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FIGURE I.A: STANDARD DUI WARRANT EXAMPLE

IN THE SECOND DISTRICT COURT - FARMINGTON DEPARTMENT
IN AND FOR DAVIS COUNTY, STATE OF UTAH

AFFIDAVIT FOR SEARCH WARRANT

STATE OF UTAH)
) ss
County of Davis)

The undersigned affiant, Officer [REDACTED] of Layton Police Department, upon an oath or written affidavit subscribed under criminal penalty, declares:

Your affiant has reason to believe that:

In the body of [REDACTED] further described as Hisp. male 602, 260 lbs, black eyes, black hair ;

In the City of Layton Police Department, County of Davis, State of Utah, there is now certain property or evidence described as:

Blood belonging to [REDACTED]

And that said property or evidence:

Contains evidence of the crime or crimes of: Driving Under the Influence, in violation of Utah Code Ann. Section 41-6a-502, specifically, the substance Marijuana.

The facts to establish the grounds for issuance of a Search Warrant are:

Your affiant, [REDACTED] a police officer with Layton Police Department, being duly sworn, deposes and states that:

I have been a police officer with Layton City for the past [REDACTED] years. I have had training in the investigation of the detection of impaired drivers. I have been trained in conducting the Standardized Field Sobriety Tests (SFST) used to detect impairment in drivers who are suspected of driving under the influence.

[REDACTED] was the driver of the vehicle that I stopped at Main and Hill Field Rd in Layton for an equipment violation. A Police K9 indicated on the vehicle. While

- Page 1 of Affidavit for Search Warrant Warrant No [REDACTED]

I

FIGURE I.C: “FORM” AFFIDAVIT FOR DUI BLOOD DRAW

IN THE FOURTH DISTRICT COURT - ALL DEPARTMENT
IN AND FOR UTAH COUNTY, STATE OF UTAH

AFFIDAVIT FOR SEARCH WARRANT

STATE OF UTAH)
) ss
County of Utah)

The undersigned affiant, [first] [last] of , upon an oath or written affidavit subscribed under criminal penalty, declares:

Your affiant has reason to believe that:

In the body of , further described as ;

In the City of _____, County of Utah, State of Utah, there is now certain property or evidence described as:

belonging to .

And that said property or evidence:

Contains evidence of the crime or crimes of: Driving Under the Influence, in violation of Utah Code Ann. Section 41-6a-502, specifically, the substance .

The facts to establish the grounds for issuance of a Search Warrant are:

Your affiant, [first] [last], a police officer with , being duly sworn, deposes and states that:

A warrant for a draw is necessary to prevent the loss of evidence, to wit: through dissipation of the alcohol or any other controlled substance, from the .

WHEREFORE, your affiant prays that a Search Warrant be issued for the seizure and testing of said at any time day or night, using a reasonable amount of force to obtain the sample.

I declare under criminal penalty of the State of Utah that the foregoing is true and correct.

IN THE SECOND DISTRICT COURT - OGDEN DEPARTMENT
IN AND FOR WEBER COUNTY, STATE OF UTAH

AFFIDAVIT FOR SEARCH WARRANT

STATE OF UTAH)
)ss
County of Weber)

The undersigned affiant, Detective [REDACTED] of Weber Morgan Strike Force,
upon an oath or written affidavit subscribed under criminal penalty, declares:

That your affiant has reason to believe:

THAT

On the premises known as [REDACTED] Ave.
Ogden Utah 84404,

On the person(s) described as: [REDACTED] Birthday [REDACTED] SSN [REDACTED]
[REDACTED] Approximately 5'10 and weighs 225.
Birthday [REDACTED] SSN [REDACTED]. Approximately 5'9 and
weighs 195.

DNA from both suspects.;

In the City of Ogden Utah, County of Weber, State of Utah, there is now certain property
or evidence described as:

DNA by form of buccal swabs.

and that said property or evidence:

Was unlawfully acquired or is unlawfully possessed;

has been used or is possessed for the purpose of being used to commit or
conceal the commission of an offense; or

is evidence of illegal conduct.

- Page 1 of Affidavit for Search Warrant No [REDACTED]

Affiant believes the property and evidence described above is evidence of the crime or crimes of Possession of a stolen firearm by restricted person..

The facts to establish the grounds for issuance of a Search Warrant are:

Your Affiant, [REDACTED] is an Ogden City Police Officer assigned to the Ogden-Metro Gang Unit. Your Affiant graduated Police Officer Standards and Training Academy in [REDACTED]. Your Affiant spent [REDACTED] years in the Patrol Division with the Ogden City Police Department. During that time your Affiant also spent 5 years on the Ogden Metro SWAT Team. Your Affiant is utilized as a Field Training Officer responsible for training new probationers, where Your Affiant, due to Your Affiant's knowledge of several aspects of law enforcement including: narcotics, gang crimes, DUI's (traffic crime), field interviews, property crimes and crimes against persons; is in charge of training new recruits. Your Affiant was assigned to the Gang Unit in [REDACTED].

Your Affiant has training in drug terminology, drug identification, drug interdiction and search and seizure. All were through Multijurisdictional Counterdrug Task Force Training in 2008 and 2013. Basic SWAT Tactics and Hostage Rescue in August of 2008. Your Affiant was also assigned as a SWAT Instructor from 2009 to 2013. Your Affiant, as a member of the Ogden Metro SWAT Team, executed numerous search warrants for narcotics and weapon related cases. Your Affiant has received training in field testing narcotics through P.O.S.T. and through the Ogden City Police Department. Your Affiant has training in Interview and Interrogation through Multijurisdictional Counterdrug Task Force Training in 2010, Patrol Interdiction through Multijurisdictional Counterdrug Task Force Training in 2008, Field Training Officer Certification from Ogden City Police Department in 2008 and Gang Awareness through the Northern Utah Gang and Youth Violence Conference in 2008 and 2013. In this training, Your Affiant, gained in depth knowledge of Outlaw Motorcycle Gangs, Ogden Trece, Suerenos, 18th Street and Nortenos Gangs.

Due to Your Affiant's training and experience, Your Affiant has knowledge of what items would most often be found at the premises where there are suspect using, selling and manufacturing these drugs. Your Affiant has worked numerous narcotics cases while a Patrolman at Ogden City Police Department giving Your Affiant experience on which to base his conclusions. The items are those I have listed in the description of the items to be searched for.

Your Affiant is familiar with how controlled substances are manufactured, transported, packaged for sale, hidden and ingested. Your Affiant has also become familiar with the street terms used for controlled substances. Your Affiant has received numerous excellent work awards from 2010 to 2013, a distinguished unit citation in [REDACTED]. Your Affiant has experience and

training in executing search warrants and interviewing individuals that use and sell narcotics.

Your Affiant was called to assist AP&P agents on a traffic stop at 27th St. and Jackson Ave. During the course of their stop they located a stolen firearm under the seat. The vehicle that was stopped is a [REDACTED] UT listing [REDACTED]. The vehicle was being driven by [REDACTED]. The passenger was identified as [REDACTED]. AP&P conducted the search on [REDACTED] and located the firearm under the seat of Moncada. Both individuals could have easily reached and possessed the firearm. The firearm is a SCCY CPXI 9mm serial number [REDACTED].

WHEREFORE, your affiant prays that a Search Warrant be issued for the seizure of said items.

I declare under criminal penalty of the State of Utah that the foregoing is true and correct.

Executed on: 29th day of March, 2017 @ 07:34 PM by /s/ [REDACTED]

IN THE SECOND DISTRICT COURT - OGDEN DEPARTMENT
IN AND FOR WEBER COUNTY, STATE OF UTAH

SEARCH WARRANT

No. 1567681

COUNTY OF WEBER, STATE OF UTAH

To any peace officer in the State of Utah:

Proof by Affidavit made upon oath or written affirmation subscribed under criminal penalty of the State of Utah having been made to me by Detective [REDACTED] of Weber Morgan Strike Force, this day, I am satisfied that there is probable cause to believe

THAT

On the premises known as [REDACTED]
Ogden Utah 84404,

On the person(s) of: [REDACTED]
Approximately 5'10 and weighs 225.

[REDACTED] Approximately 5'9 and weighs 195.

DNA from both suspects.;

In the City of Ogden Utah, County of Weber, State of Utah, there is now certain property or evidence described as:

DNA by form of buccal swabs.

and that said property or evidence:

Was unlawfully acquired or is unlawfully possessed;

has been used or is possessed for the purpose of being used to commit or conceal the commission of an offense; or

is evidence of illegal conduct.

Affiant believes the property and evidence described above is evidence of the crime or crimes of Possession of a stolen firearm by restricted person..

YOU ARE THEREFORE COMMANDED:

to make a search of the above-named or described person, vehicle, item, and/or premises for the herein-above described property or evidence and if you find the same or any part thereof, retain such property in your custody subject to the direction of a prosecutor or an order of this Court.

Dated: [REDACTED] 2017 @ 07:54 PM /s/ [REDACTED]



FIGURE I.E: MINUTE WARRANT EXAMPLE

IN THE FOURTH DISTRICT COURT - ALL DEPARTMENT
IN AND FOR WASATCH COUNTY, STATE OF UTAH

SEARCH WARRANT

No. [REDACTED]

COUNTY OF WASATCH, STATE OF UTAH

To any peace officer in the State of Utah:

Proof by Affidavit made upon oath or written affirmation subscribed under criminal penalty of the State of Utah having been made to me by Detective [REDACTED] of Heber City PD, this day, I am satisfied that there is probable cause to believe

THAT

On the premises known as A rose gold iPhone, further described as A rose gold iPhone with a clear case and broken screen protector;

On the item(s) described as: Any messaging capabilities, and photos;

In the City of Heber City, County of Wasatch, State of Utah, there is now certain property or evidence described as:

Any evidence of illegal activity

and that said property or evidence:

Was unlawfully acquired or is unlawfully possessed;

has been used or is possessed for the purpose of being used to commit or conceal the commission of an offense; or

is evidence of illegal conduct.

Affiant believes the property and evidence described above is evidence of the crime or crimes of Arranging to buy illegal drugs.

YOU ARE THEREFORE COMMANDED:

- Page 1 of Search Warrant No. [REDACTED]

to make a search in the daytime of the above-named or described person, vehicle, item, and/or premises for the herein-above described property or evidence and if you find the same or any part thereof, retain such property in your custody subject to the direction of a prosecutor or an order of this Court.

Dated: [REDACTED] 2018 @ 02:34 PM /s/ [REDACTED]



APPENDIX II: ADDITIONAL FIGURES AND TABLES

TABLE II.A(1): WARRANT APPROVAL TIME (MINUTES)
BY MIXED CRIME CATEGORY

CRIME CATEGORY	OBS.	MIN.	FIRST DECILE	FIRST QUART.	MED.	ADJ. MEAN	THIRD QUART.	MAX.
VIOLENT	1,595	0:08	1:08	2:00	3:35	8:51	6:56	721:31
PROPERTY	1,055	0:10	1:16	2:03	3:35	8:42	6:12	1,058:03
DRUG	1,245	0:08	1:05	1:55	3:12	6:53	5:31	662:40
VICE/MORALS	1,589	0:10	1:11	2:08	3:51	10:07	7:34	1,150:30
MOTOR VEHICLE	6,375	0:01	0:47	1:14	1:59	2:49	3:11	133:20
OTHER CRIMES*	4,613	0:07	1:07	1:58	3:26	7:25	6:16	1,109:13
ALL APPROVALS	29,810	0:01	0:57	1:37	2:50	6:47	5:13	2,581:37

Notes: Minutes are reported as Minutes:Seconds. "Adj. Mean" reflects the average warrant decision time in minutes once outliers were removed. "Mixed Crime" categories are determined based on whether a given warrant is coded as having that category (that is, double counting occurs). For example, if a warrant is coded under both "Property" and "Drug" crimes, the same warrant would appear in both rows of the table.

* "Other Crimes" are those warrants that were coded to crime types other than the five main categories included above.

TABLE II.A(2): WARRANT APPROVAL LENGTH (WORDS)
BY MIXED CRIME CATEGORY

CRIME CATEGORY	OBS.	FIRST QUART.	MED.	THIRD QUART.	ADJ. MEAN*
VIOLENT	1,595	935	1,255	1,768	1,719.07
PROPERTY	1,055	886	1,198	1,633	1,373.62
DRUG	1,245	862	1,161	1,567	1,295.63
VICE/MORALS	1,589	968	1,392	2,299	2,340.72
MOTOR VEHICLE	6,376	566	663	805	712.23
OTHER CRIMES	4,613	935	1,335	1,870	1,521.54
ALL APPROVALS	25,601	564	979	1,489	1,264.74

Notes: Minutes are reported as Minutes:Seconds. "Adj. Mean" reflects the average warrant decision time in minutes once outliers were removed.

FIGURE II.A: DISTRICT-LEVEL,
OVERALL REVIEW TIMES

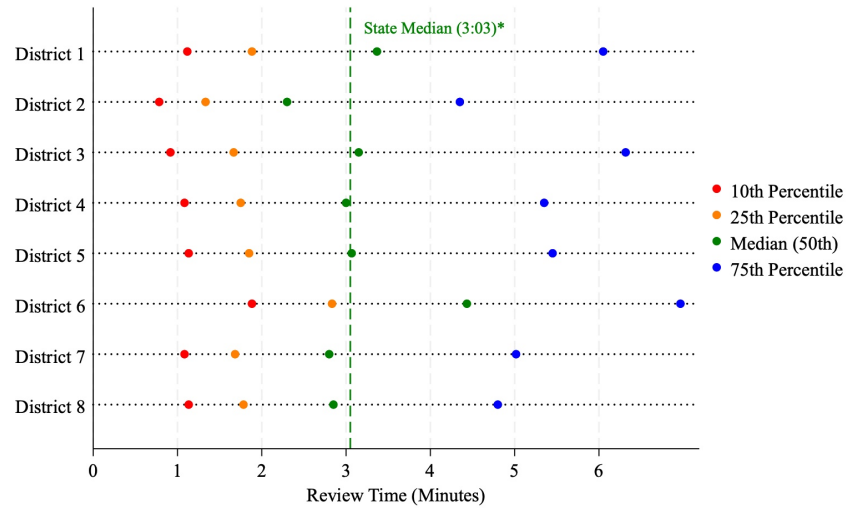


TABLE II.B: REGRESSIONS ON REVIEW TIME
BY SUBMISSION SEQUENCE

VARIABLES	(1) Approvals	(2) Approvals	(3) Approvals
Lawyer Review (Binary)	1.864*** (0.623)	2.635 (7.298)	1.876** (0.766)
Tenure (Years)	-0.104*** (0.033)	0.270 (0.424)	-0.080** (0.032)
Female (Binary)	-0.240 (0.655)	0.650 (1.782)	-0.423 (0.632)
White (Binary)	-1.086 (1.130)	6.970** (3.050)	-0.540 (1.013)
Full Time (Binary)	1.974 (1.708)	5.373 (9.188)	2.297 (2.232)
Law Degree (Binary)	6.031** (2.892)	0.979 (12.220)	5.169* (3.003)
Prosecutor Experience (Binary)	0.851 (1.013)	-1.052 (7.384)	0.880 (1.175)
Defense Experience (Binary)	-2.045** (0.875)	-1.169 (3.046)	-2.028** (0.938)
Both Experience (Binary)	-0.577 (1.805)	-2.267 (7.857)	-0.793 (1.979)
Constant	-0.810 (2.665)	12.930 (23.420)	1.420 (3.701)
Observations	22,921	1,936	24,857
Time-Fixed Effects	Yes	Yes	Yes
District-Fixed Effects	Yes	Yes	Yes
Warrant-Fixed Effects	No	No	No
District-Year Clustered SE	Yes	Yes	Yes
Dataset	First Submissions	Resubmissions	All Submissions

Notes: All linear models use fixed effects and have clustered standard errors on the district-year level. The time-fixed effects use year, month, day (weekday/weekend), and hour (four six-hour blocks, starting at 12:00 AM) measures. The warrant-fixed effects use judicial districts. "Lawyer Review" represents whether the data indicate that the affidavit was reviewed by a city or county attorney prior to submission. "Tenure" is measured at the warrant level and represents the number of years between the judge's appointment to the bench and the day of the warrant review. "Full Time" represents whether a judge is full time or part time. "Law Degree" represents whether the judge is a lawyer with a JD. "Prosecutor Experience," "Defense Experience," and "Both Experience" represent whether a judge worked as a prosecutor, a criminal defense lawyer (either public or private defense), or both.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.

Table II.B presents the results of our preferred regression model using subsets of data that include only first submissions (column 1) and resubmissions (column 2). We also include the full-data model from previous tables (column 3, a reprint of column 6b in Table 9 in the main body of this Article) for comparison.

As expected, the model using only first submissions produces nearly identical results to the full-data regression. However, although the regression that only analyzes resubmissions includes fewer than 2,000 observations, we see a statistically significant and substantively sizable relationship between race/ethnicity and review time. On average, white judges spend nearly seven minutes more on review than their nonwhite counterparts. However, the fact that this relationship only exists when analyzing the resubmissions dataset complicates the implications that can be drawn. It is not clear why such a massive correlation would only manifest on rereview, and this data is likely influenced by selection bias and small-sample variability, as the only submissions that are included are those that have previously been denied. As a result, we do not believe those results justify any solid conclusions or implications.

TABLE II.C: REGRESSIONS ON OUTCOME (APPROVAL OR NOT)
BY SUBMISSION SEQUENCE

VARIABLES	(1) Odds Ratios	(2) Odds Ratios	(3) Odds Ratios
Lawyer Review (Binary)	1.019 (0.085)	0.846 (0.168)	0.990 (0.109)
Tenure (Years)	0.998 (0.006)	0.974** (0.012)	0.995 (0.006)
Female (Binary)	0.780*** (0.044)	1.386 (0.379)	0.846** (0.063)
White (Binary)	1.664** (0.429)	0.884 (0.253)	1.504* (0.314)
Full Time (Binary)	0.883 (0.407)	1.080 (0.885)	0.894 (0.415)
Law Degree (Binary)	0.444** (0.161)		0.431** (0.146)
Prosecutor Experience (Binary)	0.648*** (0.093)	1.163 (0.302)	0.695*** (0.096)
Defense Experience (Binary)	0.975 (0.139)	0.563 (0.250)	0.871 (0.162)
Both Experience (Binary)	1.353 (0.259)	1.143 (0.472)	1.405 (0.338)
Constant	18.160*** (8.687)	21.590*** (15.880)	21.750*** (9.145)
Observations	16,946	1,508	18,468
Time-Fixed Effects	Yes	Yes	Yes
District-Fixed Effects	Yes	Yes	Yes
Warrant-Fixed Effects	No	No	No
District-Year Clustered SE	Yes	Yes	Yes
Dataset	First Submissions and Excludes Districts 2 & 5	Resubmissions and Excludes Districts 2 & 5	All Submissions and Excludes Districts 2 & 5

Notes: All logit models use fixed effects and have clustered standard errors on the district-year level. The time-fixed effects use year, month, day (weekday/weekend), and hour (four six-hour blocks, starting at 12:00 AM) measures. The warrant-fixed effects use judicial districts. "Lawyer Review" represents whether the data indicate that the affidavit was reviewed by a city or county attorney prior to submission. "Tenure" is measured at the warrant level and represents the number of years between the judge's appointment to the bench and the day of the warrant review. "Full Time" represents whether a judge is full time or part time. "Law Degree" represents whether the judge is a lawyer with a JD. "Prosecutor Experience," "Defense Experience," and "Both Experience" represent whether a judge worked as a prosecutor, a criminal defense lawyer (either public or private defense), or both.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.

In Table II.C we present the results of our preferred model on the likelihood of approval using datasets broken down by first submissions (column 1), resubmissions (column 2), and the full dataset (column 3,

which mirrors column 4 in Table 10). Given that the vast majority of submissions were approved in the first round, it is not surprising that our results for only first submissions closely match those that come from an analysis on all submissions. Having a JD and previously working as a prosecutor are still correlated with a lower likelihood of approval, and the gender and race/ethnicity relationships match those in the full dataset.

We also present the results of our preferred model using only resubmissions, although we do so with the caution that the resulting sample size (just over 1,500 observations) is so small that standard errors are likely to be large enough to mask any significant relationships. Indeed, the indicator for whether the reviewing judge has a law degree was omitted from this model due to multicollinearity. Except for a small but statistically significant correlation between tenure and approval rate — something that was not present in the tests using the full dataset — we do not see any notable relationships.

APPENDIX III: SUPPLEMENTAL EXPLANATIONS OF DATA AND METHODS

A. DETAILED DESCRIPTION OF DATASET SOURCING AND CLEANING

1. *PDF Images and Machine-Algorithm Text Analysis.* — Using the Utah Administrative Office of the Courts (AOC) database, Xchange,¹ we obtained PDF images of every unsealed digital affidavit, warrant, and return submitted and approved (denied and retracted warrants are not available, as explained in section II.A of this Article) through the e-Warrants system from December 1, 2013, to January 29, 2020.² Xchange is ostensibly designed for easy access by parties and attorneys in criminal (and civil) cases, but it is also provided to academic researchers on an as-needed basis. Because the Xchange system explicitly prohibits electronic scraping tools (that is, code or programs that automatically download files en masse), we manually downloaded each of the relevant warrant PDFs one by one.

At an individual level, procuring substantive information from the PDF files is fairly simple. Some of the data — submitting officer name; law enforcement agency; court location; and the dates of the affidavit, warrant, and return — are already available as bulk metadata via the AOC, and the data contain all the information necessary to match each

¹ For a basic description of the Xchange system, see *What Is Xchange?*, UTAH STATE CTS., <https://www.utcourts.gov/en/court-records-publications/records/xchange.html> [<https://perma.cc/P25M-7CCG>].

² For our discussion of sealed warrants, see de Figueiredo, Hashimoto & Thorley, *Unwarranted Warrants? An Empirical Analysis of Judicial Review in Search and Seizure*, 138 HARV. L. REV. 1959, 1991 n.177 (2025).

entry with the corresponding PDF image. Other key datapoints such as reviewing judge name and document length can be determined simply by reviewing the last page of the affidavit. Even the more substantively complex aspects that we hoped to identify such as the legal “type” of the warrant and the length of individual sections within the warrants can be determined in short order by reading over the affidavit language.

However, our dataset included nearly 33,500 such affidavits,³ so an individual, manual coding of them is impracticably labor- and cost-intensive. Therefore, we turned to natural language processing (NLP) methods, a computational approach, to help with the analysis of the warrants. The warrants were converted from their original image format as PDF documents to raw text using a combination of two methods. First, the files were converted to text using the PDFminer library in Python 3.⁴ However, the textual information from the judge’s seal could not be accurately converted using this method. Thus, a second method, PyTesseract, a Python wrapper for Google’s proprietary OCR Engine,⁵ was also employed to both check the accuracy of the first conversion method and to convert the text from the seal. The PDF images contained the full text of the affidavit for the search warrant, the warrant itself, and the return for the search warrant, as well as some metadata for the corresponding documents.

Relevant data was then extracted from the documents using regular expressions (or regex), an algorithmic method for advanced pattern matching in textual data. Using regex, the file was divided into its three documents (the affidavit, the warrant, and the return), and metadata about the warrant number, jurisdiction, dates, references to criminal statutes, officers submitting or returning the warrant (including their names, agencies, and ranks), and judge were generated for each file. These regular expressions were developed over several iterations and evaluated for their precision and recall to ensure that they were maximally accurate. In our final test set of 50 warrants, the accuracy of these regular expressions yielded 100% accuracy, although in the larger dataset of over 33,000 warrants, small numbers of errors were observed.

From the affidavits, two additional blocks of text were extracted using a large language model (BERT⁶): (1) an explanation of the facts to provide grounds for the search warrant, and (2) a description of the

³ This number is greater than the number of affidavits explored in our general analysis because that analysis only included affidavits that were approved from 2017 to 2019, the years in which timestamp data for the reviewing judge’s first viewing were collected.

⁴ Yusuke Shinyama, *PDFMiner: Python PDF Parser and Analyzer*, PDFMINER-DOCS, https://pdfminer-docs.readthedocs.io/pdfminer_index.html [https://perma.cc/7JNP-PYSA].

⁵ Samuel Hoffstaetter et al., *Python-Tesseract Is a Python Wrapper for Google’s Tesseract-OCR*, PYTHON PACKAGE INDEX (Aug. 15, 2024), <https://pypi.org/project/pytesseract> [https://perma.cc/CH7S-GJF9].

⁶ Jacob Devlin et al., BERT: Pre-Training of Deep Bidirectional Transformers for Language Understanding 1 (May 24, 2019) (unpublished manuscript), <https://arxiv.org/pdf/1810.04805> [https://perma.cc/N5QT-FQ6Q].

submitting officer’s experience that qualifies them to make the relevant judgments about the grounds in the search warrant. Word counts were then generated using Python for each affidavit, warrant, and return, as well as the descriptions of facts and officer experience. While the text identification process for the facts and experience are much more complex and, consequently, less accurate, they provide us with an accurate enough measure to use in some of our alternative analyses presented in the main body of this Article.

2. *Electronic Warrants Administrative Data.* — The second of our key datasets comes from the largely untapped data from the Utah Department of Public Safety (DPS).⁷ Critical to our study, and the element that makes our dataset so novel, is the metadata recorded by the electronic warrant system. These include timestamps at the second level for when (1) the officer submitted the affidavit, (2) the magistrate viewed the affidavit, (3) the magistrate made a decision on the warrant application (retraction, approval, or denial), and (4) the officer served the warrant. The data contains a warrant identification number, which allows us to easily connect it with the PDF image data, but does not have geographic, judge, or other information. The DPS retains data starting from April 6, 2016, although only starting on March 28, 2017, does the data include a timestamp for when the judge viewed the affidavit.

We obtained this dataset through a Government Records and Access Management Act⁸ (GRAMA, Utah’s equivalent to FOIA) Request, which was initially denied but granted on administrative appeal. The DPS data for this study ends on January 29, 2020 (the date our data request was fulfilled).

3. *Imputed Reviewing-Judge Data.* — As we alluded to earlier, our dataset only includes PDF images for *approved* affidavits. In other words, the small percentage of affidavits that are submitted for review and subsequently denied by the reviewing judge or withdrawn by the submitting officer will have administrative metadata (like timestamps) but no PDF images that allow us to create data derived from the text of the affidavit itself. While, in section I.D of this Article, we discuss the ways in which this prevents us from conducting certain analyses, we are able to impute the reviewing judge for a denied or retracted affidavit by reconstructing the county-level shifts for each day covered in our broader dataset. This allows us to conduct some judge-level analyses on those denied and retracted affidavits, such as exploring the likelihood of approval in Part IV of this Article.

We created this shift data using a combination of schedules provided to us by county administration and the reviewing-judge patterns that

⁷ We note the previous work by the *Salt Lake Tribune* that used a small portion of this data in their analysis. See de Figueiredo, Hashimoto & Thorley, *supra* note 2, at 1966 n.29.

⁸ UTAH CODE ANN. §§ 63G-2-101 to -901 (West 2024).

existed in the PDF image data we were able to scrape. Starting with the PDF-derived data, research assistants ordered the dataset by county and then by submission date and tracked the approving-judge name by hand, noting any clear changes in the judge name and when those changes occurred. Once the entirety of a given county’s data was coded, we attempted to identify patterns in the variations that translated to identifiable week- or month-level “shifts.”⁹ Overlaying those patterns back onto the existing data, we then calculated the judge who approved the majority of the warrant affidavits during a given shift and assigned that judge as the “on-call” judge.¹⁰ This process provided us with clear shift data in all but two of Utah’s judicial districts (the Second and Fifth Judicial Districts).¹¹

With the shift data, we then needed to determine what the parameters of our shift imputations would be. On the one hand, the most conservative assumption would be to assign all warrants reviewed during a given shift to the judge assigned to that shift. On the other hand, we have confirmed through interviews with law enforcement officers and judges (and some instances in the data) that the actual process is more complicated and that affidavits are not always sent to the judge who is on call during a given shift.

For example, in one of the warrants in our dataset, an officer submitted a warrant affidavit during shift one, was denied by the judge (anonymous in our data), resubmitted during the next shift, was denied again, and resubmitted during a third shift, where the warrant was denied for the last time. We might be justified in assuming that the reviewing judge for each submission was the on-call judge at the time of each submission, but it is also possible that the officer resubmitted the warrant both times to the judge who had originally reviewed the warrant given her familiarity with the contents.

While we have some intuitions regarding the most likely path a warrant took in a given scenario (informed by some anecdotes shared by officers we interviewed), the various permutations in the data are sufficiently complex that any attempt at systematically imputing each of them made the analysis unwieldy. As a result, our dataset adopts the more conservative approach — where the on-call judge is assumed to

⁹ As we discussed above, four districts have week-long shifts, generally starting and ending at 8 AM on Mondays; one has two-week shifts; and three have month-long shifts. See de Figueiredo, Hashimoto & Thorley, *supra* note 2, at 1989 & n.170.

¹⁰ We acknowledge that this approach is not perfect. Indeed, we are certain that in some instances judges assigned to periods within our shift data deviate from the actual judge who sat and reviewed warrants. However, we were able to confirm our inferences regarding the basic structure of the shifts (like when and how long the shifts were) in discussions with county administrators.

¹¹ In these two districts, there appeared to be a main judge on call but a backup judge that took warrants throughout the other judge’s shift. The switching between these two judges was significant enough that we did not feel comfortable making any inferences regarding reviewing judge. Consequently, these districts are not featured in our judge-level analysis of approval rates in Part IV.

be the judge who reviewed an affidavit submitted then denied or retracted during that shift. Any approved warrants during that period retained the reviewing judge that we scraped from the PDF images for the purposes of our analysis.

4. *Hand-Coded Data.* — While most of the data we use in this study is available in bulk metadata form or is electronically scraped from the PDF images, some of the data required manual efforts.

Although our analysis is completely anonymous on the judge level, we do draw some correlations between the amount of time reviewing and likelihood of approval for a warrant affidavit and the characteristics of the reviewing judge. Some of this data comes from Utah’s Judicial Performance Evaluation Commission (JPEC), a state-sponsored committee that conducts regular performance evaluations of each judge or magistrate in Utah, primarily as a mechanism for providing information to Utah’s voters during the judges’ retention elections.¹² Its dataset not only provides detailed results from these evaluations (some of which we use in our study) but also compiles clean, up-to-date registries of the judiciary, including judges’ names, tenures, and courts.¹³

We add to this base dataset with a rich set of hand-coded biographical variables on each judge, including their gender, race/ethnicity, legal education, professional experience (whether they were formerly a prosecutor or a criminal defense attorney), and the time and manner of appointment. This information was gathered by research assistants using a mix of the judge biographies included on court websites and online search engines (like Google).

In addition to the previously described administrative data, our qualitative analysis also relies on two in-depth hand-coded sources of data. First, we make use of a hand-coded random sample of 231 affidavits, warrants, and returns from the Utah AOC database. Second, we similarly review 40 warrants that were approved in a minute or less. We discuss our use of these samples in detail in Part V of this Article.

5. *Dataset Merging and Additional Cleaning.* — Due primarily to the fact that the recording of first viewing timestamps in the DPS data only began in March 2017, the primary dataset used in this study limits all the datasets (AOC PDF data, hand-coded judge data, shift data) from March 2017 to near the end of January 2020.¹⁴ Additionally, as we describe in section III.A of this Article, we exclude outlier review times for portions of our analysis.

¹² *About Us*, UTAH JUD. PERFORMANCE EVALUATION COMM’N, <https://judges.utah.gov/s/about-us> [<https://perma.cc/S5AK-P464>].

¹³ *See Know Your Judges*, UTAH JUD. PERFORMANCE EVALUATION COMM’N, <https://judges.utah.gov/s/know-your-judges> [<https://perma.cc/T6D6-72W8>].

¹⁴ Although we have some data for 2020, we are not including it due to concerns about the effect that the advent of the COVID pandemic had on the “normal” search and seizure process.

B. JACCARD SIMILARITY

While computational approaches for measuring similarity have been widely used in other fields, it has only recently been applied to analyzing legal texts.¹⁵ An extended outline of the technicalities of Jaccard similarity is beyond the scope of this Article,¹⁶ but we feel it warrants a brief explanation. Like most measures for linguistic similarity, Jaccard similarity (also called the Jaccard index) involves the direct comparison of two distinct datasets and computes a ratio of dataset observations that are the same relative to the overall number of observations in those data.¹⁷ In the case of this study, we compute word-level Jaccard coefficients for each of the approved affidavits in our dataset against every other affidavit. While including all affidavits (denials and retractions) in this analysis would be ideal, we are once again limited by the fact that only the PDF images of the approved affidavits are retained in the warrant database.

Using a simplistic but germane example of search warrants, imagine that the entirety of a warrant affidavit, Affidavit A, stated only that “the suspect was seen pocketing a bag with *unidentified* contents.” A second affidavit, Affidavit B, stating that “the suspect was seen pocketing a bag with *white* contents,” would have a Jaccard coefficient of 0.9 because there are eighteen similar observations between the two affidavits (nine words in each affidavit) and twenty observations in total. Similarly, comparing Affidavit A to a third affidavit, Affidavit C, that states that “the suspect was seen pocketing a bag with *white powder*” would produce a Jaccard coefficient of 0.8 because only sixteen of the twenty observations are similar. Conversely, the Jaccard coefficient for the comparison of Affidavits B and C would be 0.9. Computing the Jaccard similarity scores for full-length affidavits is more computationally complex than these single-sentence examples, but the resulting coefficient is still straightforward in interpretation.

Using Jaccard similarity scores naturally comes with some limitations, although we feel that they are mitigated somewhat by the general goal behind this alternative analysis. First, the Jaccard scores do not

¹⁵ See, e.g., de Figueiredo, Hashimoto & Thorley, *supra* note 2, at 2019 n.219 (citing sources that use cosine similarity — a methodological cousin to Jaccard similarity — to measure text-similarity in IPO documents).

¹⁶ As a mathematical methodology, Jaccard similarity is more than a century old. See generally Paul Jaccard, *The Distribution of the Flora in the Alpine Zone*, 11 NEW PHYTOLOGIST 37 (1912). However, it has been further developed over that time and is commonly used in linguistic analysis for measuring text similarity. See, e.g., Abhishek Jain et al., *Information Retrieval Using Cosine and Jaccard Similarity in Vector Space Model*, INT’L J. COMPUT. APPLICATIONS, April 2017, at 28, 30 (documenting the use of Jaccard similarity to match search queries to documents over the internet).

¹⁷ In formal terms, a Jaccard coefficient for datasets A and B is equal to the number of observations shared between A and B divided by the sum of the shared and unshared observations in A and B: $J(A,B) = |A \cap B| / |A \cup B|$ where $|A \cap B|$ represents the shared observations and $|A \cup B|$ represents all observations.

tell us anything about *why* there is a difference between the two affidavits, only the size of the difference. A Jaccard coefficient for two affidavits might be 0.5 because 50% of one affidavit is completely different than another affidavit, or it might be that the second affidavit contains all of the text of the first but also includes substantially more language that was not included in the first affidavit at all. Second, a Jaccard coefficient is content neutral, which is to say that the word-to-word similarity does not account for the relative substantive importance of some words over others (like facts vs. nonfacts). Using the example from above, the comparison between Affidavits A and B would yield the same coefficient as a comparison between Affidavit A and a fourth affidavit that states: “A suspect was seen pocketing a bag with unidentified contents.” Even though the difference between the first and second affidavit (that is, a bag with unidentified contents vs. one with white contents) is clearly more substantively important than the mere change in articles between the first and fourth (“the suspect” vs. “a suspect”), the Jaccard similarity score would be the same. However, because we are only broadly concerned with overall similarity for the purposes of excluding boilerplate-type observations from our dataset, neither of these limitations prove to be overly restrictive.