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ObjectID	ADDRESS	INC_	TYPE_CODE	CALL_TYPE	LOC_CODE	CASE_NUMBE	TIME_	DATE_	DAY_FROM	DATE_FROM	TIME_FROM	DAY_TO	DATE_TO
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18185344	4300 BLK OF HUNTINGTON	23500	6302	LFA $50-199	1	B6-097713	0635	10-18-2016	MON	10-17-2016	1730	TUE	10-18-2016
18185356	008700 YANKEE WOODS DR	06000	5213	BURG NRI LEE	37	B6-097792	1200	10-18-2016	MON	10-17-2016	1800	TUE	10-18-2016

Algorithmic Transparency for Governments

Robert Brauneis
Ellen Goodman

MIPLC Lecture Series • 14 November 2018

Paper available at http://dx.doi.org/10.2139/ssrn.3012499

GW LAW INTELLECTUAL PROPERTY LAW

Project summary:

- Governments are increasingly using predictive algorithms to inform decisions about allocation of resources and use of coercive force.
- In a democracy, it is important for governments to be accountable to citizens for policy decisions made
- (There may also sometimes be good reasons for private actors to disclose policy decisions, but for this talk I'm focused on governments.)

Project summary:

What should we know about predictive algorithms as citizens in order to evaluate them, and can we gain that knowledge?

If there are impediments to gaining that knowledge, what are they, and how might we overcome them?

Outline:

I. Predictive Algorithms

   A. What are they?

   B. What should we want to know as citizens about the predictive algorithms that our governments use?

      1. The algorithm itself, and how it was applied to particular facts?

      2. How the algorithm was developed

II. Can we learn what we should know about government use of predictive algorithms?

A. Open Records Act Requests / Approaches to Contractors

B. Impediments

1. Lack of Documentation Practices
2. Contractor Failure to Provide Records to Government Clients
3. Trade Secrets / NDAs

III. What should we do to overcome the impediments?

A. Amend open records acts / trade secret laws?

B. Steer development towards particular business models?

C. Develop government procurement best practices?

What Are Predictive Algorithms?

- Algorithm generally: a formalized process for generating an output from some input
  - a recipe for baking bread is an algorithm – takes the inputs of flour, water, salt, and yeast, and formalizes the process of turning them into the output of bread.

INGREDIENTS

- 1 ½ tablespoons yeast
- 1 ½ tablespoons kosher salt
- 6 ½ cups unbleached, all-purpose flour, more for dusting dough
- Cornmeal

PREPARATION

Step 1

In a large bowl or plastic container, mix yeast and salt into 3 cups lukewarm water (about 100 degrees). Stir in flour, mixing until there are no dry patches. Dough will be quite loose. Cover, but not with an airtight lid. Let dough rise at room temperature 2 hours (or up to 5 hours).

What Are Predictive Algorithms?

General definition: a formalized process for which the input is some set of data, and the output is **a prediction** – an estimate of the probability that some event will occur

What Are Predictive Algorithms?

- PSA-Court: Courts can predict the likelihood that criminal defendant will fail to appear, or will commit a crime (or a violent crime) if released or paroled based on nine facts about that defendant

RELATIONSHIP BETWEEN RISK FACTORS AND PRETRIAL OUTCOMES

Risk Factor	FTA	NCA	NVCA
1. Age at current arrest		X	
2. Current violent offense			X
Current violent offense & 20 years old or younger			X
3. Pending charge at the time of the offense	X	X	X
4. Prior misdemeanor conviction		X	
5. Prior felony conviction		X	
Prior conviction (misdemeanor or felony)	X		X
6. Prior violent conviction		X	X
7. Prior failure to appear in the past two years	X	X	
8. Prior failure to appear older than two years	X		
9. Prior sentence to incarceration		X	

What Are Predictive Algorithms?

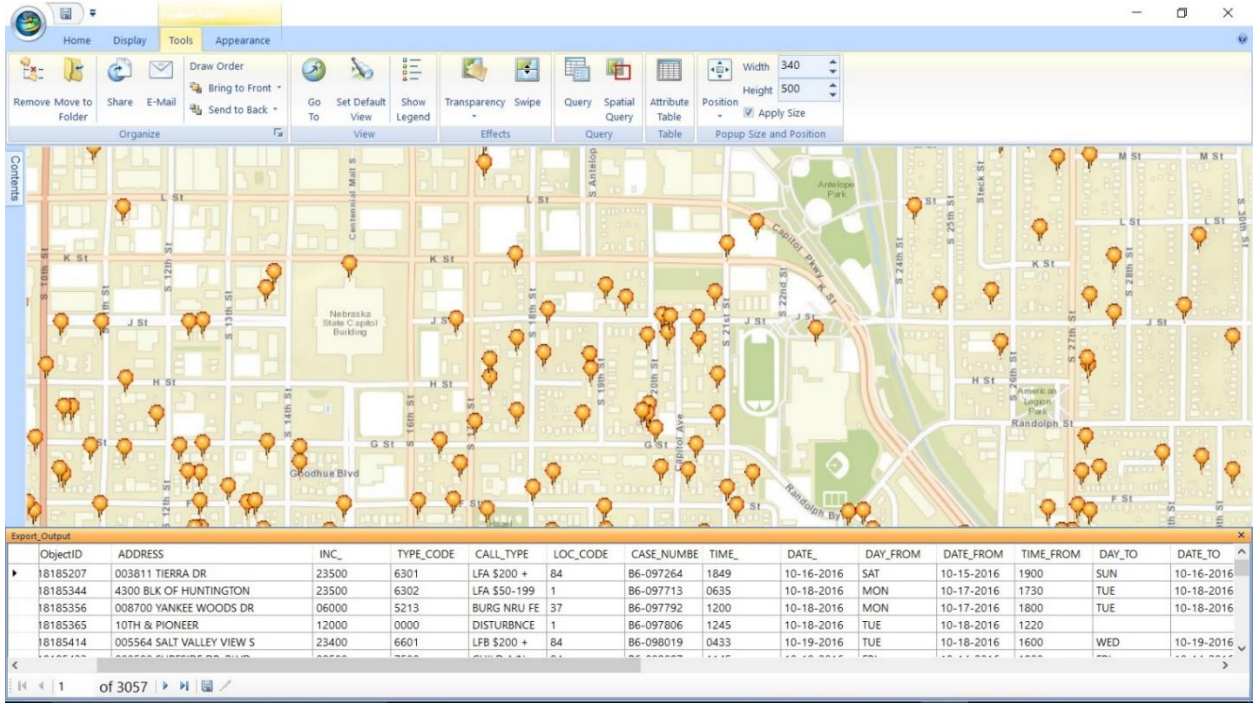
- PSA-Court: Courts can predict the likelihood that criminal defendant will fail to appear, or commit a crime (or a violent crime) based on nine facts about that defendant

New Criminal Activity (maximum total weight = 13 points)	
Age at current arrest	23 or older = 0; 22 or younger = 2
Pending charge at the time of the offense	No = 0; Yes = 3
Prior misdemeanor conviction	No = 0; Yes = 1
Prior felony conviction	No = 0; Yes = 1
Prior violent conviction	0 = 0; 1 or 2 = 1; 3 or more = 2
Prior failure to appear pretrial in past 2 years	0 = 0; 1 = 1; 2 or more = 2
Prior sentence to incarceration	No = 0; Yes = 2

NCA Raw Score	NCA 6 Point Scale
0	1
1	2
2	2
3	3
4	3
5	4
6	4
7	5
8	5
9-13	6

What Are Predictive Algorithms?

- Predictive Policing (Predpol, Hunchlab, etc.): Police departments can use historical data about where and when crimes occurred to direct where police should be deployed to deter future crimes



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What Are Predictive Algorithms?

- Eckerd Rapid Safety Feedback: Government agencies can predict when child welfare cases involve a high risk of injury or death, and can then intervene

The Eckerd Rapid Safety Feedback℠ model represents a pivotal shift in the approach to child safety.

MARCH 30, 2016

Using data now to keep children safe in the future

Unlike many traditional child welfare systems, which intervene only after a problem happens, some jurisdictions are using models designed to keep children safe before trouble escalates. In recognition of National Child Abuse Prevention Month in April, we'd like to look at one promising approach.

What Are Predictive Algorithms?

- Teacher Value-Added Models: Schools can isolate a teacher's role in student performance, and evaluate teacher effectiveness
  - starting with changes in student test scores from one year to the next, and
  - adjusting for other factors that might influence student performance

- Highly effective (18-20 points): results are well-above state average for similar students (or district goals if no state test).
- Effective (9-17 points): results meet state average for similar students (or district goals if no state test).
- Developing (3-8 points): results are below state average for similar students (or district goals if no state test).
- Ineffective (0-2 points): results are well-below state average for similar students (or district goals if no state test).

What Should We Know About Predictive Algorithms?

(1) The algorithm itself, and how it was applied to particular facts.

How could this help us?

(a) Determine whether the algorithm was correctly applied to the facts

New Criminal Activity (maximum total weight = 13 points)		NCA Raw Score	NCA 6 Point Scale
Age at current arrest	23 or older = 0; 22 or younger = 2	0	1
		1	2
Pending charge at the time of the offense	No = 0; Yes = 3	2	2
Prior misdemeanor conviction	No = 0; Yes = 1	3	3
Prior felony conviction	No = 0; Yes = 1	4	3
Prior violent conviction	0 = 0; 1 or 2 = 1; 3 or more = 2	5	4
Prior failure to appear pretrial in past 2 years	0 = 0; 1 = 1; 2 or more = 2	6	4
Prior sentence to incarceration	No = 0; Yes = 2	7	5
		8	5
		9-13	6

What Should We Know About Predictive Algorithms?

(b) Determine whether certain factors were explicitly used

New Criminal Activity (maximum total weight = 13 points)	
Age at current arrest	23 or older = 0; 22 or younger = 2
Pending charge at the time of the offense	No = 0; Yes = 3
Prior misdemeanor conviction	No = 0; Yes = 1
Prior felony conviction	No = 0; Yes = 1
Prior violent conviction	0 = 0; 1 or 2 = 1; 3 or more = 2
Prior failure to appear pretrial in past 2 years	0 = 0; 1 = 1; 2 or more = 2
Prior sentence to incarceration	No = 0; Yes = 2

NCA Raw Score	NCA 6 Point Scale
0	1
1	2
2	2
3	3
4	3
5	4
6	4
7	5
8	5
9-13	6

What Should We Know About Predictive Algorithms?

(c) Empowerment: Enable people to take action to change facts, improve position

Your credit score is: 570

Timely payment in full of credit card bill	10 points for each month paid, up to 100 points
Current full-time employment	120 points
Timely payment of house or car loan	15 points for each month paid, up to 150 points
Length of residence at current address	5 points for each month of residence, up to 100 points

What Should We Know About Predictive Algorithms?

Art. 15 GDPR

Right of access by the data subject

1. The data subject shall have the right to obtain from the controller confirmation as to whether or not personal data concerning him or her are being processed, and, where that is the case, access to the personal data and the following information:

* * * *

(h) the existence of automated decision-making, including profiling, referred to in Article 22(1) and (4) and, at least in those cases, meaningful information about the logic involved, as well as the significance and the envisaged consequences of such processing for the data subject.

What Should We Know About Predictive Algorithms?

(1) The algorithm itself, and how it was applied to particular facts.

What does this **not** tell us?

(a) validity: generally, cannot tell us the quality of the predictions

- Only rarely could we reliably test the algorithm against our background knowledge

(b) proxies: can't tell us whether some variables act as proxies for suspect classifications (e.g., residential address for race)

What Should We Know About Predictive Algorithms?

(1) The algorithm itself, and how it was applied to particular facts.

What does this **not** tell us?

(c) Input biases: can't tell us whether some inputs, e.g., arrest rates, incorporate existing human biases

(d) Policy decisions: can't tell us what policy decisions were made while constructing the algorithm

What Should We Know About Predictive Algorithms?

(2) How the algorithm was developed

How could this help us?

(a) Validity

- were best development practices were used?
- was pre- and post-implementation testing done?

(b) Proxies, biases: was algorithm cross-checked against race, gender etc. of subjects?

(c) Policy decisions: what decisions were made?

Building Predictive Algorithms

- Assertion:
  - It is only by assessing how a predictive algorithm was constructed and validated that we can understand and evaluate it
- Support:
  - Walk through the process of constructing an algorithm, and point out where policy decisions are made

Building Predictive Algorithms

1) Start with a general goal: what problem or problems are you trying to address with the help of a predictive algorithm?

   - Reduce what is perceived to be a high rate of crime by prisoners who are paroled
   - Remedy prison overcrowding by releasing more prisoners who are unlikely to commit further crimes while on parole

Building Predictive Algorithms

2) Find a discoverable, codable, timely, sufficiently frequent outcome that is related to that goal

   - Recidivism: Use arrests (PSA-Court, COMPAS) (convictions are untimely, infrequent)

The numbers behind racial disparities in marijuana arrests across Va.

POSTED 11:48 AM, MAY 15, 2017, BY CAPITAL NEWS SERVICE, *UPDATED AT 12:24PM, MAY 15, 2017*

Building Predictive Algorithms

2) Find a discoverable, codeable, sufficiently frequent outcome that is related to that goal

   - Location of crimes: use **contemporaneous reports of crimes** (HunchLab, PredPol)

ADDRESS	INC_	TYPE_CODE	CALL_TYPE
005811 TIERRA DR	23500	6301	LFA $200 +
4300 BLK OF HUNTINGTON	23500	6302	LFA $50-199
008700 YANKEE WOODS DR	06000	5213	BURG NRU FE
10TH & PIONEER	12000	0000	DISTURBNCE
005564 SALT VALLEY VIEW S	23400	6601	LFB $200 +

Building Predictive Algorithms

2) Find a discoverable, codable, timely, sufficiently frequent outcome that is related to that goal

Silence of the Innocents: Illegal Immigrants' Underreporting of Crime and their Victimization

Stefano Comino
Giovanni Mastrobuoni
Antonio Nicolò

Building Predictive Algorithms

2) Find a discoverable, codable, timely, sufficiently frequent outcome that is related to that goal

Factors in the Underreporting of Crimes Against Juveniles

David Finkelhor, Richard K. Ormrod

First Published August 1, 2001 | Research Article

Building Predictive Algorithms

3) Collect data about features of subjects that may be relevant to building a predictive model for the selected outcome
   - Existing administrative data (age, gender, race, previous convictions, drug use, employment history, family history)
   - Newly collected data (answers to interview questions, etc.)

Building Predictive Algorithms

4) Exclude some of that data
   - not available for enough subjects
   - not consistently defined or entered
   - worried about manipulability and gaming
   - judgments about time and place scope: numerosity versus variability, desired predictive span
   - other policy reasons – worried about discrimination if use race, gender, or proxies

The PSA does NOT look at any of the following factors:

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University of Pennsylvania Professor of Criminology Richard Berk said he's advised officials involved in a $6.5 million partnership with the MacArthur Foundation to reform Philadelphia's First Judicial District that they should also include factors like race and home ZIP codes in the new pre-trial program.

from http://www.cityandstatepa.com/content/brewing-battle-over-what-factors-will-determine-jail-time

"The pre-trial specifications [are] still being determined, but I am very confident that race will not be included, and probably not ZIP code," Berk said. "The price, of course, is that there will be more forecasting errors. More folks will be mistakenly detained and more folks will be mistakenly released. That is not my decision; it is a political decision."

Building Predictive Algorithms

5) Engage in a supervised learning process
   - By this point, we have a set of **training data**: data both about (1) **features** of subjects (individuals, families, crimes) and (2) **outcomes**
   - Typically use a machine learning algorithm to discover correlations between the features and the outcomes

Building Predictive Algorithms

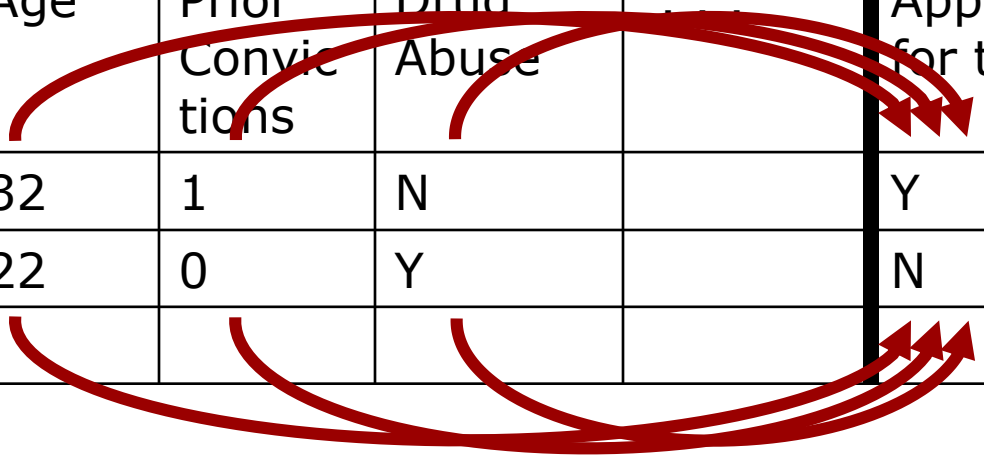
	Age	Prior Convictions	Drug Abuse	. . .	Appear for trial?
Defendant 1	32	1	N		Y
Defendant 2	22	0	Y		N
. . . .					

From the initial dataset, the research team was able to study 746,525 cases, since these defendants had been released at some point in the pretrial process.

Building Predictive Algorithms

What **correlations** can be found between the features of the subjects and and the "output" of appearance at trial or new criminal activity?

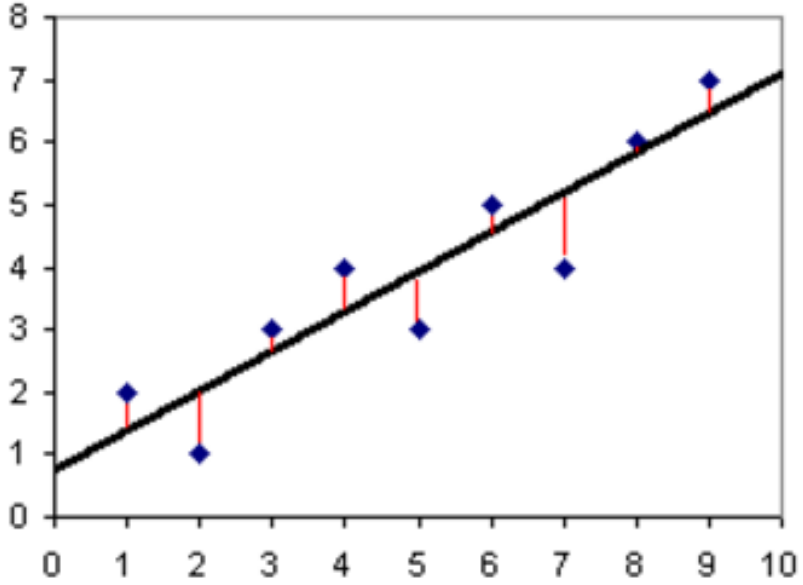
	Age	Prior Convictions	Drug Abuse		Appear for trial?
Defendant 1	32	1	N		Y
Defendant 2	22	0	Y		N
. . . .					



Building Predictive Algorithms

Wide variety of model types available

- Probably most familiar: linear regression



fit a line to the data, minimizing some cost function (e.g. the squares of the distances of each point to the line)

An Example
(71 variables total in placement model):

APPENDIX: VARIABLES USED IN THE ALLEGHENY CHILD WELFARE PREDICTIVE RISK MODEL

The weights of the model are available upon request from the Allegheny County Department of Human Services.

Placement Model

Variable	Description
adt_vic_null	If the victim is 18 years old or over at the time of the current referral
BH_c_20	Aggregate count of behavioural health events related to neurotic disorders for all individuals in this referral
BH_Substance	Aggregate count of behavioural health events related to inhalants, amphetamines, substance induced disorders, hyp/sed, PCP, cocaine, polysubstance disorder, cannabis, ethanol, and/or opioids for all individuals in this referral

from https://www.pretrial.org/download/risk-assessment/Pretrial%20Risk%20Assessment%20in%20the%20Federal%20Court%20Final%20Report%20(2009).pdf

An Example
(71 variables total in placement model):

BH_Substance	0.000349
BH_c_20	-0.000904
Ref_past548_serv	0.0180
adt_vic_null	-0.620
chld_age_pre_null	-0.00736
chld_age_sc1_null	-0.0335
chld_age_sc2_null	-0.0294
chld_age_teen_null	-0.0233
dpw_fs_1_per_chld	0.378
dpw_fs_2_per_chld	-0.843
dpw_fs_2_per_vict_othr	0.379
dpw_fs_3_per_chld	0.475

Building Predictive Algorithms

Wide variety of model types available

- Other model types
  - logistic and polynomial regression
  - decision trees
  - neural networks

Building Predictive Algorithms

Policy choices in building the cost function that will guide model creation – example:

Should false positives and false negatives be weighted equally, or differently?

- Is the cost of paroling someone who commits a crime, and not paroling someone who would not have committed a crime, the same?

> Philadelphia's APPD decided on a cost ratio where false negatives were 2.6 times more costly than false positives.

Building Predictive Algorithms

6) Pre-implementation validation
   - Test the algorithm on randomly reserved portion of training data to check for issues like "overfitting," and potentially bias, and adjust

Building Predictive Algorithms

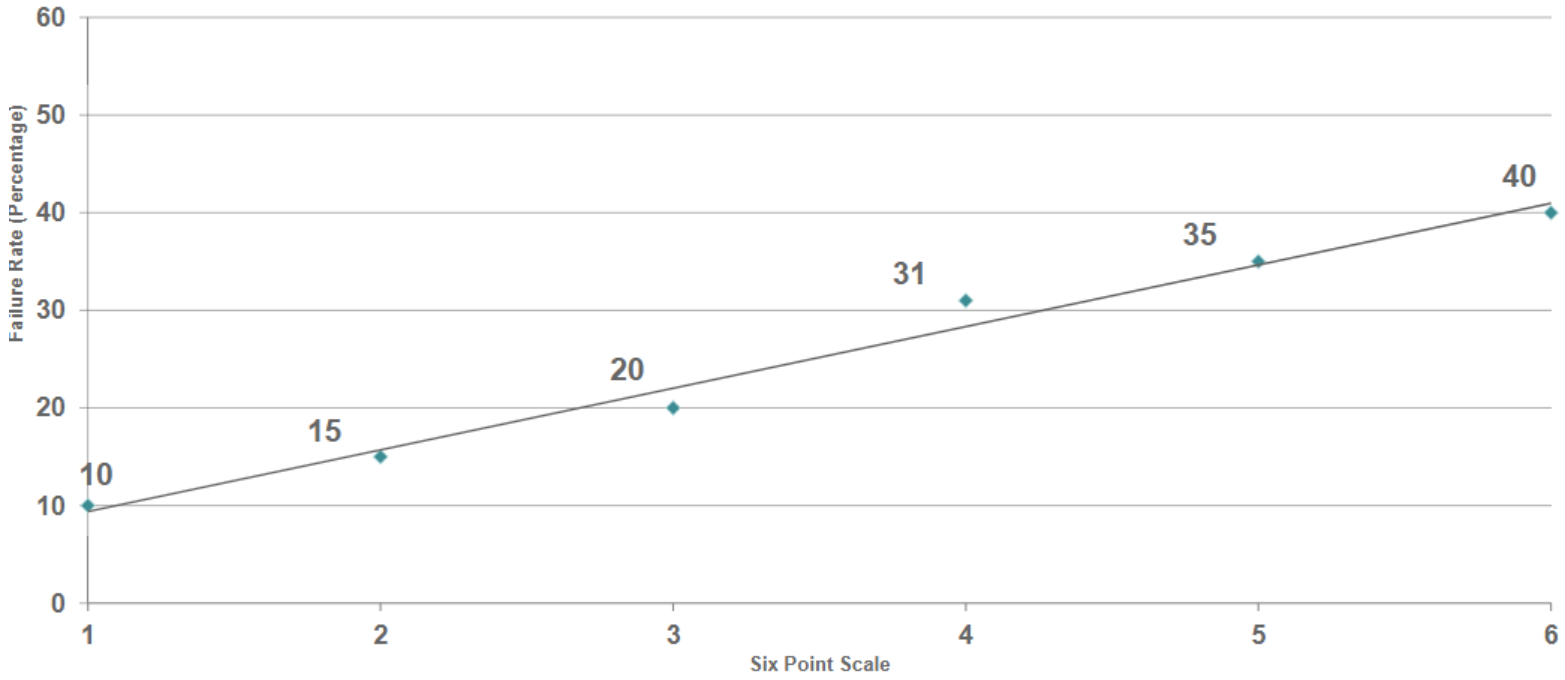
7. Presentation and interpretation of results: How are the risk assessment results presented to decisionmakers, and do they know enough to interpret those results properly?

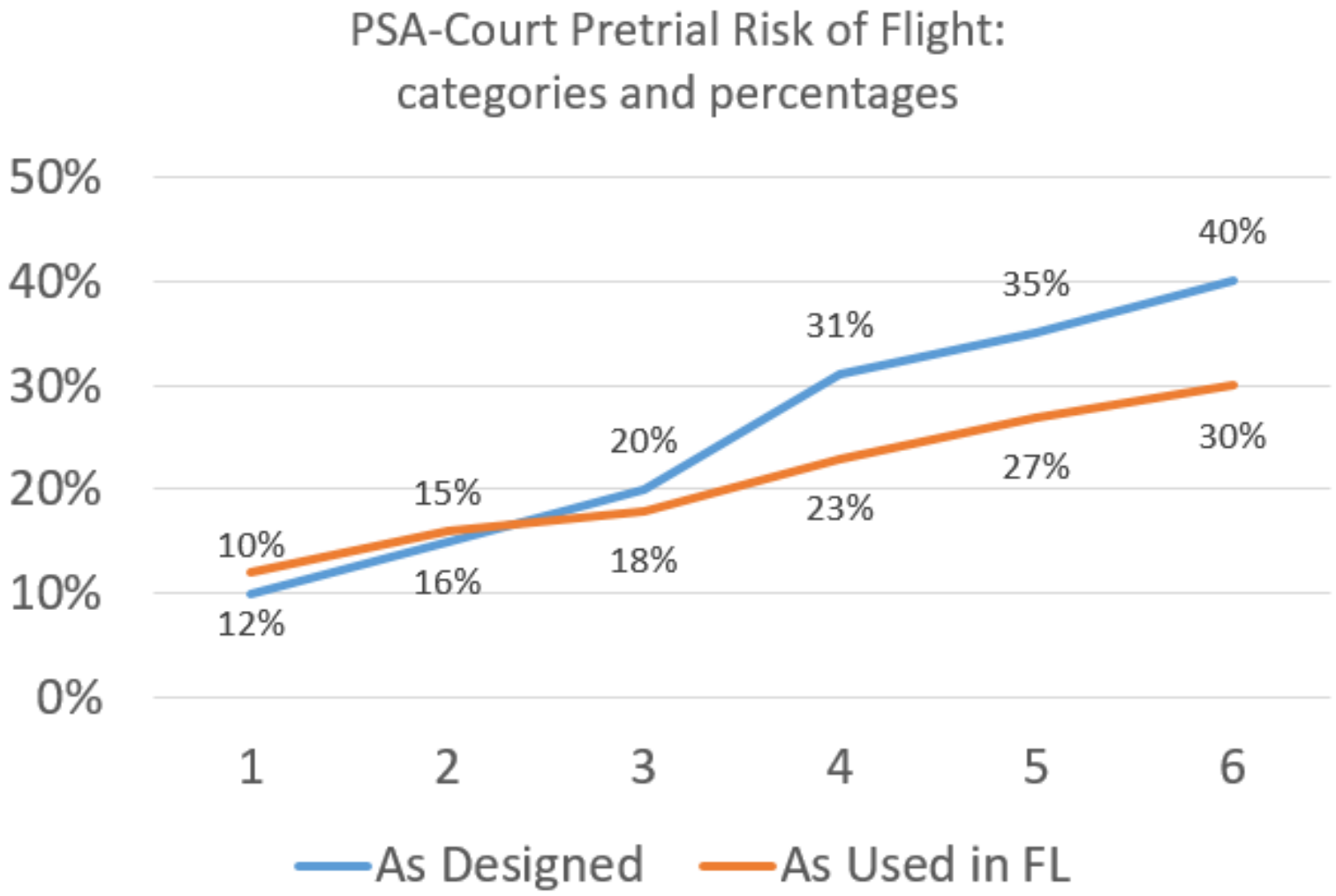
Allegheny FST	PSA-Court Risk Levels
1 -20	1
	2
	3
	4
	5
	6

Does each group represent an equal number of defendants, or are there equal (or unequal) risk percentage cutoffs for each group?

What is the average percentage risk for each group?

PSA Failure to Appear (as designed)





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Building Predictive Algorithms

8. Post-Implementation Validation Studies

How is the algorithm working in practice?

- How accurate is it, and by what measures of accuracy?
- Is it biased in some way?
- Are government decisionmakers following its recommendations?

Building Predictive Algorithms

Conclusion:

- Disclosure of the predictive algorithm itself is not sufficient, and may not be the most important information for evaluating it
- Disclosure of the development process, key policy decisions made, and validation studies undertaken, is essential

Can We Learn What We Should Know?

Summary
of the
California Public Records Act 2004

Gesetz zur Regelung des Zugangs zu Informationen des Bundes (Informationsfreiheitsgesetz - IFG)

Nichtamtliches Inhaltsverzeichnis

IFG

Ausfertigungsdatum: 05.09.2005

Vollzitat:

"Informationsfreiheitsgesetz vom 5. September 2005 (BGBl. I S. 2722), das durch Artikel 2 Absatz 6 des Gesetzes vom 7. August 2013 (BGBl. I S. 3154) geändert worden ist"

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Can We Learn What We Should Know?

We filed

- 42 open records requests
- to public agencies in 23 states
- about six predictive algorithm programs:
    - PSA-Court
    - PredPol
    - Hunchlab
    - Eckerd Rapid Safety Feedback
    - Allegheny Family Screening Tool
    - Value Added Method – Teacher Evaluation

Can We Learn What We Should Know?

Basic idea: assemble a diverse portfolio

- variety of areas (criminal justice, child welfare, education)
- variety of types of agencies (executive, judicial)
- variety of developers (for-profit, B corporation, non-profit, university)
    - no in-house development by government employees because we couldn't find any

We also approached some of the developers directly to see if they would provide their algorithms and development documentation.

Can We Learn What We Should Know?

Summary of Results:

- 6 did not respond
- 7 acknowledged request but no further response
- 2 (courts) – FOIA only reaches financial records
- 3 requested large sums of money - $400 - $2500
- 12 had no responsive documents
- 5 provided confidentiality agreements with vendor
- 6 provided some documents, typically training slides and materials
- 1 (Allegheny County) provided complete disclosure of algorithm and significant disclosure of process

Can We Learn What We Should Know?

Impediment 1: The Absence of Appropriate Record Generation Practices

- At least among records that have been provided to us, the documents created do not cover many details of the algorithms that would be important to know.

Pennsylvania Right-to-Know Law Section 705. Creation of record. When responding to a request for access, an agency shall not be required to create a record which does not currently exist . .

Can We Learn What We Should Know?

Impediment 2: Limits of open records acts with regard to outside contractors

- All predictive algorithms were developed outside of governments by contractors
- Most contractors give very little documentation to governments
- Open records laws vary in their coverage of outside contractors, and often do not reach far enough

Can We Learn What We Should Know?

Impediment 3: Trade Secrets / NDAs

- Government agencies sometimes stated that they couldn't respond because the contractors owned and controlled the information
- All open records acts have some form of trade secret exception

§ 6 Schutz des geistigen Eigentums und von Betriebs- oder Geschäftsgeheimnissen

Der Anspruch auf Informationszugang besteht nicht, soweit der Schutz geistigen Eigentums entgegensteht. Zugang zu Betriebs- oder Geschäftsgeheimnissen darf nur gewährt werden, soweit der Betroffene eingewilligt hat.
Nichtamtliches Inhaltsverzeichnis

Can We Learn What We Should Know?

Impediment 3: Trade Secrets / NDAs

- Mesa (AZ) Municipal Court (PSA-Court): "Please be advised that the information requested is solely owned and controlled by the Arnold Foundation, and requests for information related to the PSA assessment tool must be referred to the Arnold Foundation directly."
- Superior Court of CA, County of San Francisco: "Enclosed please find a [Memorandum of Understanding between the court and the Arnold Foundation]. In that document, please refer to 'II. The Court 6. Non-disclosure,' which clearly states that the Court is not permitted to release the information you are seeking beyond disclosure of the MOU."

Can We Learn What We Should Know?

"Any Presentence Investigation Report ("PSI") containing a COMPAS risk assessment should inform sentencing courts of the following cautions as discussed throughout this opinion:

- The proprietary nature of COMPAS has been invoked to prevent disclosure of information relating to how factors are weighed or how risk scores are determined."

State v. Loomis, 371 Wis.2d 235, 881 N.W.2d 749 (2016), *cert. denied*, 137 S.Ct. 2290 (Jun 26, 2017)

Can We Learn What We Should Know?

Impediment 3: Trade Secrets/NDAs

- Not necessarily easier to get information from nonprofit foundations than from for-profit companies
  - The Arnold Foundation (PSA-Court) is much less forthcoming than Azavea, Inc. (Hunchlab)
- But business model may matter
  - PSA-Court is an "off-the-rack" algorithm provided to many agencies
  - Hunchlab is modified for each agency, and Allegheny FST was custom for a single agency

Recommendations

A. Amend trade secret law? Amend trade secret exemptions in open records act?
   - Politically unlikely
   - Unlikely to be effective – many documents may not have been created, or may not be in government hands

Recommendations

B. Favor custom development of algorithms?

- likely to lead to more disclosure
- but cost factor: not all governments can afford, and even "off-the-shelf" algorithms can be developed with opportunity for local variation

Recommendations

C. Best practices for government procurement

- more promising avenue
- can cover creation, validation, documentation practices as well as disclosure
- governments have more procurement power than they may think

Recommendations

- The Arnold Foundation provides PSA-Court for free
- Its standard contract has a broad nondisclosure clause (AZ, CA examples above)
- But it was willing to contract with FL even though FL required more disclosure, and as a result, gave us the best information about PSA-Court

6. **Non-disclosure.** The Parties are required to disclose all non-confidential public records or information pursuant to Florida law, including art. I, sec. 24, Florida Constitution, and Rule 2.420, Florida Rules of Judicial Administration. A trade secret, as defined by Sec. 688.002(4), Fla. Stat. and Sec. 812.081, Fla. Stat., is confidential and exempt from disclosure pursuant to Section 815.045, Fla. Stat. Pursuant to Florida law, the Foundation must specifically designate any information it considers a trade secret. If the Foundation designates any record or information as a confidential trade secret, the Foundation must provide a redacted copy of the document containing said confidential trade secrets to the Circuit. The trade secrets must be specifically identified and redacted or any confidentiality will be considered waived.

Thank you!

Paper available at
http://dx.doi.org/10.2139/ssrn.3012499

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18185356	008700 YANKEE WOODS DR	06000	5213	BURG NRLLEE	37	B6-097792	1200	10-18-2016	MON	10-17-2016	1800	TUE	10-18-2016

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