

Code-ifying the Law: Documenting, Tracing, and Governing Breakdowns in Legal Software

Nel Escher

Bellwether Postdoctoral Scholar, UC Berkeley iSchool

EECS 481 – 4/1/2026

Agenda

- Introduction
- Research Presentation
- Career Paths Beyond Industry
- Q&A

My Background

- JD, Michigan Law, 2016
- MS, Michigan CS, 2019
- PhD, Michigan CS, 2025



Why so much school?

- My work experience with law (IP litigation in Silicon Valley): doing paperwork so that big companies could get other big companies to pay them money
- My work experience with CS (software engineering): creating products so that big companies could get other big companies to pay them money
- My solution to alienation --- self-directed projects that aim to make technology more equitable!

What is research?

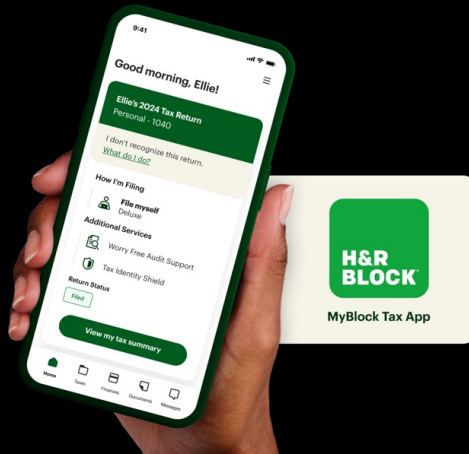
- Creating new knowledge!
 - Asking questions that haven't been answered, and figuring out a way to answer them
 - The content in lectures often represents the accumulation of a lot of research --- the greatest hits from decades of work and thousands of people
- This presentation is on the research I conducted in my PhD
 - A PhD trains you to be a researcher in a particular field

Agenda

- Introduction
- Research Presentation
- Career Paths Beyond Industry
- Q&A

Computational Legal Systems

- Software that encodes and automatically applies the law
 - Also called “legal expert systems” or “legal automation” or “legal software”



Am I eligible for SNAP

Find out if you may be eligible in 10 seconds.

How many people live in your household, including you? (Required)

If you buy and make more than 2/3 of your meals with others, they must be in your household. If your spouse or children under 22 live with you, they must be in your household even if you do not buy and make meals with them.

1 2 3 4 5 More

Is anyone age 60 or older? (Required)

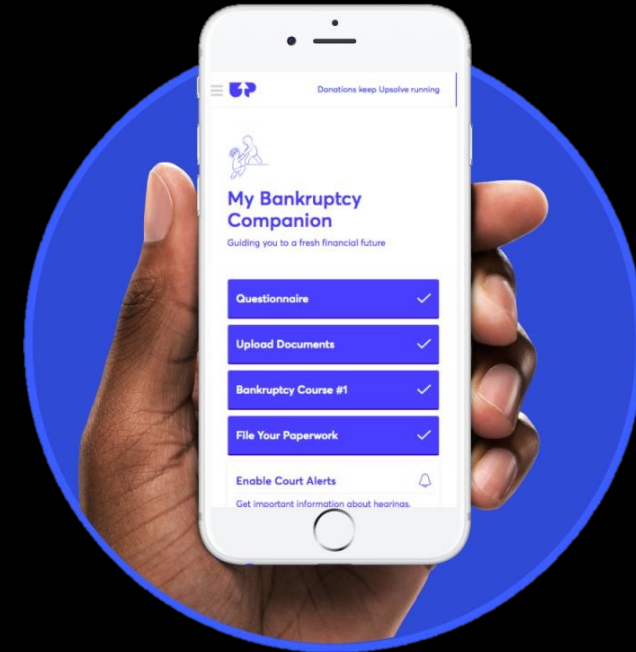
Yes No

Does anyone in the household have a physical or mental disability? (Required)

Yes No


What is the total gross income for your household? (Required)

\$ per



Department of Labor and Economic Opportunity

UNEMPLOYMENT INSURANCE



Settings Settings Help Log Off

Claim: Settings

Profile **Payment Sources** Activity

Payment Profile

Filter

+ Setup New Payment Source

No Default Payment Source PUA

Why translate the law to code?



Federal Register / Vol. 84, No. 22 / Friday, February 1, 2019 / Notices 1167

DEPARTMENT OF HEALTH AND HUMAN SERVICES

National Committee on Vital and Health Statistics: Meeting

Pursuant to the Federal Advisory Committee Act, the Department of Health and Human Services (HHS) announces the following advisory committee meeting.

Name: National Committee on Vital and Health Statistics (NCVHS), Subcommittee on Privacy, Confidentiality and Security.

Date and Times: Thursday, March 21, 2019: 9:00 a.m.–5:30 p.m. (EDT), Friday, March 22, 2019: 8:30 a.m.–3:00 p.m. (EDT).

Place: Centers for Disease Control and Prevention, National Center for Health Statistics, 3311 Toledo Road, Auditorium, Hyattsville, Maryland 20782.

Status: Open. There will be an opportunity for public comment at the end of the first day of the meeting.

Purpose: NCVHS is charged with studying and identifying privacy and security and access measures to protect individually identifiable health information in an environment of electronic networking and multiple uses of data. Further, the Committee advises the Secretary and is mandated to report to Congress on the status of the Health Information Portability and Accountability Act of 1996 (HIPAA), which establishes the regulatory framework for personally identifiable health information by covered entities and business associates.

Through the Subcommittee on Privacy, Confidentiality and Security, the Committee undertook a “Beyond HIPAA” initiative to examine emerging health information privacy and security issues that are beyond the scope of HIPAA to consider a health data privacy and security framework for the 21st century. The goals for the Beyond HIPAA initiative are to:

1. Identify and describe the changing environment and the risks to privacy and security of confidential health information; highlight promising policies, practices and technology;
2. Lay out integrative models for how to protect individuals’ privacy and secure health data uses outside of HIPAA protections while enabling useful uses, services and research;
3. Formulate recommendations for the Secretary on actions that HHS and other Federal Departments might take; and
4. Prepare a report for data stewardship.

The objective of this meeting is to develop recommendations to define a

contemporary framework of data stewardship for the HHS Secretary, including a pathway for improving private and public sector governance of health information over the next decade. To accomplish this, the Subcommittee plans to:

- (a) Outline key principles for stewardship of health data in the environment described in a recent NCVHS environmental scan report and the essential public and private levers to ensure appropriate governance;
- (b) Reach consensus on actions to update NCVHS’ 2008 report, “Enhanced Protections for Uses of Health Data: A Stewardship Framework for “Secondary Use” of Electronically Collected and Transmitted Health Data—Summary for Policy Makers.”

Through this work, the Subcommittee also plans to identify key themes for communications with individuals, policymakers, and stakeholders in the private sector. The times and topics for the meeting are subject to change. Please refer to the posted agenda for any updates.

Contact Persons for More Information: Substantive program information may be obtained from Rebecca Hines, MHS, Executive Secretary, NCVHS, National Center for Health Statistics, Centers for Disease Control and Prevention, 3311 Toledo Road, Hyattsville, Maryland 20782, telephone (301) 458-4715. Information pertaining to meeting content may be obtained from Rachel Seeger, MA, MBA, Office of the Secretary/Office of Civil Rights, Room 509E, Department of Health and Human Services, 200 Independence Avenue SW, Washington, DC 20201, telephone: (202) 260-7106. Summaries of meetings and a roster of Committee members are available on the NCVHS website: www.ncvhs.hhs.gov, where further information including a meeting agenda and instructions to access the live broadcast of the meeting will be posted.

Should you require reasonable accommodation, please contact the CDC Office of Equal Employment Opportunity on (770) 488-3210 as soon as possible.

Dated: January 28, 2019.

Sharon Aronoff,
Associate Deputy Assistant Secretary for Planning and Evaluation, Science and Data Policy, Office of the Assistant Secretary for Planning and Evaluation.
(FR Doc. 2019-07706 Filed 1-31-19; 8:45 am)
BILLING CODE 4151-56-P

1168 Federal Register / Vol. 84, No. 22 / Friday, February 1, 2019 / Notices

For information about the number of people in poverty, visit the Poverty section of the Census Bureau’s website at <https://www.census.gov/topics/income-poverty/poverty.html> or contact the Census Bureau’s Customer Service Center at 1-800-923-8282 (toll-free) or visit <https://ask-census.gov> for further information.

SUPPLEMENTARY INFORMATION:

Background

Section 673(2) of the Omnibus Budget Reconciliation Act (OBRA) of 1981 (42 U.S.C. 9902(2)) requires the Secretary of the Department of Health and Human Services to update the poverty guidelines at least annually, adjusting them on the basis of the Consumer Price Index for All Urban Consumers (CPI-U). The poverty guidelines are used as an eligibility criterion by Medicaid and a number of other Federal programs. The poverty guidelines issued here are a simplified version of the poverty thresholds that the Census Bureau uses to prepare its estimates of the number of individuals and families in poverty.

As required by law, this update is accomplished by increasing the latest published Census Bureau poverty thresholds by the relevant percentage change in the Consumer Price Index for All Urban Consumers (CPI-U). The guidelines in this 2019 notice reflect the 2.4 percent price increase between calendar years 2017 and 2018. After this inflation adjustment, the guidelines are rounded and adjusted to standardize the differences between family sizes. In rare circumstances, the rounding and standardizing adjustments in the formula result in small decreases in the poverty guidelines for some household sizes even when the inflation factor is not negative. In cases where the year-to-year change in inflation is not negative and the rounding and standardizing adjustments in the formula result in reductions to the guidelines from the previous year for some household sizes, the guidelines for the affected household sizes are fixed at the prior year’s guidelines. As in prior years, these 2019 guidelines are roughly equal to the poverty thresholds for calendar year 2018 which the Census Bureau expects to publish in final form in September 2019.

The poverty guidelines continue to be derived from the Census Bureau’s current official poverty thresholds; they are not derived from the Census Bureau’s Supplemental Poverty Measure (SPM).

The following guideline figures represent annual income.

2019 POVERTY GUIDELINES FOR THE 48 CONTIGUOUS STATES AND THE DISTRICT OF COLUMBIA

Persons in family/household	Poverty guideline
1	\$12,490
2	16,910
3	21,330
4	25,750
5	30,170
6	34,590
7	39,010
8	43,430

For families/households with more than 8 persons, add \$4,420 for each additional person.

2019 POVERTY GUIDELINES FOR ALASKA

Persons in family/household	Poverty guideline
1	\$15,600
2	21,130
3	26,660
4	32,190
5	37,720
6	43,250
7	48,780
8	54,310

For families/households with more than 8 persons, add \$5,530 for each additional person.

2019 POVERTY GUIDELINES FOR HAWAII

Persons in family/household	Poverty guideline
1	\$14,380
2	19,460
3	24,540
4	29,620
5	34,700
6	39,780
7	44,860
8	49,940

For families/households with more than 8 persons, add \$5,080 for each additional person.

Separate poverty guideline figures for Alaska and Hawaii reflect Office of Economic Opportunity administrative practice beginning in the 1966-1970 period. (Note that the Census Bureau poverty thresholds—the version of the poverty measure used for statistical purposes—have never had separate figures for Alaska and Hawaii.) The poverty guidelines are not defined for Puerto Rico or other outlying jurisdictions. In cases in which a Federal program using the poverty guidelines serves any of those jurisdictions, the Federal office that

administers the program is generally responsible for deciding whether to use the contiguous-states-and-DC guidelines for those jurisdictions or to follow some other procedure.

Due to confusing legislative language dating back to 1972, the poverty guidelines sometimes have been mistakenly referred to as the “OMB” (Office of Management and Budget) poverty guidelines or poverty line. In fact, OMB has never issued the guidelines; the guidelines are issued each year by the Department of Health and Human Services. The poverty guidelines may be formally referenced as “the poverty guidelines updated periodically in the Federal Register by the U.S. Department of Health and Human Services under the authority of 42 U.S.C. 9902(2).”

Some Federal programs use a percentage multiple of the guidelines (for example, 125 percent or 185 percent of the guidelines), as noted in relevant authorizing legislation or program regulations. Non-Federal organizations that use the poverty guidelines under their own authority in non-Federally-funded activities also may choose to use a percentage multiple of the guidelines.

The poverty guidelines do not make a distinction between farm and non-farm families, or between aged and non-aged units. (Only the Census Bureau poverty thresholds have separate figures for aged and non-aged one-person and two-person units.)

Note that this notice does not provide definitions of such terms as “income” or “family,” because there is considerable variation in defining these terms among the different programs that use the guidelines. These variations are traceable to the different laws and regulations that govern the various programs. This means that questions such as “Is income counted before or after taxes?”, “Should a particular type of income be counted?”, and “Should a particular person be counted as a member of the family/household?” are actually questions about how a specific program applies the poverty guidelines. All such questions about how a specific program applies the guidelines should be directed to the entity that administers or funds the program, since that entity has the responsibility for defining such terms as “income” or “family,” to the extent that these terms are not already defined for the program in legislation or regulations.

Alex M. Azar,
Secretary of Health and Human Services.
(FR Doc. 2019-06623 Filed 1-31-19; 8:45 am)
BILLING CODE 4150-05-P



Why translate the law to code?

DEPARTMENT OF HEALTH AND HUMAN SERVICES
National Committee on Vital and Health Statistics: Meeting

Pursuant to the Federal Advisory Committee Act, the Department of Health and Human Services (HHS) announces the following advisory committee meeting.

Name: National Committee on Vital and Health Statistics (NCVHS), Subcommittee on Privacy, Confidentiality and Security.
Date and Times: Thursday, March 21, 2019: 9:00 a.m.–5:30 p.m. (EDT), Friday, March 22, 2019: 8:30 a.m.–3:00 p.m. (EDT).

Place: Centers for Disease Control and Prevention, National Center for Health Statistics, 3311 Toledo Road, Auditorium, Hyattsville, Maryland 20782.

Status: Open. There will be an opportunity for public comment at the end of the first day of the meeting.

Purpose: NCVHS is charged with studying and identifying privacy and security and access measures to protect individually identifiable health information in an environment of electronic networking and multiple uses of data. Further, the Committee advises the Secretary and is mandated to report to Congress on the status of the Health Insurance Portability and Accountability Act of 1996 (HIPAA), which establishes the regulatory framework for personally identifiable health information by covered entities and business associates.

Through the Subcommittee on Privacy, Confidentiality and Security, the Committee undertook a "Beyond HIPAA" initiative to examine emerging health information privacy and security issues that are beyond the scope of HIPAA to consider a health data privacy and security framework for the 21st century. The goals for the Beyond HIPAA initiative are to:

1. Identify and describe the changing environment and the risks to privacy and security of confidential health information; highlight promising policies, practices and technology;
2. Lay out integrative models for how best to protect individuals' privacy and secure health data uses outside of HIPAA protections while enabling useful uses, services and research;
3. Formulate recommendations for the Secretary on actions that HHS and other Federal Departments might take; and
4. Prepare a report for data stewardship.

The objective of this meeting is to develop recommendations to define a

contemporary framework of data stewardship for the HHS Secretary, including a pathway for improving private and public sector governance of health information over the next decade. To accomplish this, the Subcommittee plans to:

- (a) Outline key principles for stewardship of health data in the environment described in a recent NCVHS environmental scan report and the essential public and private levers to ensure appropriate governance;
- (b) Reach consensus on actions to update NCVHS' 2008 report, "Enhanced Protections for Uses of Health Data: A Stewardship Framework for "Secondary Uses" of Electronically Collected and Transmitted Health Data—Summary for Policy Makers."

Through this work, the Subcommittee also plans to identify key themes for communications with individuals, policymakers, and stakeholders in the private sector. The times and topics for this meeting are subject to change. Please refer to the posted agenda for any updates.

Contact Persons for More Information: Substantive program information may be obtained from Rebecca Hines, MIS, Executive Secretary, NCVHS, National Center for Health Statistics, Centers for Disease Control and Prevention, 3311 Toledo Road, Hyattsville, Maryland 20782, telephone (301) 458-4715. Information pertaining to meeting content may be obtained from Rachel Seeger, MA, MPA, Office of the Secretary/Office of Civil Rights, Room 509E, Department of Health and Human Services, 200 Independence Avenue SW, Washington, DC 20201, telephone: (202) 260-7106. Summaries of meetings and a roster of Committee members are available on the NCVHS website: www.ncvhs.hhs.gov, where further information including a meeting agenda and instructions to access the live broadcast of the meeting will be posted.

Should you require reasonable accommodation, please contact the CDC Office of Equal Employment Opportunity on (770) 488-3210 as soon as possible.
Sharon Arnold,
Associate Deputy Assistant Secretary for Planning and Evaluation, Science and Data Policy, Office of the Assistant Secretary for Planning and Evaluation.
 (FR Doc. 2019-00706 Filed 1-31-19; 8:45 am)
BILLING CODE 4161-06-P

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Office of the Secretary
Annual Update of the HHS Poverty Guidelines

AGENCY: Department of Health and Human Services.
ACTION: Notice.

SUMMARY: This notice provides an update of the Department of Health and Human Services (HHS) poverty guidelines to account for last calendar year's increase in prices as measured by the Consumer Price Index.

DATES: *Applicable Date:* January 11, 2019 unless an office administering a program using the guidelines specifies a different effective date for that particular program.

ADDRESSES: Office of the Assistant Secretary for Planning and Evaluation, Room 404E, Humphrey Building, Department of Health and Human Services, Washington, DC 20201.

FOR FURTHER INFORMATION CONTACT: For information about how the guidelines are used or how income is defined in a particular program, contact the Federal, state, or local office that is responsible for that program. For information about poverty figures for immigration forms, the Hill-Burton Uncompensated Services Program, and the number of people in poverty, use the specific telephone numbers and addresses given below.

For general questions about the poverty guidelines themselves, contact Kendall Svenson, Office of the Assistant Secretary for Planning and Evaluation, Room 422F.5, Humphrey Building, Department of Health and Human Services, Washington, DC 20201—telephone: (202) 690-7409—or visit <http://aspe.hhs.gov/poverty/>.

For information about the percentage multiple of the poverty guidelines to be used on immigration forms such as USCIS Form I-864, Affidavit of Support, contact U.S. Citizenship and Immigration Services at 1-800-375-5283.

For information about the Hill-Burton Uncompensated Services Program (free or reduced-fee health care services at certain hospitals and other facilities for persons meeting eligibility criteria involving the poverty guidelines), contact the Health Resources and Services Administration Information Center at 1-800-638-0742. You also may visit <https://www.hrsa.gov/get-health-care/affordable/hill-burton/index.html>.

For information about the number of people in poverty, visit the Poverty section of the Census Bureau's website at <https://www.census.gov/topics/income-poverty/poverty.html> or contact the Census Bureau's Customer Service Center at 1-800-923-8282 (toll-free) or visit <https://ask.census.gov> for further information.

SUPPLEMENTARY INFORMATION:
Background

Section 673(2) of the Omnibus Budget Reconciliation Act (OBRA) of 1981 (42 U.S.C. 9902(2)) requires the Secretary of the Department of Health and Human Services to update the poverty guidelines at least annually, adjusting them on the basis of the Consumer Price Index for All Urban Consumers (CPI-U). The poverty guidelines are used as an eligibility criterion by Medicaid and a number of other Federal programs. The poverty guidelines issued here are a simplified version of the poverty thresholds that the Census Bureau uses to prepare its estimates of the number of individuals and families in poverty.

As required by law, this update is accomplished by increasing the latest published Census Bureau poverty thresholds by the relevant percentage change in the Consumer Price Index for All Urban Consumers (CPI-U). The guidelines in this 2019 notice reflect the 2.4 percent price increase between calendar years 2017 and 2018. After this inflation adjustment, the guidelines are rounded and adjusted to standardize the differences between family sizes. In rare circumstances, the rounding and standardizing adjustments in the formula result in small decreases in the poverty guidelines for some household sizes even when the inflation factor is not negative. In cases where the year-to-year change in inflation is not negative and the rounding and standardizing adjustments in the formula result in reductions to the guidelines from the previous year for some household sizes, the guidelines for the affected household sizes are fixed at the prior year's guidelines. As in prior years, these 2019 guidelines are roughly equal to the poverty thresholds for calendar year 2018 which the Census Bureau expects to publish in final form in September 2019.

The poverty guidelines continue to be derived from the Census Bureau's current official poverty thresholds; they are not derived from the Census Bureau's Supplemental Poverty Measure (SPM). The following guideline figures represent annual income.

2019 POVERTY GUIDELINES FOR THE 48 CONTIGUOUS STATES AND THE DISTRICT OF COLUMBIA

Persons in family/household	Poverty guideline
1	\$12,490
2	16,910
3	21,330
4	25,750
5	30,170
6	34,590
7	39,010
8	43,430

For families/households with more than 8 persons, add \$4,420 for each additional person.

2019 POVERTY GUIDELINES FOR ALASKA

Persons in family/household	Poverty guideline
1	\$15,800
2	21,130
3	26,660
4	32,190
5	37,720
6	43,250
7	48,780
8	54,310

For families/households with more than 8 persons, add \$5,330 for each additional person.

2019 POVERTY GUIDELINES FOR HAWAII

Persons in family/household	Poverty guideline
1	\$14,380
2	19,460
3	24,540
4	29,620
5	34,700
6	39,780
7	44,860
8	49,940

For families/households with more than 8 persons, add \$5,080 for each additional person. Separate poverty guideline figures for Alaska and Hawaii reflect Office of Economic Opportunity administrative practice beginning in the 1966-1970 period. (Note that the Census Bureau poverty thresholds—the version of the poverty measure used for statistical purposes—have never had separate figures for Alaska and Hawaii.) The poverty guidelines are not defined for Puerto Rico or other outlying jurisdictions. In cases in which a Federal program using the poverty guidelines serves any of those jurisdictions, the Federal office that

administers the program is generally responsible for deciding whether to use the contiguous-states-and-DC guidelines for those jurisdictions or to follow some other procedure.

Due to confusing legislative language dating back to 1972, the poverty guidelines sometimes have been mistakenly referred to as the "OMB" (Office of Management and Budget) poverty guidelines or poverty line. In fact, OMB has never issued the guidelines; the guidelines are issued each year by the Department of Health and Human Services. The poverty guidelines may be formally referenced as "the poverty guidelines updated periodically in the Federal Register by the U.S. Department of Health and Human Services under the authority of 42 U.S.C. 9902(2)."

Some Federal programs use a percentage multiple of the guidelines (for example, 125 percent or 185 percent of the guidelines), as noted in relevant authorizing legislation or program regulations. Non-Federal organizations that use the poverty guidelines under their own authority in non-Federally-funded activities also may choose to use a percentage multiple of the guidelines.

The poverty guidelines do not make a distinction between farm and non-farm families, or between aged and non-aged units. (Only the Census Bureau poverty thresholds have separate figures for aged and non-aged one-person and two-person units.)

Note that this notice does not provide definitions of such terms as "income" or "family," because there is considerable variation in defining these terms among the different programs that use the guidelines. These variations are traceable to the different laws and regulations that govern the various programs. This means that questions such as "Is income counted before or after taxes?" "Should a particular type of member be counted?" and "Should a particular person be counted as a member of the family/household?" are actually questions about how a specific program applies the poverty guidelines. All such questions about how a specific program applies the guidelines should be directed to the entity that administers or funds the program, since that entity has the responsibility for defining such terms as "income" or "family," to the extent that these terms are not already defined for the program in legislation or regulations.

Alex M. Azar,
Secretary of Health and Human Services.
 (FR Doc. 2019-00821 Filed 1-31-19; 8:45 am)
BILLING CODE 4161-06-P

```
def poverty_guidelines(percent=1):
    guidelines = {
        1: 12490,
        2: 16910,
        3: 21330,
        4: 25750,
        5: 30170,
        6: 34590,
        7: 39010,
        8: 43430
    }
    for i in range(9, 21):
        guidelines[i] = (43430 + (i - 8) * 4420)
    guidelines.update((x, y*percent) for x, y in guidelines.items())
    return guidelines
```

Python function encoding FPIG for Pennsylvania

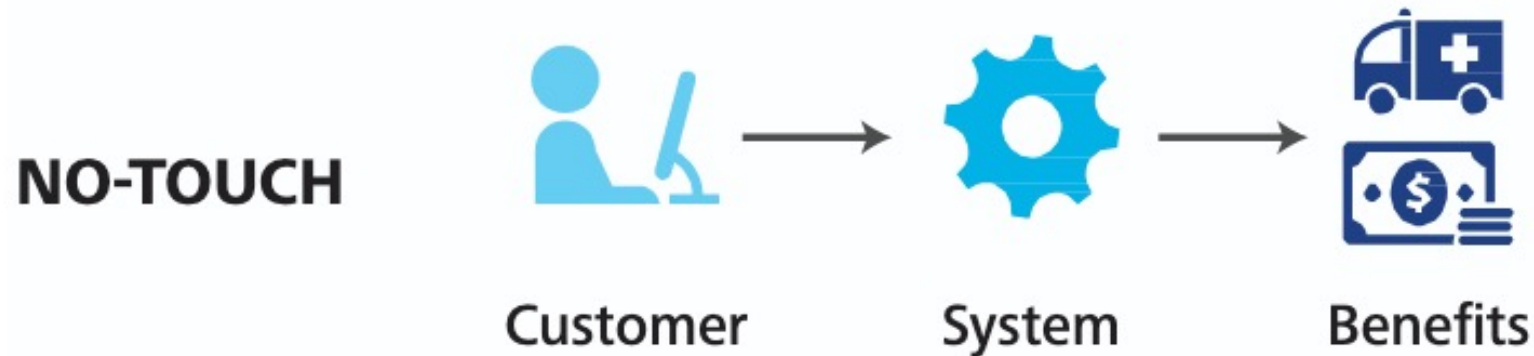
Claimed Benefits of Legal Automation

Potential benefits:

- Expand access to justice
- Lower costs
- Expedite services
- Improve consistency of decisions



Promise of Legal Automation in Government



Zero worker involvement in the application process; e.g., application received, verifications completed, eligibility determined, notice generated, and benefits issued to individual without assistance from the worker

Promise of Legal Automation in Government

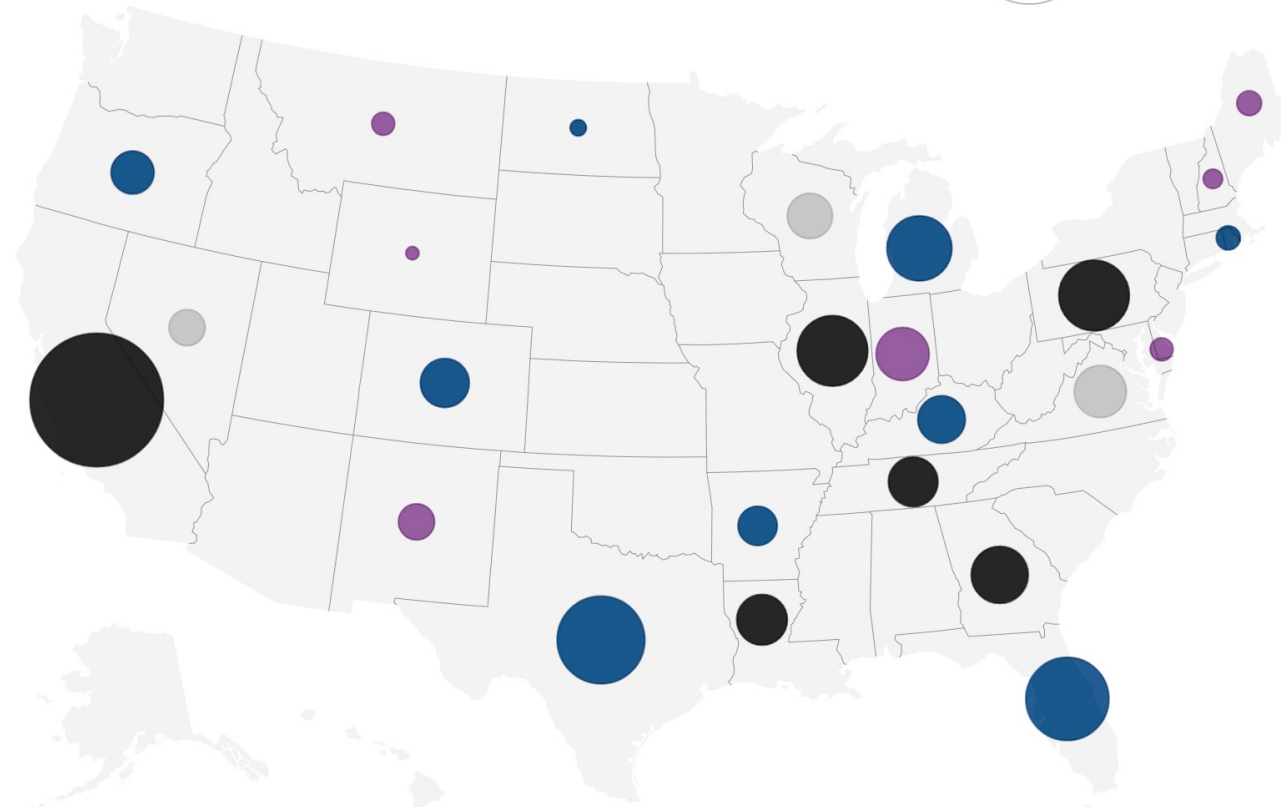
Consulting firm Deloitte dominates an important slice of government business: Twenty-five states have awarded it eligibility system contracts, worth at least \$6 billion, with 53 million Medicaid enrollees in those states as of April 1, 2023.

Contract value:

■ <\$100M ■ \$100M-\$500M ■ >\$500M ■ Unavailable

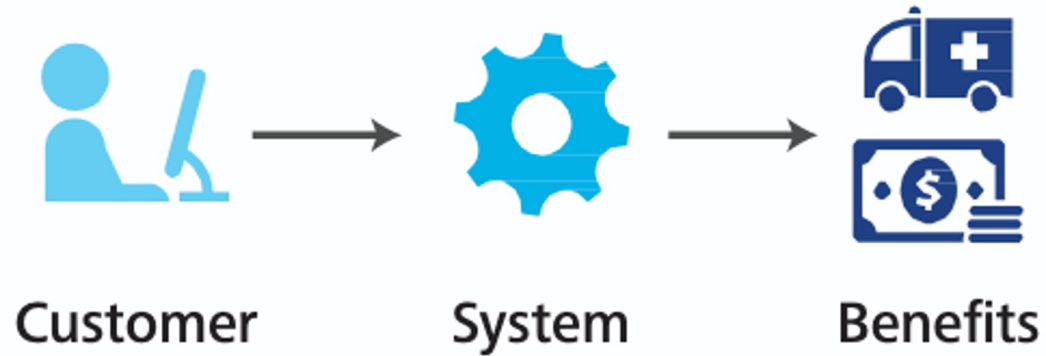
Medicaid enrollment:

○ 1M ○ 4M ○ 10M



Reality of Public-Sector Legal Automation

NO-TOUCH



DiJuana Davis and her five children lost healthcare coverage due to error in Deloitte Medicaid system

When Law Mistranslated into Software, Can have Devastating Effects

- Failure to release eligible prisoners
 - 733 inmates in Arizona (at least)
- Interrupting access to public benefits like health care and food assistance
 - 100,000 people in Texas
 - 24,000 children
- Automated accusations of fraud
 - 42,000 in Michigan (\$20-100M)
 - 526,000 in Australia



Investigating Breakdowns in Public Sector Legal Automation

Policymakers and vendors downplay errors as aberrant and correctable

I empirically investigate errors in legal automation:

- How can we find these errors?
- Where are problems coming from?
- Why don't regulations root out issues?



Thesis Statement:

Legal automation is afflicted by endemic error that is harder to avoid, detect, and fix than recommendations from policymakers and practitioners assume.

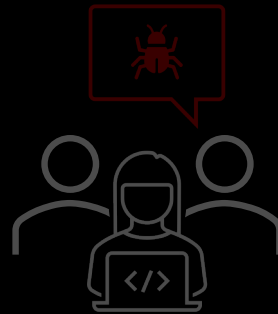
Study 1:

Novel (but resource intensive) methods for evaluating computational legal systems reveal extensive errors.



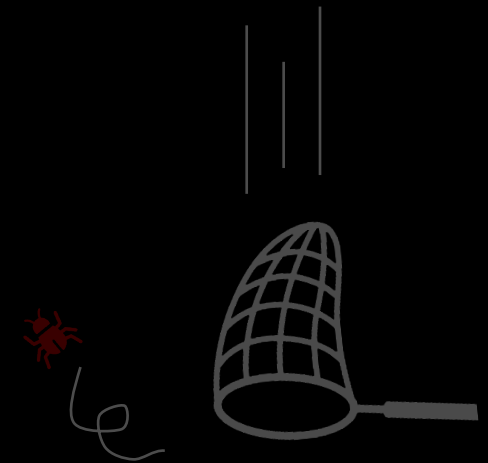
Study 2:

The disciplinary divide between computer science and law contributes to endemic error, but practitioners fail to recognize flaws.



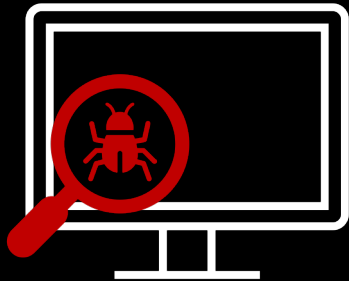
Study 3:

Errors persist because policies aiming to uncover and address problems are misaligned with the reality of algorithmic systems.



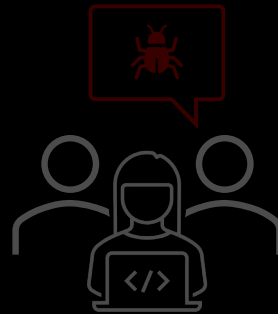
Study 1:

Novel (but resource intensive) methods for evaluating computational legal systems reveal extensive errors.



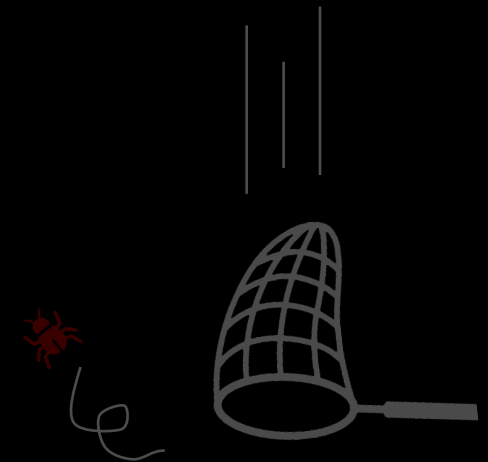
Study 2:

The disciplinary divide between computer science and law contributes to endemic error, but practitioners fail to recognize flaws.



Study 3:

Errors persist because policies aiming to uncover and address problems are misaligned with the reality of algorithmic systems.



USA Public Benefits

(synonyms: government benefits, welfare programs)

- Benefits programs can help people afford necessities like food, housing, and healthcare
- Applicants are **means-tested** for many programs – families only get benefits if they prove that they lack the means to do without that help
- Usually established by legislation
 - Funding and eligibility requirements are frequently revised by the legislators or by the agencies administering the programs.

A *SNAP household* is a person or a group of persons applying for or receiving SNAP benefits. The household may live in a house, apartment, or institutional setting (such as a group living arrangement or battered women's shelter) or may be homeless.

[7 CFR § 273.1\(a\)](#)

The following are households:

- A person living alone who buys food and prepares meals

[7 CFR § 273.1\(a\)\(1\)](#)

- A person or group living with others who buy and prepare meals separately

[7 CFR § 273.1\(a\)\(2\)](#)

Example: Judy and her two children share a house with Karen and her daughter. Judy and Karen are not related, and they prepare meals and eat separately. Judy (with her two children) and Karen (with her daughter) are two separate households. See [Section 510.2](#).

- A group of persons who live together and buy food and prepare meals together

[7 CFR § 273.1\(a\)\(3\)](#)

Example: Ken and Susan share an apartment with Susan's friend Lynne and her two daughters. They all eat together. All five people are one SNAP household.

Exception: Ken and Susan may be a separate household if they are elderly and cannot buy food and prepare meals because they are permanently disabled. See [Section 510.41](#).

[7 CFR § 273.1\(b\)\(2\)](#)

Many Government Systems Automatically Apply Benefits Rules



Option 1: Ask Nicely for the Code



Option 2: Seize it!!! (Politely)

- Some tools have inputs and outputs exposed for probing
 - Method: Algorithmic Auditing
 - Target: Eligibility Screening Tools

Eligibility Screening Tools

- Type of computational legal systems
 - Optional subcomponent of automated benefits system
- Accepts information about a household, then predicts whether they will qualify for benefits
 - No need to read hundreds of pages of eligibility handbooks

Am I eligible for SNAP

Find out if you may be eligible in 10 seconds.

How many people live in your household, including you? (Required)

If you buy and make more than 2/3 of your meals with others, they must be in your household. If your spouse or children under 22 live with you, they must be in your household even if you do not buy and make meals with them.

1 2 3 4 5

Is anyone age 60 or older? (Required)

Yes No

Does anyone in the household have a physical or mental [disability](#)? (Required)

Yes No

What is the total [gross income](#) for your household? (Required)

\$ per

Method for Auditing Screening Tools

Can be adapted to benefits eligibility screening tools in any jurisdiction in the USA, without requiring state cooperation

- Locate embedded errors, i.e., incorrect application of the legal rules
- Illustrated on the Pennsylvania “Do I Qualify?” screening tool

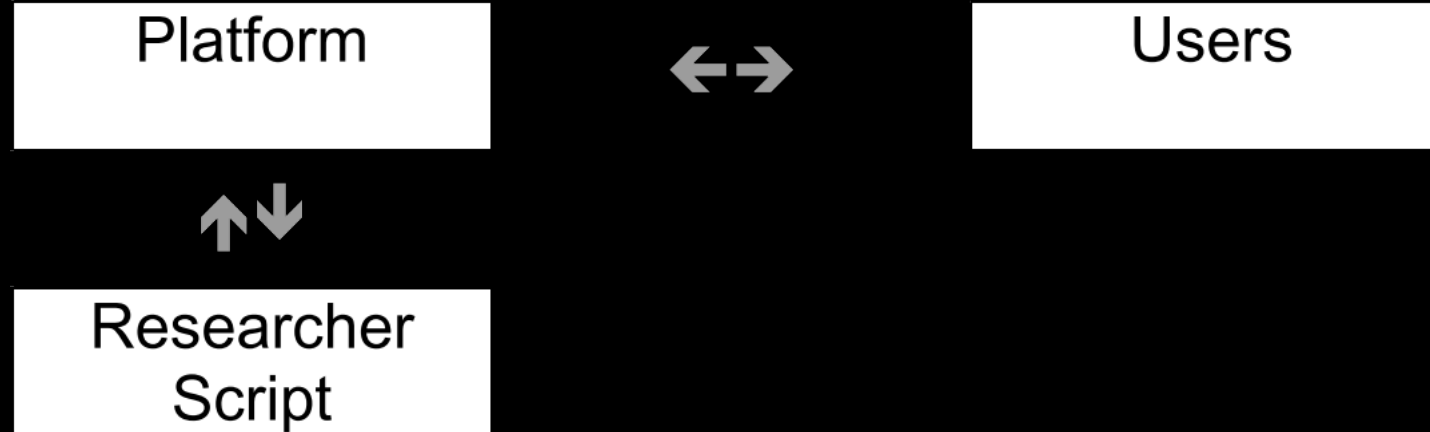
The screenshot shows the homepage of the COMPASS website. The header includes the Pennsylvania state logo, the COMPASS logo with the tagline 'CLICK. APPLY. BENEFIT.', and navigation links for 'WHAT WE OFFER', 'HELPFUL LINKS', 'ABOUT', 'CONTACT US', and 'LOGIN / REGISTER'. A blue banner on the left contains the text 'Welcome to COMPASS' and 'The fast and easy way to access benefits - anytime and anywhere'. Below this banner are two buttons: 'APPLY NOW' and 'DO I QUALIFY?'. The main content area features a photograph of a doctor in a white coat talking to a family (a woman and two children) in a medical office setting.

This screenshot shows the 'Do I Qualify?' step of the screening tool. It features a progress bar at the top with icons for 'Getting Started', 'Do I Qualify?' (active), and 'Your Results'. The form is titled 'Household' and asks for details about the head of household. Fields include 'Name', 'Age', and 'Sex' (with radio buttons for Male and Female). There is an 'ADD ANOTHER PERSON' button and a 'Remove' button. Below these are two questions: 'Does anyone in the household pay for heat?' and 'About how much is the total value of all the resources owned by the people in the household?'. The form includes radio buttons for 'Yes' and 'No' and a text input field for the resource value with a 'Format: XXXXXXXXX' placeholder.

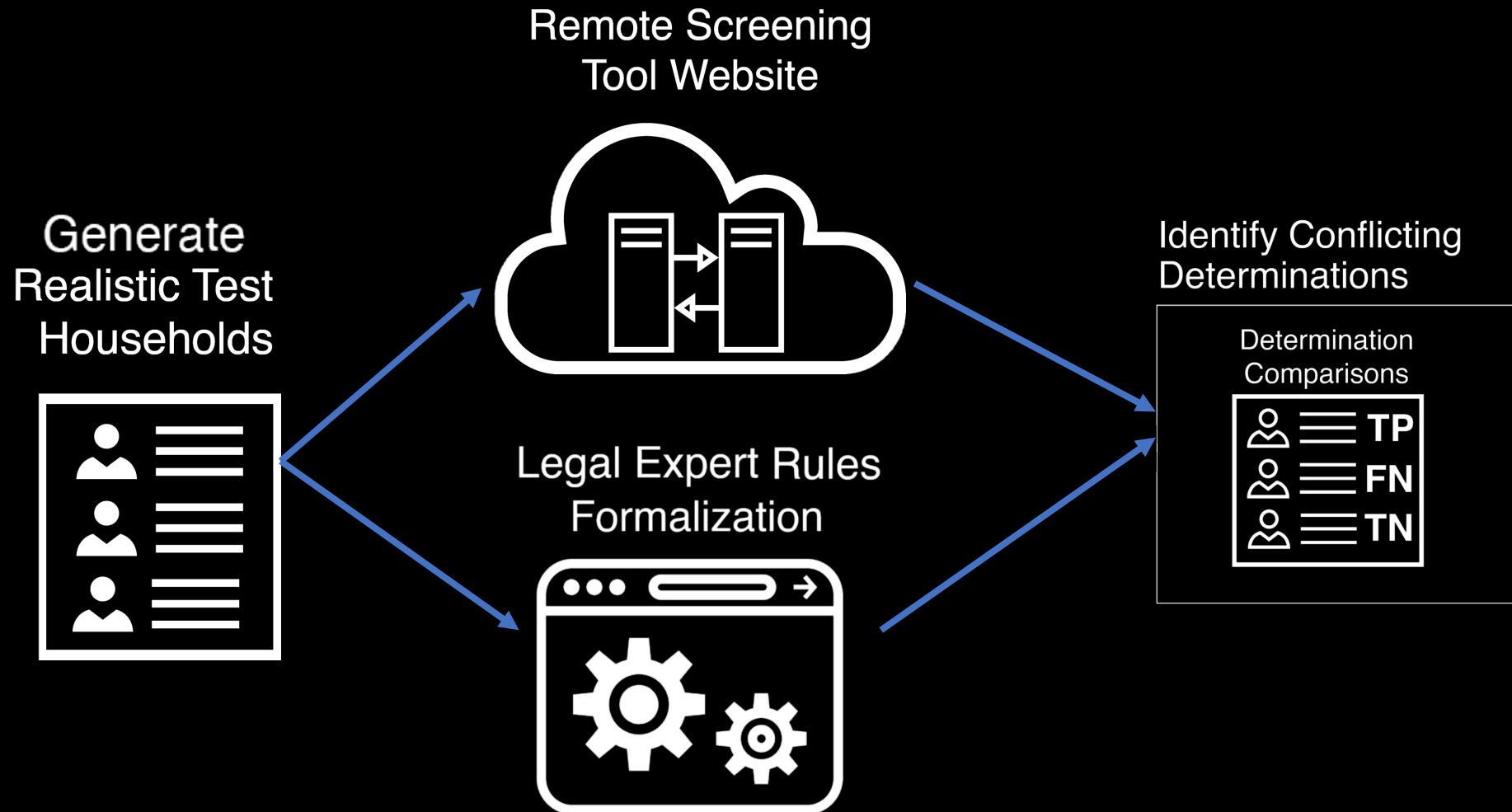
This screenshot shows the 'Your Results' page. The progress bar at the top indicates that the 'Do I Qualify?' step is complete. The main heading reads: 'We looked at your answers and someone in your house may qualify for benefits.' Below this, there are three sections of results, each with a checkmark icon and a 'More Information' link. The first section states: 'Based on the answers you gave, one or more people in the house may qualify for the following benefits. Click the 'Apply Now' button at the bottom of the page to start the application process.' The listed benefits are: 'Health Care Coverage (CHIP, Medical Assistance, Medicaid for Former Foster Care Youth, Mental Health/Substance Abuse, Health Insurance Marketplace) - For Children', 'Supplemental Nutrition Assistance Program (Food Stamps)', and 'Low-Income Home Energy Assistance Program (LIHEAP)'. The second section states: 'Based on the answers you gave, one or more people in your household may also qualify for the following benefits that are not available through COMPASS. Click on the 'More Information' link(s) to learn more about each benefit and how to apply.' The listed benefits are: 'Medicare Program' and 'Supplemental Security Income'. The third section states: 'Based on the answers you gave, we did not determine you eligible for the following benefits you selected. You may still be eligible if you meet certain qualifications that are not determined here. Click on the 'More Information' link(s) to learn more about why you may or may not qualify for those benefits.'

Algorithmic Auditing Method

- Algorithmic audit is a method used to probe black-box algorithms
 - **Scraping audits** involve sending multiple queries to a system and observing the results



Approach to Audit Correctness of Screening Tool Decisions



Generate Test Households

Getting Started Do I Qualify? Your Results

🏠 Household

🏠 Household

Please provide the details about the Head of Household first. [?](#)

Name * Age * Sex *

 Male Female

[Remove](#)

[ADD ANOTHER PERSON](#) If there is anyone else in the household, please click the 'Add Another Person' button.

Does anyone in the household pay for heat?

Yes No

About how much is the total value of all the resources owned by the people in the household? [?](#)

Format: XXXXXXXX.XX

Does anyone in the household who is 21 or younger have a parent who does not live in the house or who has died?

Yes No

- Challenges of creating test input set:
 - Must be limited number, since others use this service
 - Wide range of possible inputs could produce unrealistic families

Generate (Realistic) Test Households

Getting Started Do I Qualify? Your Results

🏠 Household

🏠 Household

Please provide the details about the Head of Household first.

Name * Age * Sex *

 Male Female

If there is anyone else in the household, please click the 'Add Another Person' button.

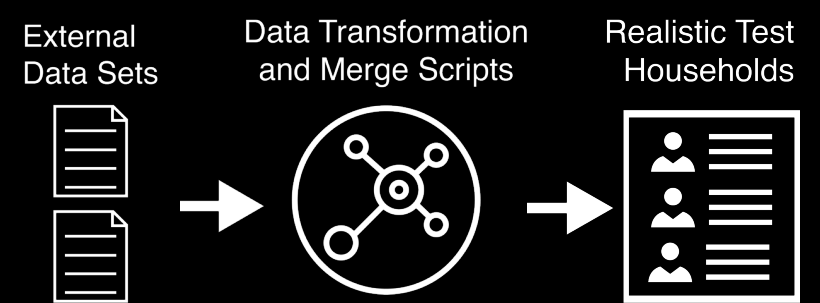
Does anyone in the household pay for heat?
 Yes No


About how much is the total value of all the resources owned by the people in the household? ?
Format: XXXXXXXX.XX


Does anyone in the household who is 21 or younger have a parent who does not live in the house or who has died?
 Yes No


Census Data

person_id	household_id	age	sex
1	1	30	m
2	1	2	f
3	2	44	f



 Household

 Household

Please provide the details about the Head of Household first. 

Name *

Age *

Sex *

Male Female

Remove

ADD ANOTHER PERSON

If there is anyone else in the household, please click the 'Add Another Person' button.

About how much is the total value of all the resources owned by the people in the household? 

Format: XXXXXXXX.XX

Does anyone in the household who is 21 or younger have a parent who does not live in the house or who has died?

Yes No

Does anyone in the household have a spouse who is not living in the house or has died?

Yes No

Has anyone in the household lost their job or had their hours reduced through no fault of their own within the past year?

Yes No

Legal Expert Representation of Law in Code

DEPARTMENT OF HEALTH AND HUMAN SERVICES
National Committee on Vital and Health Statistics: Meeting

Pursuant to the Federal Advisory Committee Act, the Department of Health and Human Services (HHS) announces the following advisory committee meeting.

Name: National Committee on Vital and Health Statistics (NCVHS), Subcommittee on Privacy, Confidentiality and Security.

Date and Times: Thursday, March 21, 2019: 9:00 a.m.–5:30 p.m. (EDT), Friday, March 22, 2019: 8:30 a.m.–3:00 p.m. (EDT).

Place: Centers for Disease Control and Prevention, National Center for Health Statistics, 3311 Toledo Road, Auditorium, Hyattsville, Maryland 20782.

Status: Open. There will be an opportunity for public comment at the end of the first day of the meeting.

Purpose: NCVHS is charged with studying and identifying privacy and security and access measures to protect individually identifiable health information in an environment of electronic networking and multiple uses of data. Further, the Committee advises the Secretary and is mandated to report to Congress on the status of the Health Insurance Portability and Accountability Act of 1996 (HIPAA), which establishes the regulatory framework for personally identifiable health information by covered entities and business associates.

Through the Subcommittee on Privacy, Confidentiality and Security, the Committee undertook a “Beyond HIPAA” initiative to examine emerging health information privacy and security issues that are beyond the scope of HIPAA to consider a health data privacy and security framework for the 21st century. The goals for the Beyond HIPAA initiative are to:

1. Identify and describe the changing environment and the risks to privacy and security of confidential health information; highlight promising policies, practices and technology;
2. Lay out integrative models for how best to protect individuals’ privacy and secure health data uses outside of HIPAA protections while enabling useful uses, services and research;
3. Formulate recommendations for the Secretary on actions that HHS and other federal departments might take; and
4. Prepare a report for data stewardship.

The objective of this meeting is to develop recommendations to define a

contemporary framework of data stewardship for the HHS Secretary, including a pathway for improving private and public sector governance of health information over the next decade. To accomplish this, the Subcommittee plans to:

- (a) Outline key principles for stewardship of health data in the environment described in a recent NCVHS environmental scan report and the essential public and private levers to ensure appropriate governance;
- (b) Reach consensus on actions to update NCVHS’ 2008 report, “Enhanced Protections for Uses of Health Data: A Stewardship Framework for “Secondary Uses” of Electronically Collected and Transmitted Health Data—Summary for Policy Makers.”

Through this work, the Subcommittee also plans to identify key themes for communications with individuals, policymakers, and stakeholders in the private sector. The times and topics for this meeting are subject to change. Please refer to the posted agenda for any updates.

Contact Persons for More Information: Substantive program information may be obtained from Rebecca Hines, MHS, Executive Secretary, NCVHS, National Center for Health Statistics, Centers for Disease Control and Prevention, 3311 Toledo Road, Hyattsville, Maryland 20782, telephone (301) 458-4715. Information pertaining to meeting content may be obtained from Rachel Seeger, MA, MPA, Office of the Secretary/Office of Civil Rights, Room 509E, Department of Health and Human Services, 200 Independence Avenue SW, Washington, DC 20201, telephone: (202) 260-7106. Summaries of meetings and a roster of Committee members are available on the NCVHS website: www.ncvhs.hhs.gov, where further information including a meeting agenda and instructions to access the live broadcast of the meeting will be posted.

Should you require reasonable accommodation, please contact the CDC Office of Equal Employment Opportunity on (770) 488-3210 as soon as possible.

Date: January 28, 2019.
Sharon Arnold,
Associate Deputy Assistant Secretary for Planning and Evaluation, Science and Data Policy, Office of the Assistant Secretary for Planning and Evaluation.

(FR Doc. 2019-00706 Filed 1-31-19; 8:45 am)
BILLING CODE 4161-06-P

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Office of the Secretary

Annual Update of the HHS Poverty Guidelines

AGENCY: Department of Health and Human Services.

ACTION: Notice.

SUMMARY: This notice provides an update of the Department of Health and Human Services (HHS) poverty guidelines to account for last calendar year’s increase in prices as measured by the Consumer Price Index.

DATES: *Applicable Date:* January 11, 2019 unless an office administering a program using the guidelines specifies a different effective date for that particular program.

ADDRESSES: Office of the Assistant Secretary for Planning and Evaluation, Room 404E, Humphrey Building, Department of Health and Human Services, Washington, DC 20201.

FOR FURTHER INFORMATION CONTACT: For information about how the guidelines are used or how income is defined in a particular program, contact the Federal, state, or local office that is responsible for that program. For information about poverty figures for immigration forms, the Hill-Burton Uncompensated Services Program, and the number of people in poverty, use the specific telephone numbers and addresses given below.

For general questions about the poverty guidelines themselves, contact Kendall Svenson, Office of the Assistant Secretary for Planning and Evaluation, Room 422F, Humphrey Building, Department of Health and Human Services, Washington, DC 20201—telephone: (202) 690-7409—or visit <http://aspe.hhs.gov/poverty/>.

For information about the percentage adjustments in the formula result in reductions to the guidelines from the previous year for some household sizes, the guidelines for the affected household sizes are fixed at the prior year’s guidelines. As in prior years, these 2019 guidelines are roughly equal to the poverty thresholds for calendar year 2018 which the Census Bureau expects to publish in final form in September 2019.

The poverty guidelines continue to be derived from the Census Bureau’s current official poverty thresholds; they are not derived from the Census Bureau’s Supplemental Poverty Measure (SPM).

The following guideline figures represent annual income.

For information about the number of people in poverty, visit the Poverty section of the Census Bureau’s website at <https://www.census.gov/topics/income-poverty/poverty.html> or contact the Census Bureau’s Customer Service Center at 1-800-923-8282 (toll-free) or visit <https://ask.census.gov> for further information.

SUPPLEMENTARY INFORMATION:

Background

Section 673(2) of the Omnibus Budget Reconciliation Act (OBRA) of 1981 (42 U.S.C. 9902(2)) requires the Secretary of the Department of Health and Human Services to update the poverty guidelines at least annually, adjusting them on the basis of the Consumer Price Index for All Urban Consumers (CPI-U). The poverty guidelines are used as an eligibility criterion by Medicaid and a number of other Federal programs. The poverty guidelines issued here are a simplified version of the poverty thresholds that the Census Bureau uses to prepare its estimates of the number of individuals and families in poverty.

As required by law, this update is accomplished by increasing the latest published Census Bureau poverty thresholds by the relevant percentage change in the Consumer Price Index for All Urban Consumers (CPI-U). The guidelines in this 2019 notice reflect the 2.4 percent price increase between calendar years 2017 and 2018. After this inflation adjustment, the guidelines are rounded and adjusted to standardize the differences between family sizes. In rare circumstances, the rounding and standardizing adjustments in the formula result in small decreases in the poverty guidelines for some household sizes even when the inflation factor is not negative. In cases where the year-to-year change in inflation is not negative and the rounding and standardizing adjustments in the formula result in reductions to the guidelines from the previous year for some household sizes, the guidelines for the affected household sizes are fixed at the prior year’s guidelines. As in prior years, these 2019 guidelines are roughly equal to the poverty thresholds for calendar year 2018 which the Census Bureau expects to publish in final form in September 2019.

The poverty guidelines continue to be derived from the Census Bureau’s current official poverty thresholds; they are not derived from the Census Bureau’s Supplemental Poverty Measure (SPM).

The following guideline figures represent annual income.

2019 POVERTY GUIDELINES FOR THE 48 CONTIGUOUS STATES AND THE DISTRICT OF COLUMBIA

Persons in family/household	Poverty guideline
1	\$12,490
2	16,910
3	21,330
4	25,750
5	30,170
6	34,590
7	39,010
8	43,430

For families/households with more than 8 persons, add \$4,420 for each additional person.

2019 POVERTY GUIDELINES FOR ALASKA

Persons in family/household	Poverty guideline
1	\$15,800
2	21,130
3	26,660
4	32,190
5	37,720
6	43,250
7	48,780
8	54,310

For families/households with more than 8 persons, add \$5,530 for each additional person.

2019 POVERTY GUIDELINES FOR HAWAII

Persons in family/household	Poverty guideline
1	\$14,380
2	19,460
3	24,540
4	29,620
5	34,700
6	39,780
7	44,860
8	49,940

For families/households with more than 8 persons, add \$5,080 for each additional person.

Separate poverty guideline figures for Alaska and Hawaii reflect Office of Economic Opportunity administrative practice beginning in the 1966–1970 period. (Note that the Census Bureau poverty thresholds—the version of the poverty measure used for statistical purposes—have never had separate figures for Alaska and Hawaii.) The poverty guidelines are not defined for Puerto Rico or other outlying jurisdictions. In cases in which a Federal program using the poverty guidelines serves any of those jurisdictions, the Federal office that

administers the program is generally responsible for deciding whether to use the contiguous-states-and-DC guidelines for those jurisdictions or to follow some other procedure.

Due to confusing legislative language dating back to 1972, the poverty guidelines sometimes have been mistakenly referred to as the “OMB” (Office of Management and Budget) poverty guidelines or poverty line. In fact, OMB has never issued the guidelines; the guidelines are issued each year by the Department of Health and Human Services. The poverty guidelines may be formally referenced as “the poverty guidelines updated periodically in the Federal Register by the U.S. Department of Health and Human Services under the authority of 42 U.S.C. 9902(2).”

Some Federal programs use a percentage multiple of the guidelines (for example, 125 percent or 185 percent of the guidelines), as noted in relevant authorizing legislation or program regulations. Non-Federal organizations that use the poverty guidelines under their own authority in non-Federally-funded activities also may choose to use a percentage multiple of the guidelines.

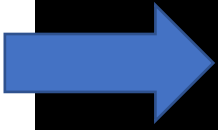
The poverty guidelines do not make a distinction between farm and non-farm families, or between aged and non-aged units. (Only the Census Bureau poverty thresholds have separate figures for aged and non-aged one-person and two-person units.)

Note that this notice does not provide definitions of such terms as “income” or “family,” because there is considerable variation in defining these terms among the different programs that use the guidelines. These variations are not traceable to the different laws and regulations that govern the various programs. This means that questions such as “Is income counted before or after taxes?”, “Should a particular type of income be counted?”, and “Should a particular person counted as a member of the family/household?” are actually questions about how a specific program applies the poverty guidelines. All such questions about how a specific program applies the guidelines should be directed to the entity that administers or funds the program, since that entity has the responsibility for defining such terms as “income” or “family,” to the extent that those terms are not already defined for the program in legislation or regulations.

Alex M. Azar,
Secretary of Health and Human Services.
 (FR Doc. 2019-00621 Filed 1-31-19; 8:45 am)
BILLING CODE 4190-06-P



```
def poverty_guidelines(percent=1):
    guidelines = {
        1: 12490,
        2: 16910,
        3: 21330,
        4: 25750,
        5: 30170,
        6: 34590,
        7: 39010,
        8: 43430
    }
    for i in range(9, 21):
        guidelines[i] = (43430 + (i - 8) * 4420)
    guidelines.update((x, y*percent) for x, y in guidelines.items())
    return guidelines
```

Python function encoding FPIG for Pennsylvania



Investigate Conflicts between Screening Tool and Legal Expert

- Treated conflicts as a sign to explore further
 - Manually reviewed households against legal rules

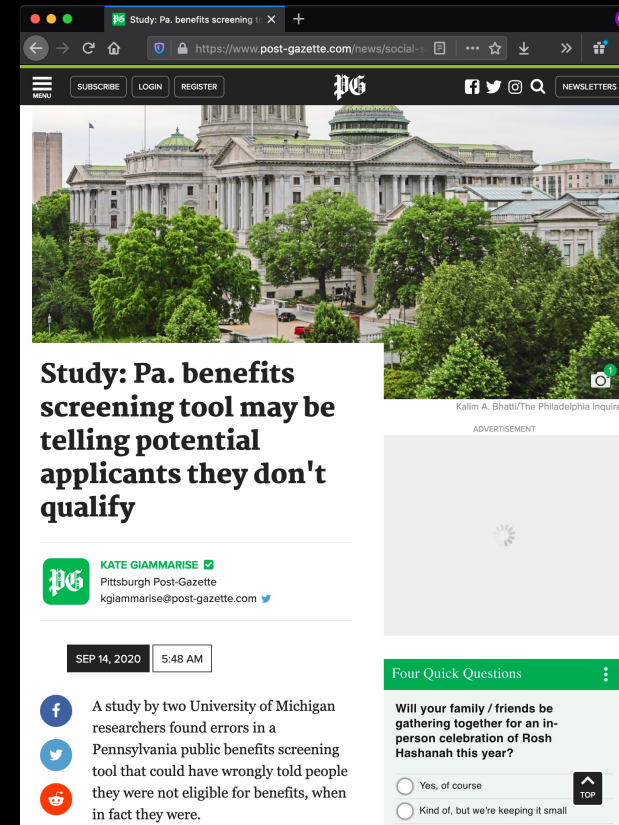
Test Household	All adults employed or disabled?	Income below threshold for family size?	Childcare eligibility Legal expert:	Childcare eligibility Screening tool:
	Parent 1: employed ✓	Threshold for 2 people: \$33,820 Income: \$11,101 ✓	✓	✗
	Parent 1: employed Parent 2: employed ✓	Threshold for 4 people: \$51,500 Income: \$45,300 ✓	✓	✗

Results: Subsidized Child Care

- Program described in Pennsylvania Code Title 55, Chapter 3041
 - Families with a child who needs supervision and whose income falls below specified income thresholds are eligible
- The tool **predicted zero families eligible** for the subsidized child care benefit
 - Our formalization marked ~1/3 of households with children as eligible

An update...

- Some of the errors we exposed have been corrected in the “Do I Qualify?” Screening Tool
- But coordination between interested groups & public attention meant that it took a while to correct errors



The screenshot shows a web browser displaying a news article. The browser's address bar shows the URL: <https://www.post-gazette.com/news/social-...>. The article's main headline is "Study: Pa. benefits screening tool may be telling potential applicants they don't qualify". The author is identified as KATE GIAMMARISE, Pittsburgh Post-Gazette. The article is dated SEP 14, 2020, at 5:48 AM. A social media share box includes Facebook, Twitter, and Reddit icons. The article text begins with "A study by two University of Michigan researchers found errors in a Pennsylvania public benefits screening tool that could have wrongly told people they were not eligible for benefits, when in fact they were." To the right of the article, there is an advertisement placeholder with a loading spinner and a "Four Quick Questions" section with a poll question: "Will your family / friends be gathering together for an in-person celebration of Rosh Hashanah this year?". The poll options are "Yes, of course" and "Kind of, but we're keeping it small".

Takeaways

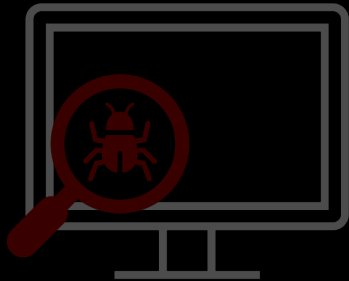
- Can evaluate the decisions made by a subset of computational legal systems
- Applying this method to a real tool revealed extensive errors
- However, resource-intensive process and may take years to realize fixes

What next?

- Results indicate pervasive error in government tool
- Ex post evaluation not the most efficient for dealing with errors
 - Pennsylvania only corrected problems after public pressure
- Can we address these issues at an earlier point, before they have harmed vulnerable people?

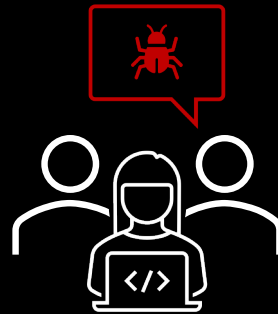
Study 1:

Novel (but resource intensive) methods for evaluating computational legal systems reveal extensive errors.



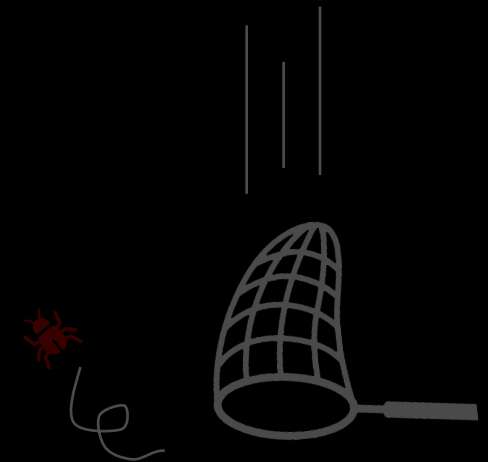
Study 2:

The disciplinary divide between computer science and law contributes to endemic error, but practitioners fail to recognize flaws.



Study 3:

Errors persist because policies aiming to uncover and address problems are misaligned with the reality of algorithmic systems.



Existing Proposals for Improving Translation of Law into Code

- Which laws should be translated to software?

Concrete law

- Well-defined, determinate, predictable
- Reasonable humans would all agree
- Ex: Identifying students who qualify for free school lunch based on whether household income is at or below 130% of the Federal poverty line
 - Think computers can calculate inequalities well

Ambiguous law

- Indeterminate, open to multiple interpretations
- Reasonable human could disagree
- Ex: Determining whether the defendant committed first-degree murder by evaluating evidence that a killing was premeditated
 - Don't think computers should determine a person's mental state

Existing Proposals for Improving Translation of Law into Code

- Who should translate law to software?



Interdisciplinary teams

- Software development teams should incorporate legal experts



Siloed, homogenous teams

- Many development teams are composed exclusively of programmers who lack legal expertise
- When legal department is separate, often reluctant to intrude on tasks they deem “technical”

Existing Proposals for Improving Translation of Law into Code

- Which laws should be translated to software?
 -  Concrete law
 -  Ambiguous law

→ Mistranslations are the result of improper law selection

- Who should translate law to software?
 -  Interdisciplinary teams
 -  Siloed, homogenous teams

→ Mistranslations are the result of programmer ignorance of law

Neither proposal has been empirically validated...

Experimental Study Design

- 15 teams translated concrete and ambiguous bankruptcy provisions into an interactive legal tool
 - 9 teams of computer scientists, 6 interdisciplinary teams of CS + Law
- Interpretive qualitative analysis
 - 100+ hours of screen recordings
 - Chat logs, audio transcripts
 - Code diffs

Translating the Law Task

11 U.S. Code § 523. Exceptions to discharge

(a) A discharge under... this title does not discharge an individual debtor from any debt—

(4) for fraud or defalcation while acting in a fiduciary capacity, embezzlement, or larceny;

(5) for a domestic support obligation;

(8) unless excepting such debt from discharge under this paragraph would impose an undue hardship on the debtor and the debtor's dependents, for—

(A)

(ii) an obligation to repay funds received as an educational benefit, scholarship, or stipend

Example Tool Produced

Eligibility Screening

localhost:8080/survey? 200%

Screening Questions

EXIT →

11 U.S. Code § 523.

Was your debt incurred as an action that you committed in regards to fraud, defalcation, embezzlement, or larceny? :

Yes

No

Submit

CompHCI Lab

Eligibility Response

localhost:8080/response 200%

Screening Result

EXIT →

You are not eligible to discharge of debt under U.S. Code § 523 -
Exceptions to discharge

Start Over

CompHCI Lab

Contrast in Disciplinary Modes of Reasoning

	CS Mode of Reasoning	Legal Mode of Reasoning
Task	Simple	Complex
People	Users	Clients
Software	Inspectable	Black Box
Translation of Law into Code	Direct Representation of Law	Simplified Representation of Law

Translating the Law – Expected Behavior

- In bankruptcy, some types of debt can be forgiven to give a debtor a fresh start
 - 11 USC 523 lists types of debts that cannot be forgiven
- A person can have different types of debt
- Should evaluate each debt separately and decide whether it can be forgiven

Unpaid utilities

debt: \$1100



Child support


debt: \$850




High Rates of Error Observed

	Interdisciplinary Teams	Computer Science Teams
Correct Advice	1 (17%)	1 (11%)
Incorrect Advice	5 (83%)	8 (89%)


Correct
Advice


*Unpaid utilities
debt: \$1100* 

*Child support
debt: \$850* 



Common
Incorrect
Advice

*Unpaid utilities
debt: \$1100* 

*Child support
debt: \$850* 



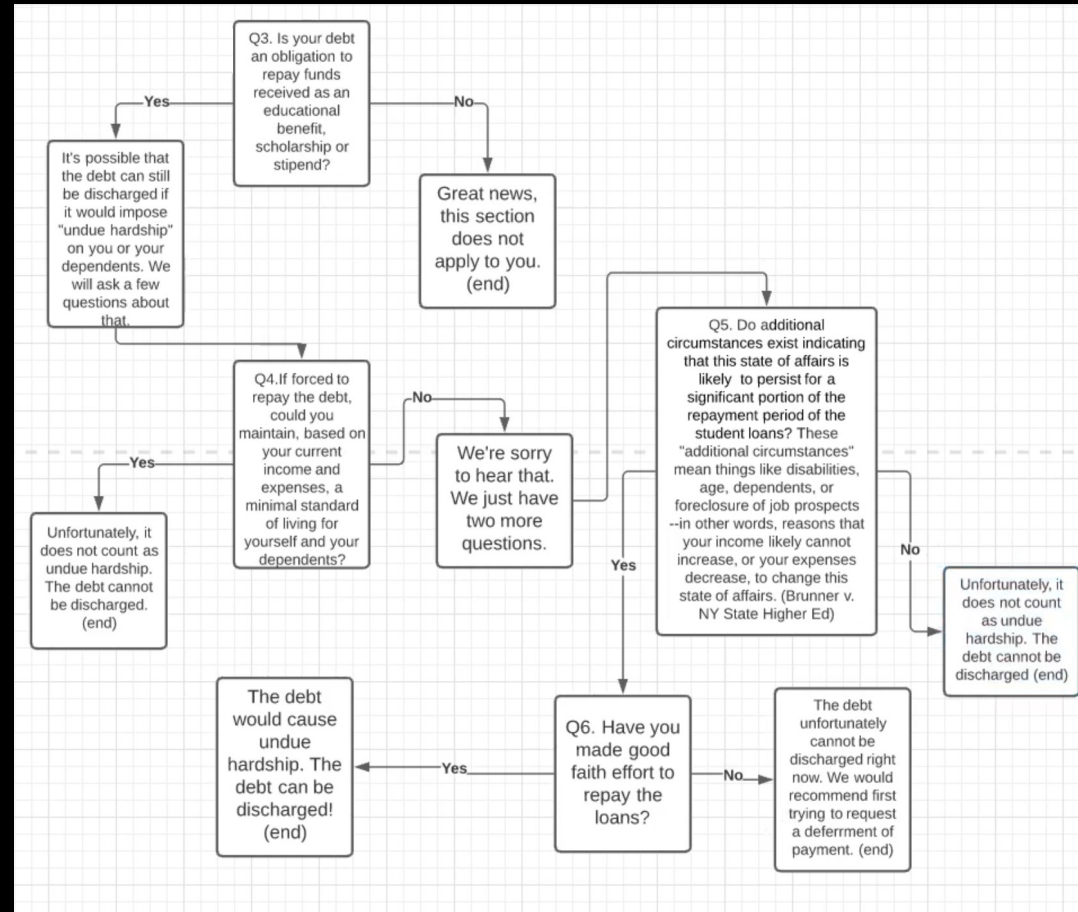
Computer Science Teams Thought Task Did not Require Understanding Law or Bankruptcy Context

- Did less legal research than interdisciplinary teams
 - < 7 minutes for computer science teams
 - > 30 minutes for interdisciplinary teams
- *CS25: I guess since we're just kind of just asking questions, we don't really need to understand the reasoning behind [the law].*

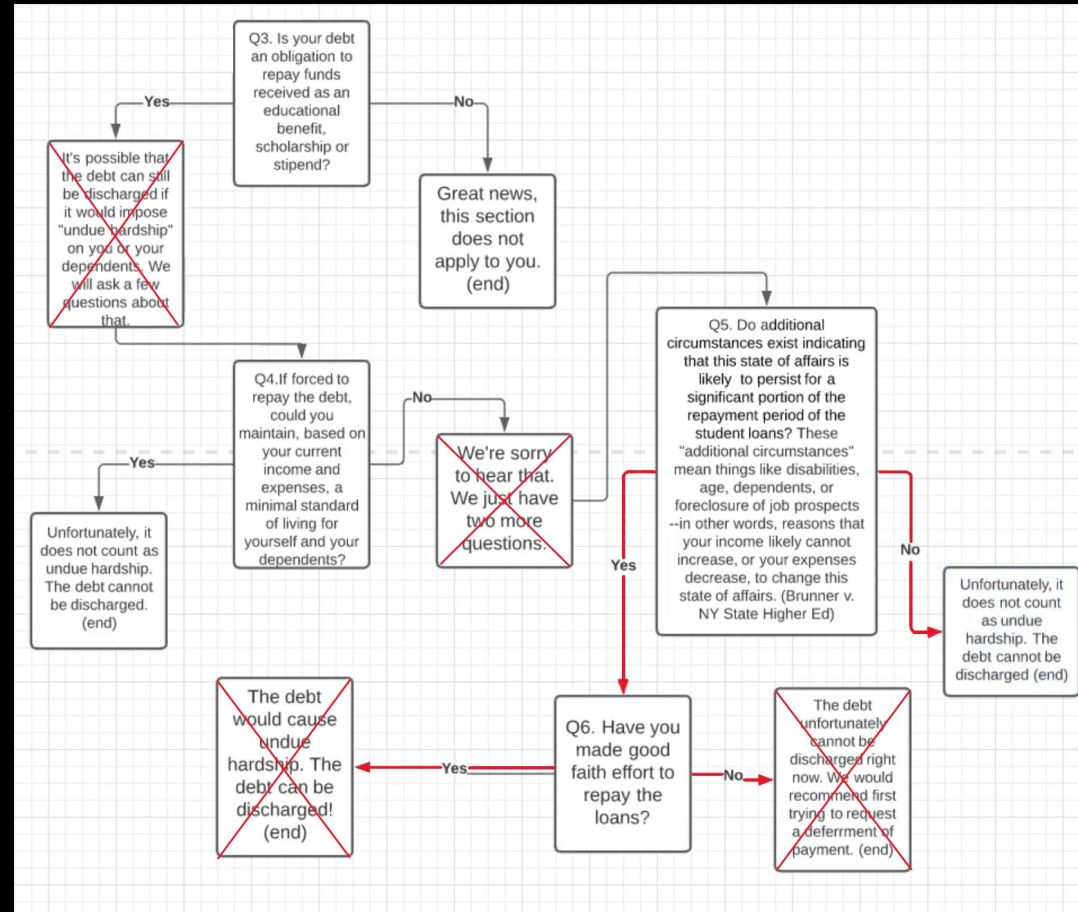
Interdisciplinary Teams used Boundary Objects to Negotiate Design of Tools

- Lawyers developed strong understanding of the law through legal research
- Lawyers used boundary objects, like diagrams and outlines to coordinate tool development
- Yet, specifications often ambiguous, incoherent, or ignored
 - Unrecognized because lawyers reluctant to engage in testing

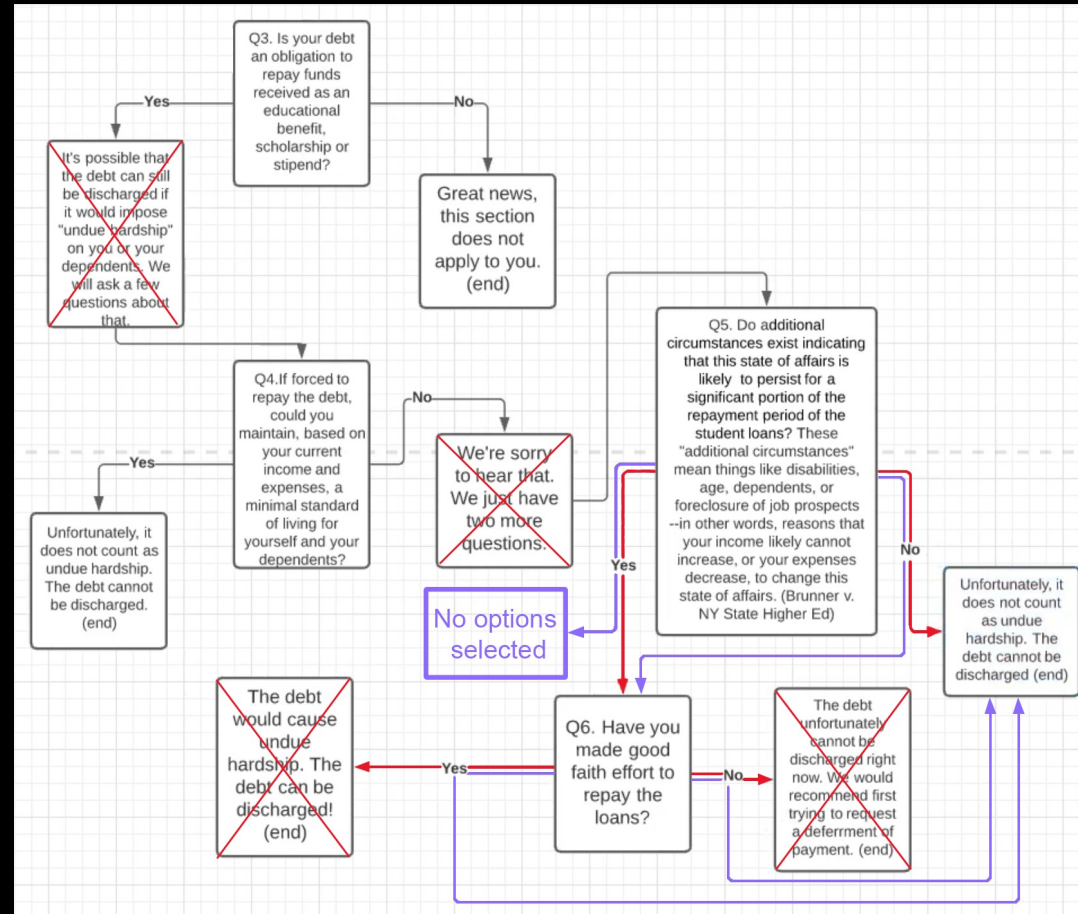
Departure of Tools from Lawyer-Created Specifications



Departure of Tools from Lawyer-Created Specifications



Departure of Tools from Lawyer-Created Specifications



Lawyers *also* deviated from established legal practice

- When multiple interpretations available, lawyers opted for strict standards
 - Believed computers can only operate over rigid categories
 - Did not attempt to balance factors
- Created tools more strict about forgiving student loan debt than judges!

Translating Ambiguous Law

11 U.S. Code § 523. Exceptions to discharge

(a) A discharge under... this title does not discharge an individual debtor from any debt—

(4) for fraud or defalcation while acting in a fiduciary capacity, embezzlement, or larceny;

(5) for a domestic support obligation;

(8) unless excepting such debt from discharge under this paragraph would impose an undue hardship on the debtor and the debtor's dependents, for—

(A)

(ii) an obligation to repay funds received as an educational benefit, scholarship, or stipend

(Non)Interpretation of ambiguity in CS only teams

- Most CS teams **push the ambiguity to the user, rather than resolving it internally**

Was this debt received as an educational benefit, scholarship, or stipend?

Yes

No

Does this 'student' debt impose an undue hardship on the debtor?

Yes

No

Interpretation of Ambiguity in CS+Law teams

- Resolution of ambiguity often involves choosing among judicial interpretations

Law participant: *Um, uh, will, um, yeah, would a continued obligation to repay this debt... Yeah, will, uh, will these circumstances continue... Uh, maybe we just use the Brunner language.*

CS participant: *Yeah.*

Law: *Actually. Like, it's a little legalese, but I think it's still, is understandable.*

CS: *Yeah.*

Interpretation of Ambiguity in CS+Law teams

- Ambiguity resolved by asking about a fixed set of factors

Do any additional circumstances such as:

(a) permanent or long term illness,

(b) an inability to work due to lack of skills, and/or

(c) having numerous dependents, or similarly long-lasting



circumstances exist indicating that any inability to pay will persist for a significant portion of the repayment period?

Have you attempted to obtain employment (including seeking non-desirable jobs or jobs unrelated to your education), maximize income, and minimize expenses in order to repay the debt(s)?



Submit

Results Challenge Existing Proposals



- Proposal: Which laws should be translated to software?

-  Concrete law
-  Ambiguous law



- In practice:

-  Concrete law
-  Ambiguous law

- Proposal: Who should translate laws to software?

-  Interdisciplinary teams
-  Siloed, homogenous teams

- In practice:

-  Interdisciplinary teams
-  Siloed, homogenous teams

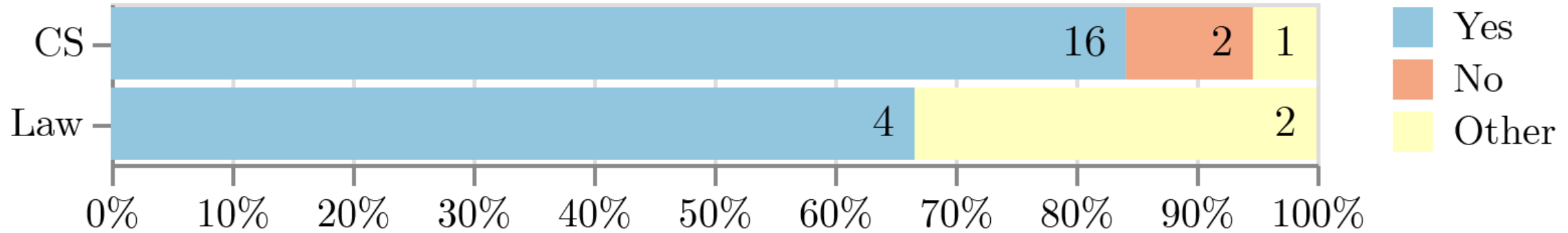
Characteristics of Most Successful Team

	Interdisciplinary Teams	Computer Science Teams
Correct Advice	1 (17%)	1 (11%)
Incorrect Advice	5 (83%)	8 (89%)

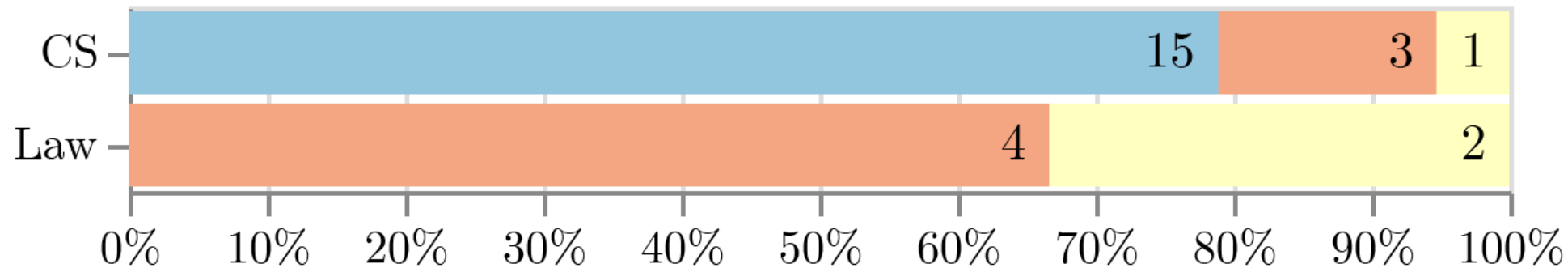
Unlike other groups, worked to understand each other's domains

- Lawyer explained real cases with sympathetic debtors
- Computer scientist explained how code functioned

Would you be willing to install your tool as a legal advisor for laypeople?



Would you be willing to install your tool as a decider of court cases?



Experimental Takeaways

- Disciplinary divide makes it very challenging to automate complex processes from other professional realms
- Adding a professional to a development team does not guarantee that knowledge from that domain is preserved
- Practitioners over-confident in shoddy tools

What next?

- Given that error is widespread...
- Given that the causes of these errors are not trivial...
- We can expect that systems tasked with administering important government services will misapply the law

- Surely the law recognizes these problems?

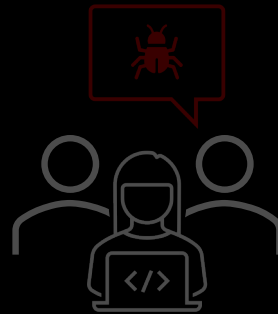
Study 1:

Novel (but resource intensive) methods for evaluating computational legal systems reveal extensive errors.



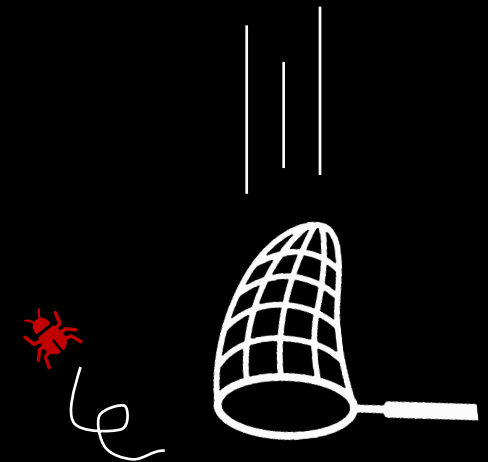
Study 2:

The disciplinary divide between computer science and law contributes to endemic error, but practitioners fail to recognize flaws.



Study 3:

Errors persist because policies aiming to uncover and address problems are misaligned with the reality of algorithmic systems.

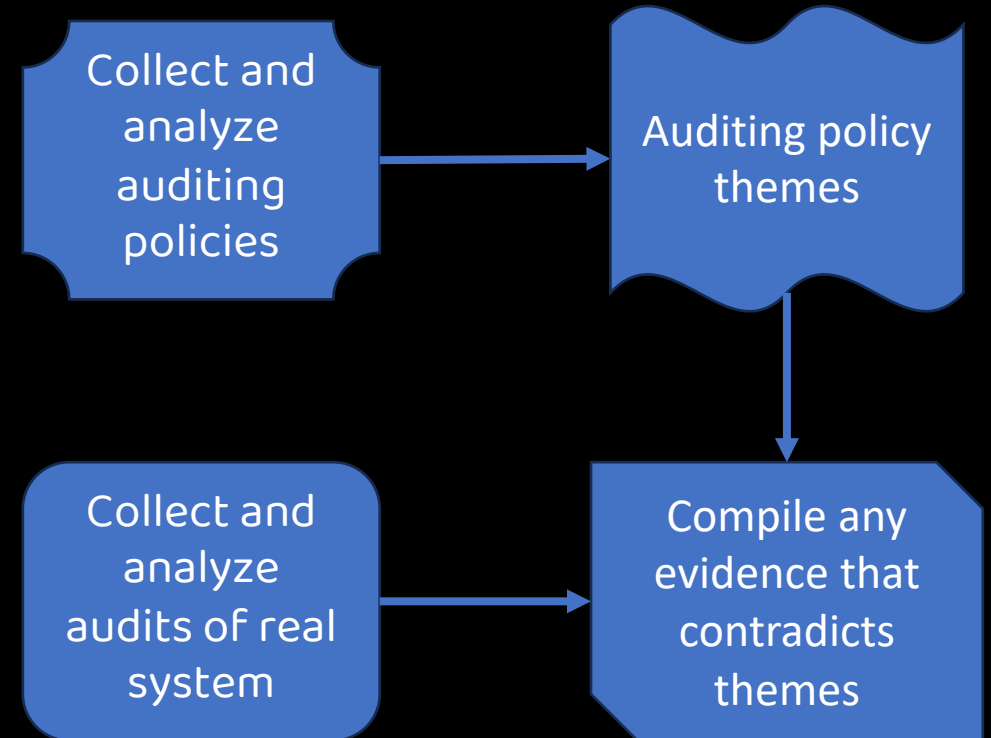


Software Auditing Policies

- Auditing is emerging as a popular policy approach for evaluating software systems
- Proposed in jurisdictions across the world
 - EU Digital Service Act 2022
 - Chinese Algorithmic Management Provisions
 - Validation and Evaluation for Trustworthy (VET) Artificial Intelligence Act
 - Et al.

Study Approach

- What are common assumptions of existing regulatory frameworks that require audits of software systems?
- Do these assumptions hold for a real system in the public sector?



Policies that Require Algorithmic Audits

HOUSE OF REPRESENTATIVES
THIRTY-SECOND LEGISLATURE, 2024
STATE OF HAWAII

H.B. NO. 1607

A BILL FOR AN ACT

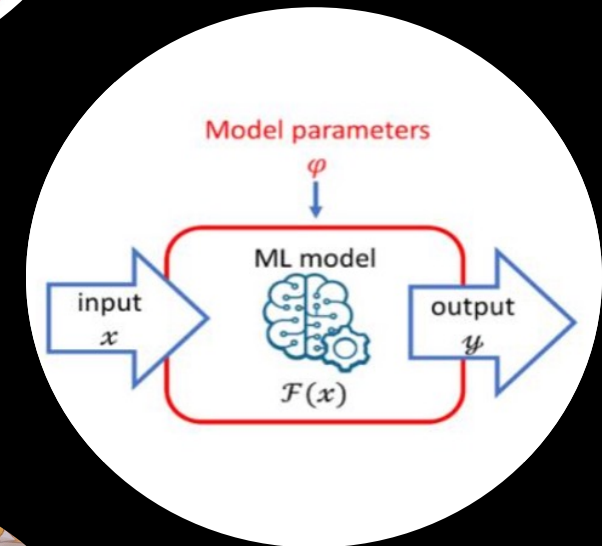
RELATING TO ALGORITHMIC DISCRIMINATION.

§ -5 **Auditing for discriminatory processing and reporting requirement.** (a) A covered entity shall annually audit its algorithmic eligibility determination and algorithmic information availability determination practices to:

- (1) Determine whether the processing practices discriminate in a manner prohibited under -2;
- (2) Analyze disparate-impact risks of algorithmic eligibility determinations and algorithmic information availability determinations based on actual or perceived race, color, religion, national origin, sex, gender identity or expression, sexual orientation, familial status, genetic information, source of income, or disability;
- (3) Create and retain for at least five years an audit trail that records, for each algorithmic eligibility determination:
 - (A) The type of algorithmic eligibility determination made;
 - (B) The data used in the determination, including the source of the data;
 - (C) The methodology used by the entity to establish the algorithm;
 - (D) The algorithm used to make the determination;
 - (E) Any data or sets of data used to train the algorithm;
 - (F) Any testing and results for model performance across different subgroups or for discriminatory effects;
 - (G) The methodology used to render the determination; and

Thematic Analysis of Auditing Policies

- Analyzed 32 policies
 - City, state, national proposed and passed legislation
- Emergent themes:
 - Policies harm manifests as bias
 - Policies assume limited scope of systems
 - Static, well-bounded software
 - Policies assume operators will be able to address audit results



Case Study: MiDAS

Administers unemployment insurance

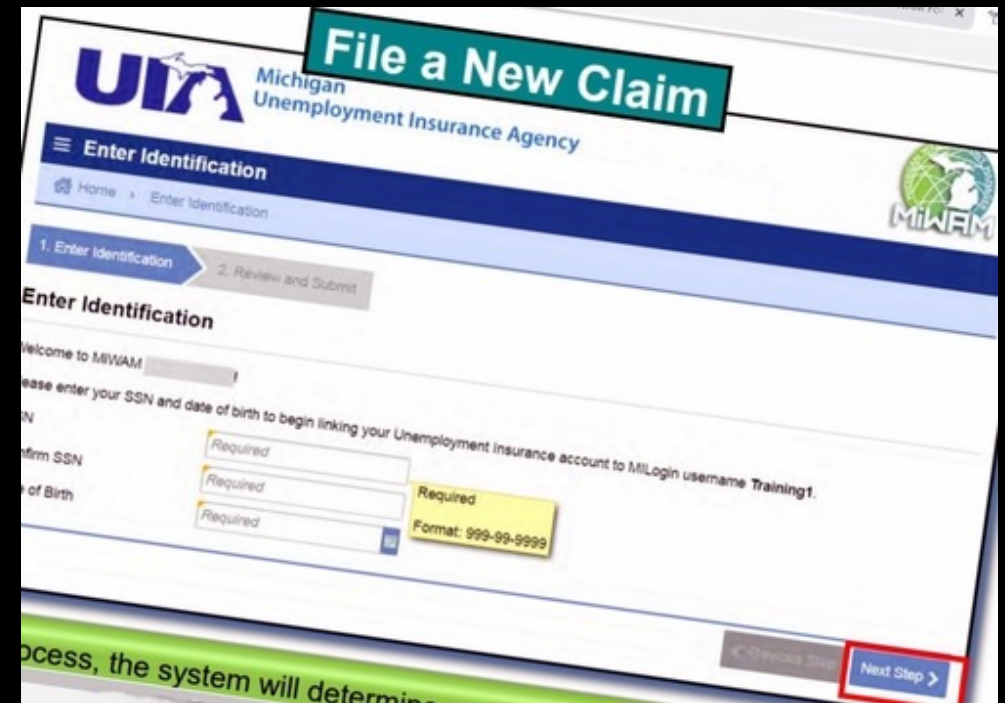
- Established by Michigan Employment Security Act
- Purchased by Michigan's Unemployment Insurance Agency
- Developed by Fast Enterprises

Program functions: automatically apply provisions, like collecting taxes, evaluating eligibility



Case Study: MiDAS Failures

- Infamous robo-debt scandal
 - 2013-2015
 - ~40,000 false accusations
 - \$20M class-action settlement
- Yet, problems persist...
 - Clawing back pandemic benefits
 - ~500,000 affected
 - \$55M class-action settlement
 - Other ongoing court cases
 - (Case background informed by my expert witnessing experience)



MiDAS Audits

- Office of the Auditor General
 - Authorized to conduct financial and performance audits of all state branches, departments, and other institutions
- Deloitte
 - Competing vendor
 - Third-party audit

Document Analysis of Audits

- Obtained audit documents
 - OAG Performance Audits of the Unemployment Insurance Agency
 - 8 audits performed since 2016
 - Deloitte Audit
 - Reports filed November 2020 and December 2021 with UIA's parent department
- Compared policy themes to evidence from audits

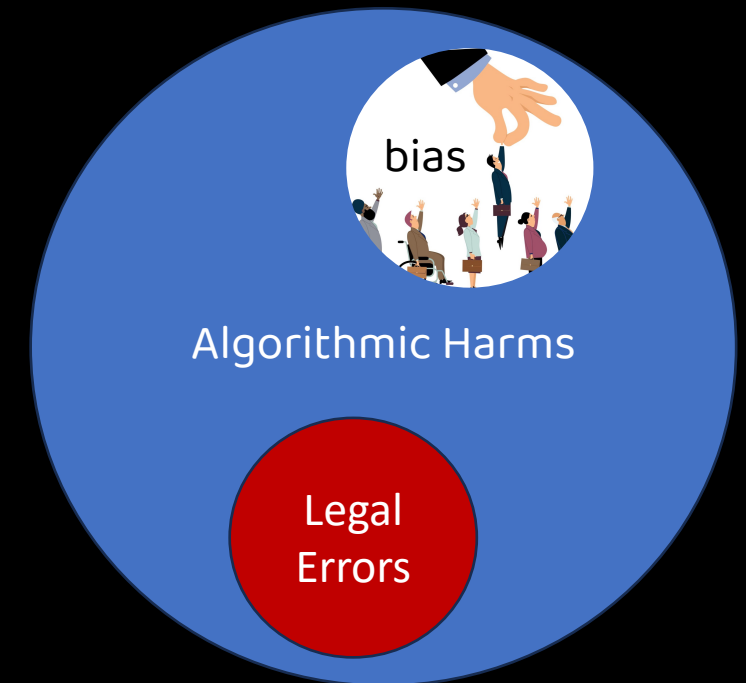
Policies Too Narrowly Frame Algorithmic Harms

Common Policy Assumption	MiDAS Case Study
Harms Manifest as Discriminatory Bias	MiDAS Afflicted by a Range of Algorithmic Harms

Many Legal Errors in MiDAS Software

Sample of legal errors:

- 30 days to appeal decisions (MCL - Section 421.32a)
 - Batch processing at 12:01 am
 - For over a decade, incorrectly marked on-time protests as late
- Must keep record of facts considered when making decisions (CFR - Title 20, Part 602B)
 - Overwrote survey question language
 - Later, cross-check flagged answers to original question as fraudulent
 - Fix can have unforeseen effects!



Policies Target Limited Slice of System

Common Policy Assumptions about Audited Systems	MiDAS Case Study
Static	Frequently Updated
Discrete	Composed of Complex Sub-systems
Can be Audited in Isolation from Practice	Agency Employees Co-Construct Outcomes

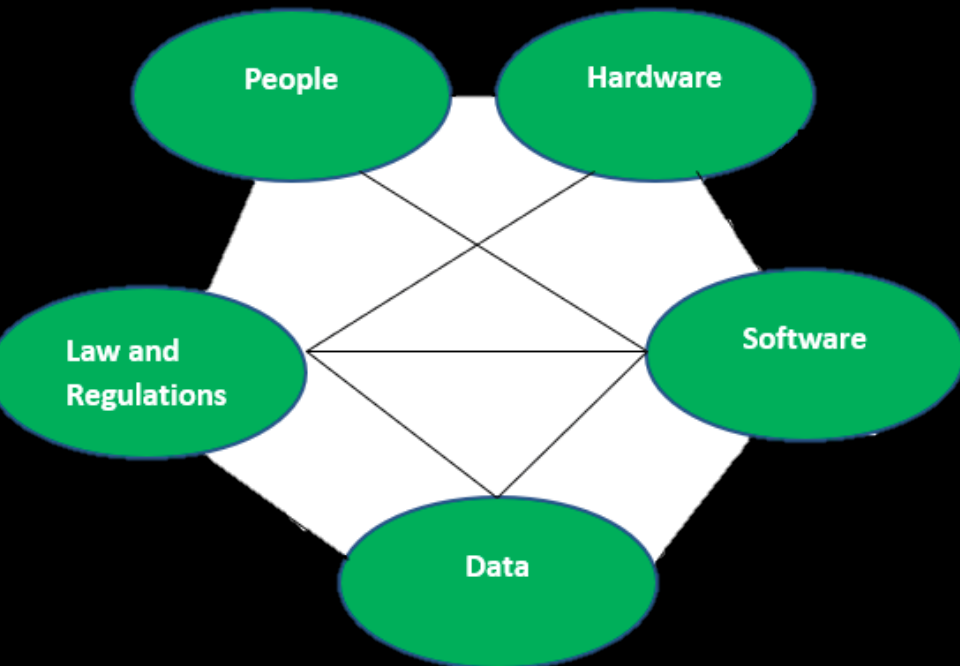
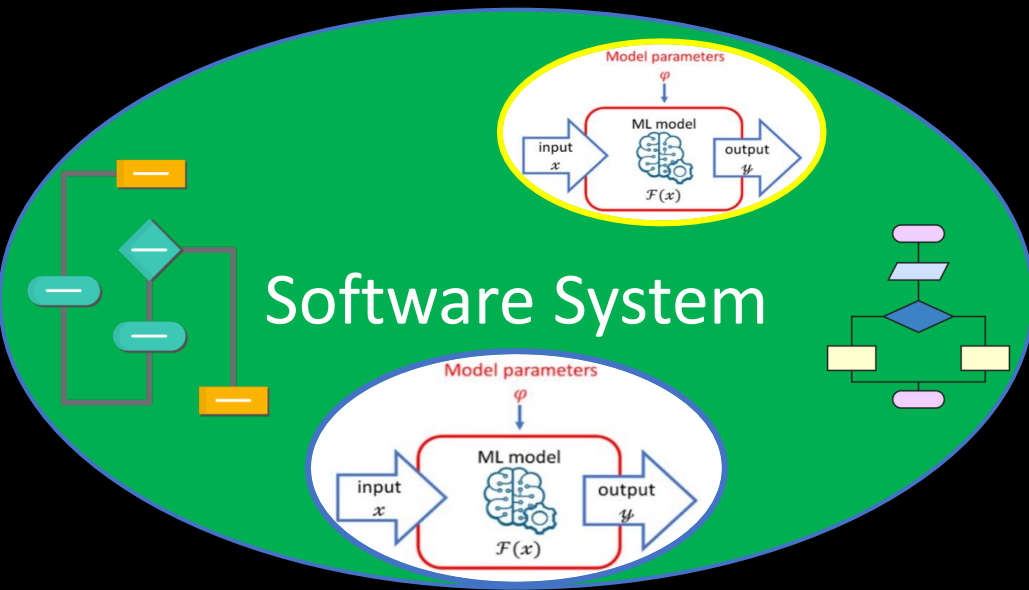
Must Take Broad View to Identify MiDAS Failures

Problems can emerge from interaction of technical components

- Example of sequencing error:
 - Supposed to run fraud checker program, then pay benefits
 - For a period, flipped the order, so paid public funds to fraudsters

Problems can emerge from interaction of technical and social/organizational components

- Tried to administer new pandemic programs using old software system using workarounds
- Did not train staff to process workarounds
- Pandemic-era records “[c]annot be used with any level of reliability”



Policies Have Unrealistic Expectations for Post-Audit Activity

Common Policy Assumptions about Addressing Audit Results	MiDAS Case Study
Operators have Resources to Respond to Audit Results	Agency Lacks Technical Staff and Resources to Correct Problems
Audited Software will be Corrected or Replaced	Remains Broken Despite Audits

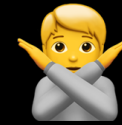
Government Lacks the Resources to Make Changes

- In each audit from the Michigan Auditor General, list of recommendations
- In follow-up reports, the Agency has not implemented the requested changes
- Technical, financial, and human resource constraints
- Competing governance objectives



Struggles in Replacing Broken Systems

- A decade later, the Agency has announced a MiDAS replacement
 - End work with FAST Enterprise
 - New, improved system from Deloitte
- In Massachusetts, also making a switch
 - End work with Deloitte
 - New, improved system from FAST Enterprise
- *Lack of reliable alternatives*



Deloitte.



Deloitte.



Need Broader Policy Shift to Recognize Fallibility of Software Systems

After robofraud scandal broke:

"In one case, the state spent two years and deployed a team of attorneys to pry back \$158 in benefits from a seasonal worker at Bloomfield Hills Country Club—only to lose when an appeals court ruled in July there was not "even a scintilla of evidence" she had committed fraud.

Remarkably, the state is apparently not done in its battle for \$158. On July 31, the state filed a motion asking the appellate court to reconsider its ruling." Reporting: Bridge Michigan

Must align government actions with reality of computational legal systems---absurd to rely on outputs from system that audit has shown is deficient!

Paths Forward

- More robust oversight
- Policymakers should require system evaluation at earlier stages, rather than relying on audits
- Government could develop technology in-house
 - Many problems come from silos---legal experts within government, software expert at private company
 - Open-source alternatives to private vendors

Takeaways

- Public sector services are administered by systems that are more complex and dynamic than policy envisions
- Could have excellent audits, but still stuck with harmful systems

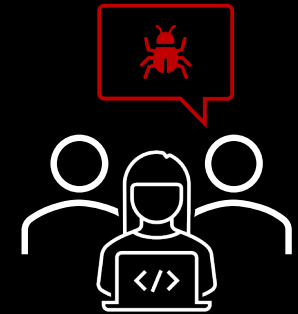
--> Revisit automation agenda?

Thesis Statement:
Legal automation is afflicted by endemic error that is harder to avoid, detect, and fix than recommendations from policymakers and practitioners assume.

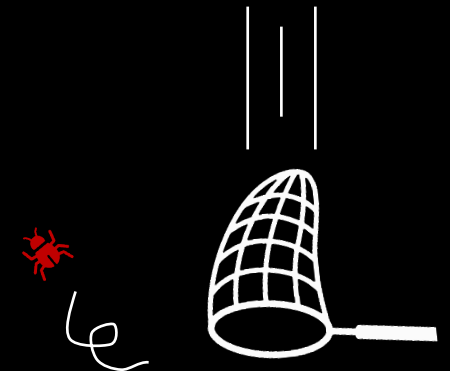
Revealing errors in computational legal systems



Tracing errors to development processes and unsuspecting practitioners



Demonstrating insufficiency of current policy for treating algorithmic harms



Future Lines of Research

- Improving legal software development
- Reckoning with the rise of LLMs in governance
- Changing policy to recognize fallibility of legal automation

Is this something Michigan CSE needs to worry about?

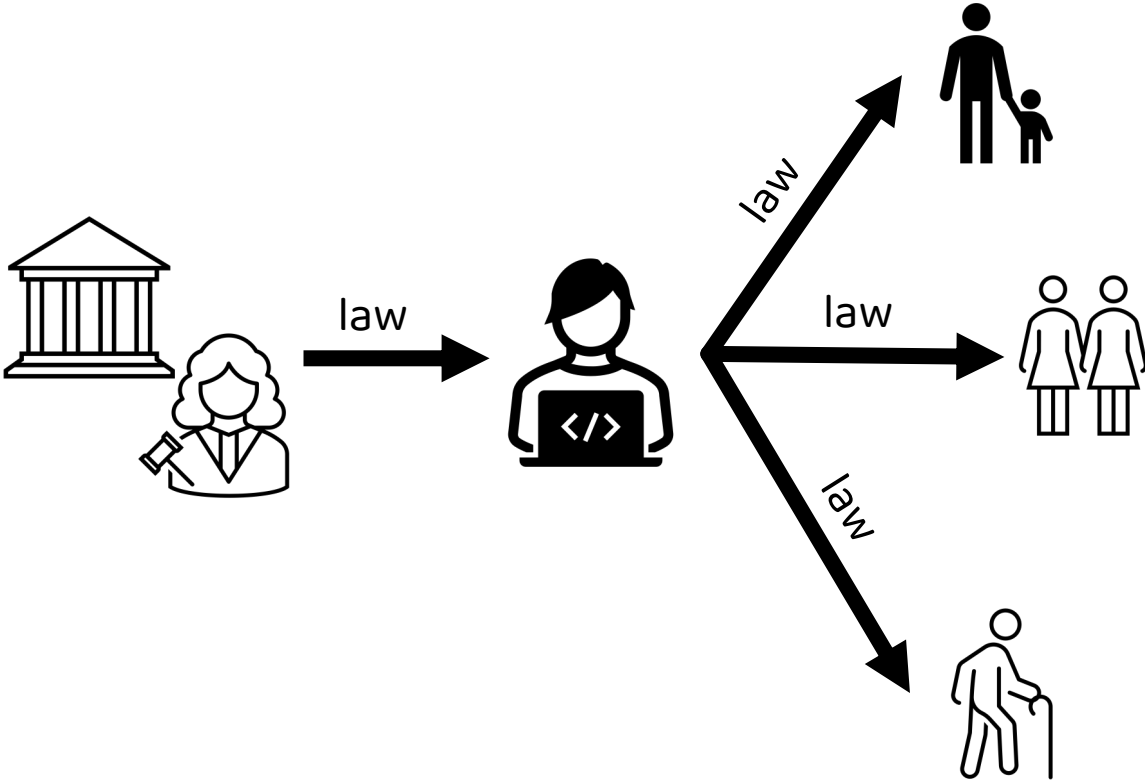
The image shows a screenshot of the Michigan Unemployment Insurance Agency (UIA) website. At the top, there is a green banner that says "File a New Claim". Below this, the UIA logo and "Michigan Unemployment Insurance Agency" are visible. The page has a blue header with "Enter Identification" and a breadcrumb trail "Home > Enter Identification". A progress bar shows "1. Enter Identification" as the current step and "2. Review and Submit" as the next step. The main content area is titled "Enter Identification" and includes a "Welcome to MIWAM" message. Below this, there are three input fields for "Please enter your SSN and date of birth to begin linking your Unemployment Insurance account to MILogin username Training1." Each field is marked as "Required". The SSN field has a yellow tooltip that says "Required" and "Format: 999-99-9999". At the bottom right, there are two buttons: "Previous Step" and "Next Step", with the "Next Step" button highlighted with a red border.

- Our students build these systems!
- Must provide them better support as they go on to build the digital infrastructure of our society

TRANSLATING LAW TO CODE

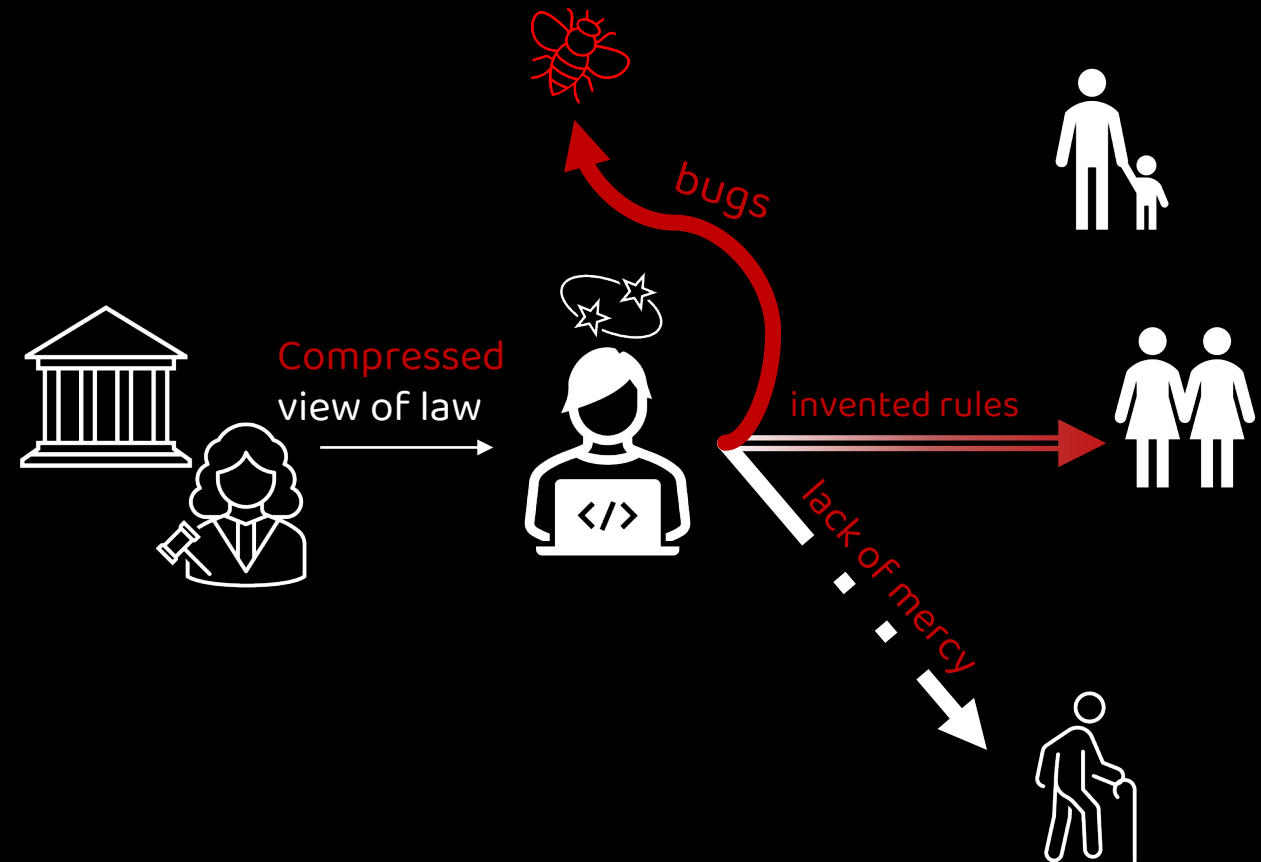
Expectation

Software will amplify the reach of the legal system by neutrally conveying law



Reality

The process of encoding the law into software distorts the law in ways that are unexpected & hard to detect



Agenda

- Introduction
- Research Presentation
- Career Paths Beyond Industry
- Q&A

Career Paths that Advance Social Good

- Researcher (depending on research program...)
- Government technologists
 - Federal
 - State
- Civil Society Organizations
 - ACLU
 - Data & Society
 - Center for Democracy and Technology
 - Etc!
- Job Boards: <https://www.benzevgreen.com/jobs/>

Questions???

Thank you 😊

Nel Escher

nelescher@berkeley.edu

 @nelescher

 nel_on_wheels

kescher.github.io/cool-zone

Getting started in research

- Get involved in projects happening at Michigan!
 - Have a favorite class? Go to the CSE website and see who's doing research on that topic
 - Lecturers are more teaching focused
 - Assistant/Associate Professors are all doing research
- Approaches:
 - Go to professor's office hours
 - Say: "Hey, I'm interested in doing research. Do you have any projects that could use a pair of hands?"
 - If you have trouble getting a hold of professors, email their PhD students!
 - PhD students get way fewer emails
 - Check out programs like UROP