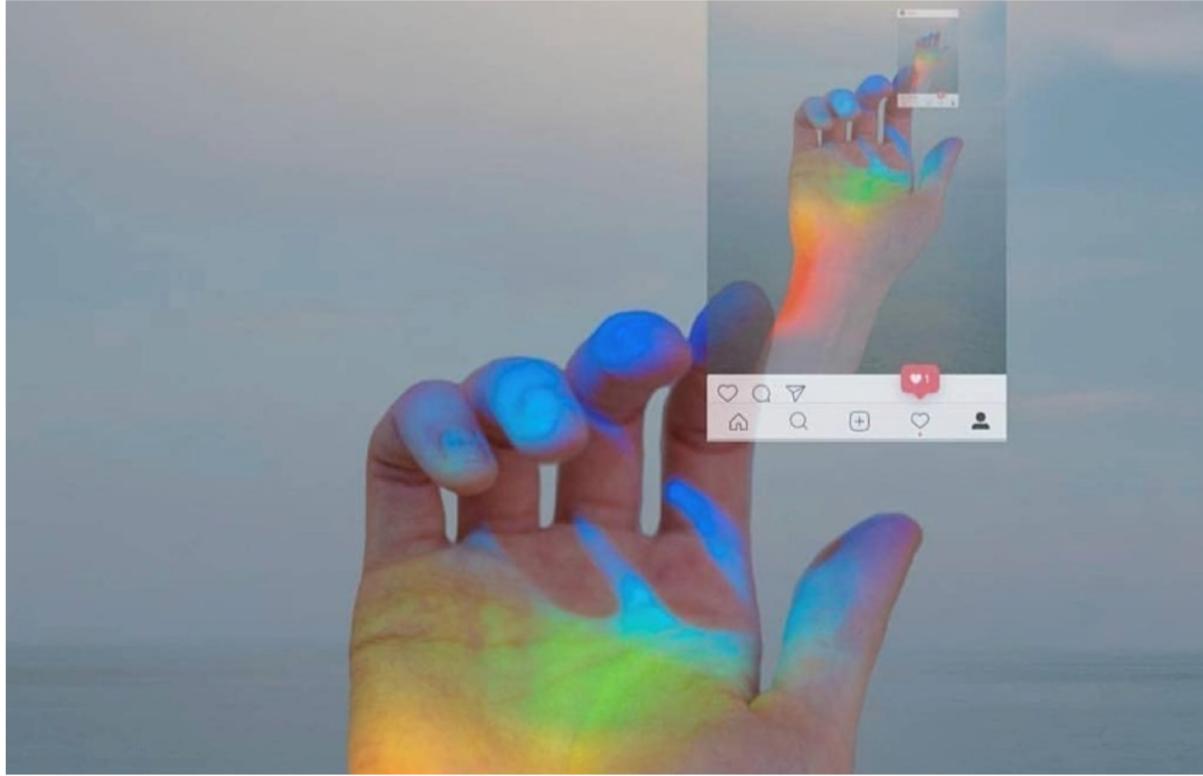
|                             | Before       | After        |
|-----------------------------|--------------|--------------|
| Trusted the bad model       | 10 out of 27 | 3 out of 27  |
| Snow as a potential feature | 12 out of 27 | 25 out of 27 |

# Explain “why” to customers



There may be other reasons you're seeing this ad, including that Rivendale Farms wants to reach **people ages 22 to 64 who live or were recently near Pittsburgh, Pennsylvania.** This is information based on your Facebook profile and where you've connected to the internet.





@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

[http://anildash.com/2011/07/20/if\\_your\\_websites\\_full\\_of\\_assholes\\_its\\_your\\_fault-2/](http://anildash.com/2011/07/20/if_your_websites_full_of_assholes_its_your_fault-2/)

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.

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

# 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
- composable [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
- tailorbility
- testability
- timeliness
- traceability
- transparency
- ubiquity
- understandability
- upgradability
- vulnerability
- usability

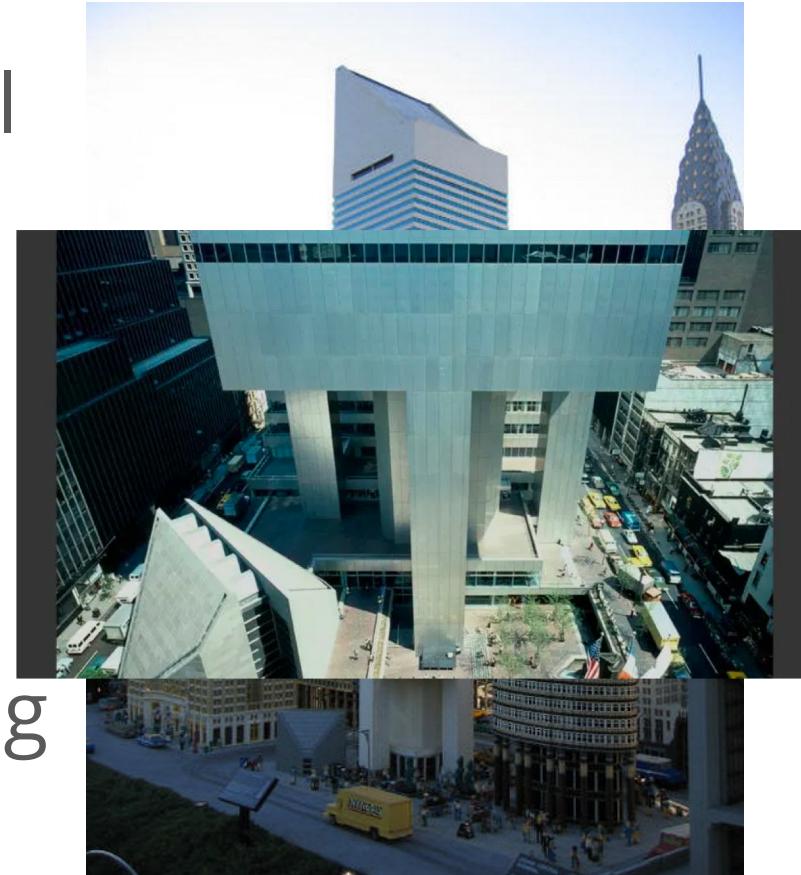
# Engineering ethics.

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.

# **“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

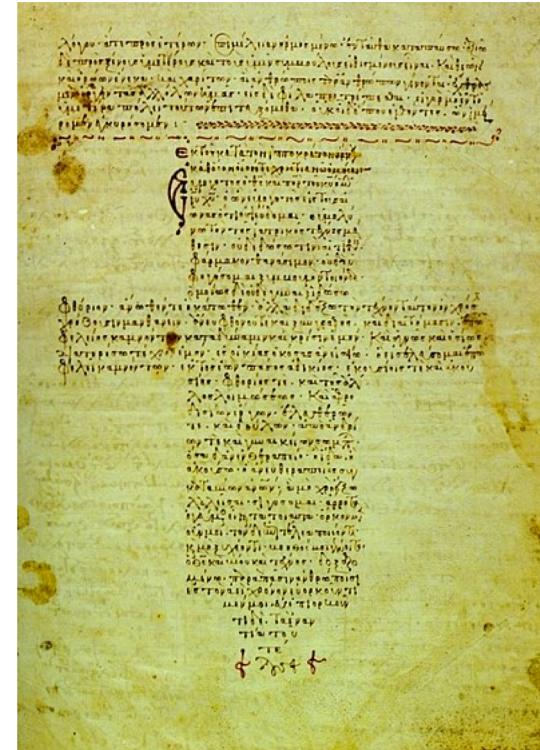


# Medicine - Intrinsic

## Hippocratic Oath

~450BC

## “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

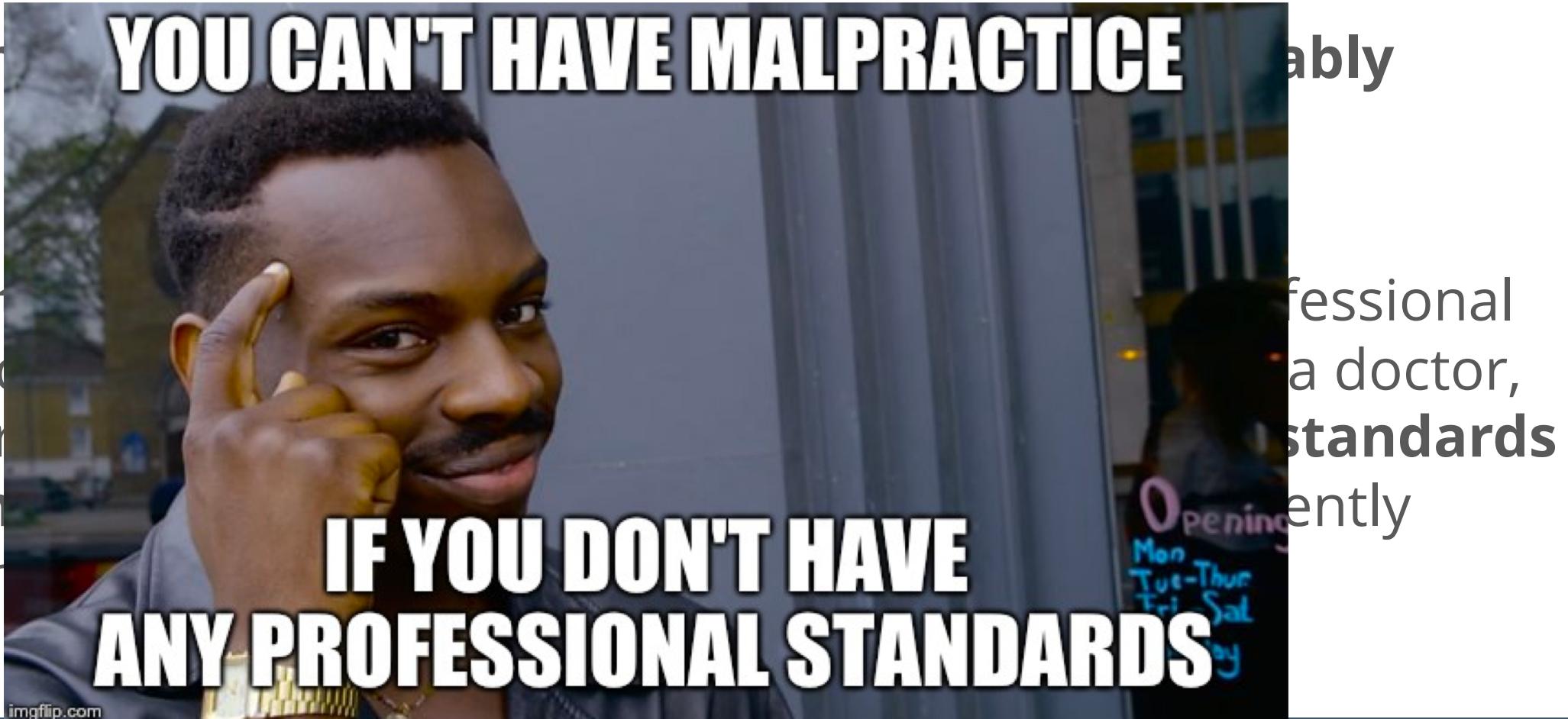
due to negligence or with intent to harm

And cause damages to a client

# Malpractice vs. Negligence

Negligent  
prudent

Malpractice  
negligence  
lawyer or  
**set by the**  
causing h



# **DISCUSSION: WHAT SHOULD WE DO GOING FORWARD?**

# Bioengineering Ethics:

- Respect for Autonomy
- Beneficence
- Nonmaleficence
- Justice

# Will software quality impact human flourishing?

Most traditional emphasis of “engineering ethics”

What can we learn from other professions?

Should software have “Professional Engineers”?

How do we define “safety critical systems”?

How much testing is enough? How can we convince others to do that much testing?

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

# 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?