Improving Citizen-initiated Police Reform Efforts through Interactive Design: A Case Study in Allegheny County

Yongsu Ahn*
University of Pittsburgh

Eliana Beigel
University of Pittsburgh

Noah Braun
University of Pittsburgh

Collin Griffin
University of Pittsburgh

Sera Linardi
University of Pittsburgh

Blair Mickles
University of Pittsburgh

Emmaline Rial
University of Pittsburgh

ABSTRACT

Increasing police accountability in the US has been an issue for decades, but citizen-initiated reform efforts have been less than effective at moving the needle on the issue. Our project aims to provide citizens and community organizers with a better understanding of the legal landscape of police accountability in Allegheny County, allowing them to more effectively advocate for reform. We do so by creating an open collaborative network that works to overcome the issues of data inaccessibility, data complexity, and the fragmentation of data across different municipalities. We engaged with community leaders, gathered contracts and other data on over 100 police departments in Allegheny County, and created a web platform to make this previously inaccessible information available to the public. In its creation, we also utilized visual representation to aid those engaging with the law to better understand and collaborate without being inhibited by complicated legal concepts.

CCS CONCEPTS

• **Human-centered computing → Participatory design**; **Visualization systems and tools**.

KEYWORDS

Policing, Police accountability, Legal corpus analysis, Legal visualization, Interactive system

---

*All authors contributed equally to this research.

---

1 INTRODUCTION

The George Floyd uprisings in Summer 2020 sparked what has been referred to as a national reckoning on race and policing. Excessive use of force—particularly in non-white communities—has been an issue for decades in the United States [35, 39, 48]. Evidence from contemporary and historical contexts suggests that an increase in police accountability, from both internal and external pressure, can lead to a decline in police misconduct [3, 7, 19]. However, citizen-initiated reform efforts are not always effective. As an example, in the summer of 2020, a coalition of Pittsburgh-based racial justice organizations issued a "list of demands" to then-mayor William Peduto. At the time, the movement received massive public support, pressuring the local government to be receptive. Unfortunately, due to the legal contracts governing the Pittsburgh Bureau of Police (PBP), many of these demands were either not within the power of the Mayor's Office or contestable in court by the Fraternal Order of Police [28].

This project attempts to 1) understand the obstacles in informing community-driven police reform of the legal landscape of policing, and 2) build a platform to overcome these challenges, so that the passion, energy, and resources devoted to these efforts can engender lasting changes. Using the case of Allegheny County, we identified four major obstacles: three regarding data and one pertaining to organizational infrastructure. The data challenges comprise data inaccessibility, data complexity, and the fragmentation of data across different municipalities; in the setting of police accountability, accessing contracts mandates formal requests, relating incidents to legal provisions is arduous, and small geographical regions often involve multiple small police departments. To overcome these issues, relevant information to reform efforts needs to be systematically collected, efficiently summarized, and effectively presented in a digestible fashion to the public. While community groups excel at community engagement, a sustainable infrastructure is necessary for data collection and platform development due to the incident-driven nature of community organizing.

Our project aims to provide citizens and community organizers a tool that allows them to better understand the legal landscape of local policing and, thus, advocate more effectively for reform. To continue centering the reform effort on the lived experiences of those affected while introducing novel technical expertise, our first step was to create an open collaboration network, the Grief to Action network ("G2A"), where anyone interested can contribute to the project regardless of their academic affiliation. Since some of

our members have had direct experience with police violence, it was a priority in G2A to engage with the work in a way that minimizes the possibility of retraumatization [51]. Over a two year period, more than 70 individuals came together to practice mindfulness [10], engage with community leaders, gather data, and co-develop a web platform that allows the public to interact with previously inaccessible information. The platform[1] features a contract search tool, an interactive map of the county's police departments, and a novel keyword guide that provides a beginner-friendly entry-point for citizens to engage with the legal language of contracts. Lastly, we built an interactive flowchart of the police misconduct complaint process in Pittsburgh to illustrate how general understanding of contracts acquired from our platform can lead to educational tools for the public. As this in an ongoing project, future plans include pre/post user tests to measure how the platform improves understanding of police accountability, additional interactive flowcharts to explain complex accountability procedures, and modularization and container-based virtualization of our platform to allow community organizations to build and customize their own police contract platforms.

Our primary goal is connecting research and practical knowledge from multiple disciplines into a practical, tangible effort to support citizen-initiated police reform efforts. Too often, activist energy is wasted on reforms that do not withstand legal challenges or are not effective within their specific locality. Fig. 1 summarizes how we believe our platform can aid in the reform process by ensuring that activists have the knowledge necessary to pass amendments that are both legal and effective at changing the police accountability process. Our work thus far includes:

- Creating and maintaining an ongoing Community Based Participatory Research (CBPR) infrastructure that wove together the contributions of more than 70 individuals - one third of which are unaffiliated with academia - into a data science project.
- Collected over 100 contracts through Pennsylvania's "right to know" (RTK) process for each of the 130 municipalities in Allegheny County, creating the first hyper-local police contract library of its kind. The comprehensive coverage of our contract library over contiguous geographical areas will allow future researchers to understand the political economy of local policing at a level not possible before.
- Extracted legal keywords pertaining to problematic legal provisions as identified by national police reform nonprofit Campaign Zero [50] and researchers. Presented the keywords as entry points into contract searches, connecting local issues to the broader national conversation.
- Visualized contract search results in an interactive map complemented with contextual information most often requested by community organizers, such as budget information and size of police forces. This allows users to identify the spread of certain contract language across municipalities and draw insights about policy adoption [1] [29].
- Provided a demonstration of interactive flowcharts for specific police processes that can emerge from this project with

an interactive guide to filing misconduct complaints in Pittsburgh.

2 RELATED WORK AND LITERATURE REVIEW

2.1 Police Accountability and Police Unions

An informed public is a powerful public. Advocates, policymakers, and members of the over-policed communities that they represent are essential stakeholders in ending police abuse. Evidence suggests that an increase in police accountability can lead to a decline in police misconduct [3, 7] and that external pressure could be an important source of increased accountability. Civilian protests for Black Lives Matter have been successful in reducing short term police violence [9],[2] and electoral accountability was successful at closing part of the racial gap in policing in the 1960s [17]. Experts, therefore, encourage the public to engage in the processes of establishing legal frameworks to ensure that they do not impede accountability for law enforcement [32, 46], which requires knowledge of existing police accountability processes [22].

Police unions play an important role in police accountability through their ability to directly influence investigations [19, 44] and bring legislative changes to the discipline process [26]. For example, police union contracts mandate the destruction of disciplinary records, prevent anonymous complaints, and may limit a municipality's ability to interrogate officers which impedes the municipality's ability to collect and maintain information about problematic officers [38, 44, 50].[3] However, it is often necessary to file a RTK request to obtain these documents and, once obtained, relevant information has to be extracted from the legal corpus [41], which is challenging as individuals need to know the specific rules of each department they interact with.

These informational barriers constitute administrative burdens—an ordeal mechanism that makes it so only those who are highly motivated will participate in a process [24]. The role of informational complexity in ambiguous, tedious forms have been found to reduce participation in government programs [8, 18], and randomized control trials of low-cost information intervention has shown that reducing complexity increases participation [18, 20]. To reduce the administrative burden that has to be borne by the public in order to participate meaningfully in local police reform efforts, we aim to create an interactive tool to understand police accountability at the municipal level.

2.2 Interactive Design to Increase Legal Transparency

Recent studies have established that locating, searching, and reviewing a large set of legal documents is challenging even for experts [23]. Complex research tools have been created with document structures or linguistic cues constructed by either domain experts or automatic techniques [2, 12, 30, 34, 45], but this is beyond the

---

[1]Available on https://www.grieftoaction.org/

[2]See the Ferguson effect [36]

[3] Information about problematic officers is very important to an efficient police accountability process, as a small number of police officers are responsible for a large percentage of police misconduct [13, 21, 43]. Civilian complaints serve as an early warning since complaints made against an officer are highly predictive of future misconduct from that same officer [43].
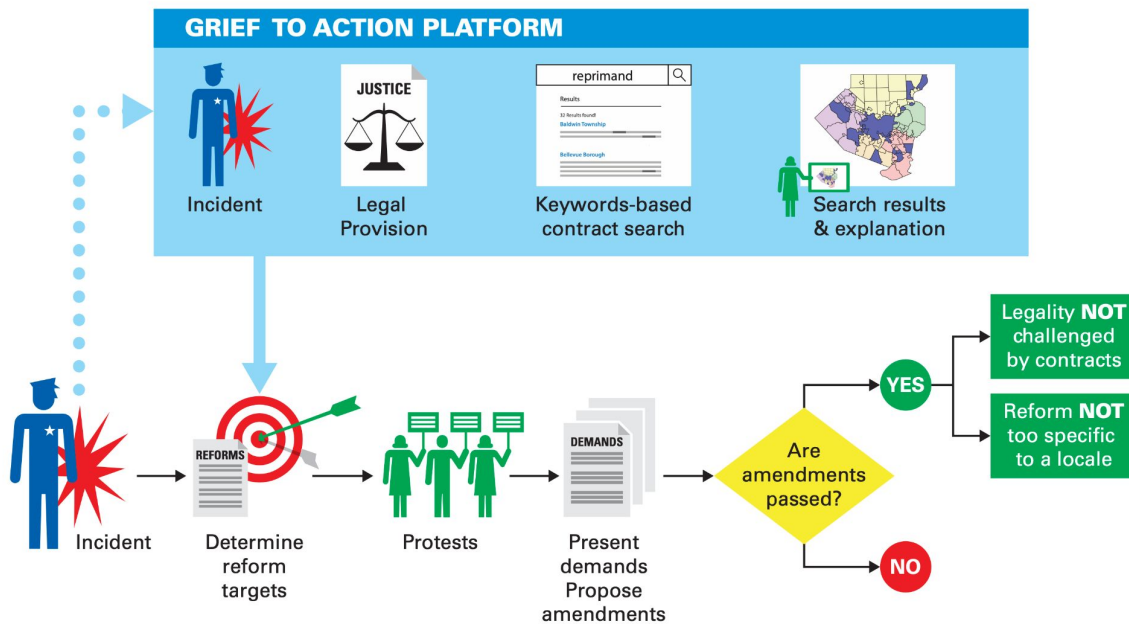
Figure 1: Our logic model: our interactive platform (highlighted as blue) helps the public navigate local police contracts and regional hyperfragmentation, improving the chances of successful citizen-initiated police reform.

technical and financial capability of most grassroots organizations, including ours. Simpler systems that calculate frequency of terms across contracts [47], allow spatial comparisons of policies [27], and highlight the common structure or keywords across documents in a corpus [11, 47] are the pragmatic solution. Additionally beneficial is research that focuses on visually representing a body of specialized science by charting administrative justice paths of redress [41] or representing legal knowledge [42] with process diagrams.[4] These process flows can be used to visualize policy adoption patterns among political actors [1] and can help laypersons facilitate discussions and effectively engage in problem-solving legal matters [33, 52]. In this paper, we will discuss how we developed a simple platform that summarizes and compares police contracts in a region and separately develop a flowchart for a specific legal process using our understanding of contracts. Our ultimate future goal is to link these two systems: the one that summarizes and compares contracts with the one that creates visual representations of processes so that the citizens can move beyond comparing contract terms to comparing entire legal processes across municipalities.

2.3 Web Platforms for Policing and Contract Analysis

Efforts to gather and publish policing data have grown in the last decade. Invisible Institute's Citizens Police Data Project collected and published information about police misconduct in Chicago dating back to 1988, creating a dataset that has been a boon for researchers [4–7, 13, 14, 25, 40, 43] . Mapping Police Violence, the Washington Post's Fatal Force project, and Fatal Encounters are

interactive databases that track fatal shootings by police officers in the US. Most relevant to our work is Campaign Zero's Check the Police initiative [50], which analyzed police union contracts of 81 of the 100 largest cities in the USA and police bill of rights in 16 states. Though we focus on smaller municipalities, our analysis adopts their categorization of six problematic contract provisions, and we used their earlier contract annotation database for work on automatic keyword identification.[5] Public contract search tools are deployed by different government agencies, such as the U.S. Department of Labor [31] and the U.S. Department of Treasury [49]. However, these are usually intended as databases for specialists rather than as interactive tools for citizens. Compared to these nonprofit and government contract tools, ours is unique in the features that make it an interactive platform, including the capabilities to search contracts for keywords, to geographically visualize the spread of keywords, and to connect the occurrences of keywords to the characteristics of the governing unit (e.g budget of police department).

3 MOTIVATION AND DESIGN OF ACPP

3.1 Policing in Allegheny County

In Allegheny County, community activists have organized against police misconduct for decades. Following the death of George Floyd in Minneapolis, Minnesota in May 2020, concerned residents around the county took part in solidarity protests. These protests also led to renewed calls for police reform at the local level. For example, two weeks after Floyd's death, a coalition of Pittsburgh-area racial justice organizations presented a list of demands for criminal justice

---

[4]The most common visualizations in this context are diagrammatic representations of legislation including concept flow, UML workflow, flowchart, or relational model.

[5]This analysis was unsuccessful - we discuss this briefly in Section 4.3.

reform to then-mayor William Peduto. However, stipulations in the city's police union contract precluded the possibility of enacting many of these changes. For example, the coalition called for the termination of Robert Swartzwelder, the president of the Fraternal Order of Police (FOP), due to his reluctance to engage with police reform, but doing so is disallowed by section F2.B. of the contract which states that "There shall be no discrimination, restraint, or coercion against any employee because of membership of the FOP."

Though municipal police contracts are technically public documents, they are rarely publicly posted, and local governments may be reluctant to share them with residents. Pennsylvania's Right to Know Law grants the public the ability to access these contracts by filing a formal request, but this process can be incredibly confusing to the uninitiated. Because these contracts can be so difficult to obtain and to understand, even seasoned organizers may be unaware of these restrictions.

To make matters more complicated, Allegheny County is exceptionally politically fragmented, with the County's 1.2 million residents distributed amongst 130 different municipalities. 1/3 of these municipalities cover less than one square mile. The city of Pittsburgh at the County's center is the most populous municipality by far with 300,000 residents, and the Pittsburgh Bureau of Police (PBP) is the County's largest police force employing about 1,000 officers. In total, however, there are 108 governmental police departments in operation across the County, each of which operates according to its own policies and procedures. An individual traveling across the county is likely to enter the jurisdiction of multiple law enforcement agencies who have different codes of conduct, levels of resources, and processes for filing a complaint.

The problems of hyper fragmented policing extend well beyond Allegheny County. Antwon Rose's death at the hands of the police department of a small borough independent from the police department of the large city a few miles from it garnered comparisons to the death of Michael Brown in 2014 in Ferguson, Missouri. A 2015 report addressing policing in Ferguson, produced in collaboration with stakeholders across the region, identified the hyperfragmentation of St. Louis County's policing into 58 different police departments, representing the 90 municipalities as a problem in need of urgent redress. Similar issues of disunity in local policing have also been raised in the cases of Philando Castille (St. Anthony police department outside of St. Paul, MN), Sandra Bland (Waller County, outside of Houston, TX), and others.

Below, we summarize the challenges in increasing police accountability within Allegheny County. We believe these challenges are similar to efforts in other counties.

- **C1:** Police reform efforts are often incident-driven and, hence, limited in temporal and geographic scope.
- **C2:** The inaccessibility of legal regulations and other local policing data makes it difficult to gain the systematic understanding necessary for effective reform.
- **C3:** Hyper-fragmentation of local policing means that reform efforts have to be coordinated across many police jurisdictions to be at a geographical scale that is relevant to individuals' lives.
- **C4:** Individuals experiencing police misconduct are unable to navigate the opaque channels for accountability (such as

the misconduct complaint process) without the assistance of community organizations, thus straining the community's scarce resources.

3.2 Design

Many barriers exist before citizens can meaningfully participate in police reform efforts. Our project takes the first step by tackling the information barriers related to the rules and context of local policing. This has been and will continue to be an ongoing project with multiple iterative cycles of community feedback and redesign, with an end goal of community ownership of the platform. Components of our project design thus far are listed below as a response to the challenges discussed in Section 3.1. This list also serves as the roadmap through the rest of this paper.

- In relation to C1, we need to provide an organizational infrastructure that can support ongoing data collection and technical work while retaining public engagement (Fig 2a and 2e, details in Section 4.1)
- In relation to C2 and C3, our project needs to collect police contracts and police department data (size of force, budget, bargaining unit, police accountability process) creating a centralized database of information crucial to understand local policing (Fig. 2b, details in Section 4.2)
- In relation to C2, we need to analyze contracts (and other procedures) to identify keywords that suggest legal provisions that may impede police accountability (Fig. 2c, details in Section 4.3)
- In relation to C2-C4, we need to design and implement a web-based tool with modules that organizes disparate information into a relational database and provides multiple entry points for users' sense-making of police contracts, a geospatial overview of policing, and an interactive flowchart to aid citizens in navigating the misconduct complaint process (Fig. 2, details in Section 5):

4 COMMUNITY ORIENTED PLANNING, DESIGN, AND ANALYSIS

4.1 Community Engaged Design Process

Grief to Action (G2A) was started at the Center for Analytical Approaches to Social Innovation (CAASI) at University of Pittsburgh in response to the police killing of George Perry Floyd Jr. in May 2020. The event galvanized a grassroots effort to harness the University of Pittsburgh's technical and social science expertise towards community needs, moving G2A to a Community Based Participatory Research (CBPR) approach that has integrated the contributions of more than 70 diverse participants. Our CBPR approach has four phases: 1) problem scoping and prototyping, 2) data collection and prototype testing, 3) development and testing of the actual platform, and 4) deployment and dissemination.[6] Foundational to the development of all phases was consideration of retraumatization ([51]), which informed G2A's incorporation of mindfulness [10] and members' social work training [37].

---

[6]The use of participatory methods across all stages of platform development is a signature of G2A projects [16].
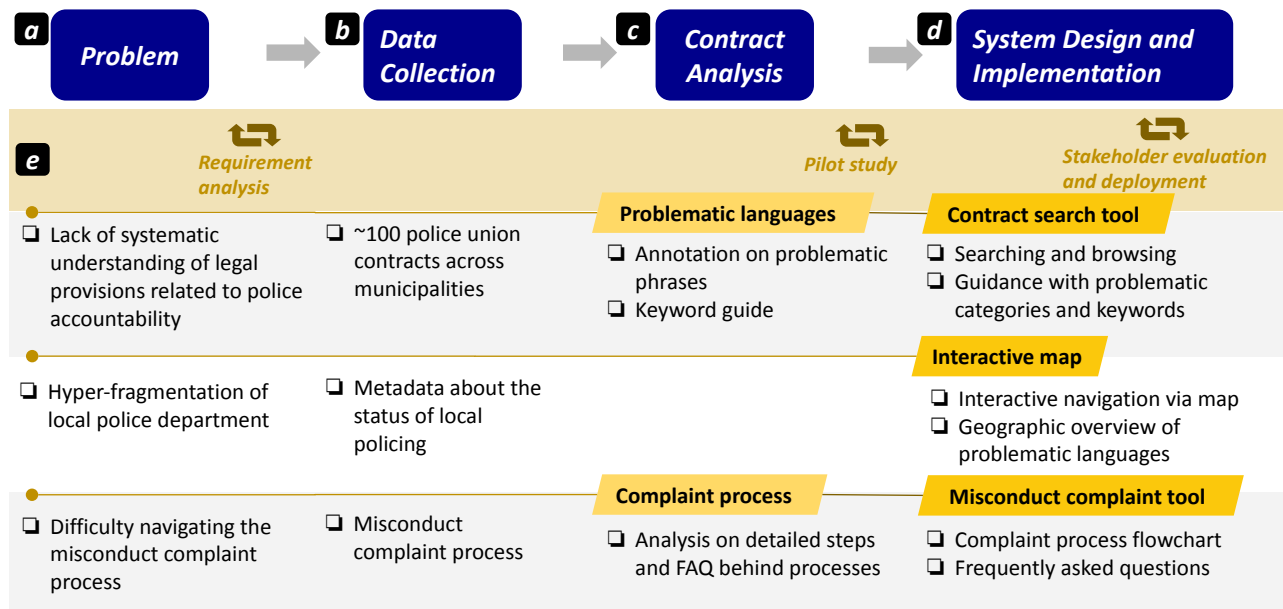
Figure 2: The design of our study. (a) Our project was motivated by the informational barriers faced by the public when advocating for more police accountability. This led us to plan a systematic development on (b) data collection, (c) data analysis, and (d) interactive data presentation and visualization. (e) The entire project was collaboratively designed with citizens, community leaders, faculty, students and local/national activists.

Phase One of the project consisted of establishing an ongoing inclusive weekly meeting with community leaders, people in public safety, faculty members, students, and local/national activists. This network grew organically through word-of-mouth and has met continuously since May 2020. Conversations at this phase created common knowledge about local contexts and challenges and their connections with national issues (Section 3.1), as well as the consensus on the end product: a platform to navigate the many contracts and data that make up the hyperfragmented local policing landscape. In Fall 2020, we recruited a computer science capstone team to create the first prototype using Campaign Zero's national data to stand-in for the local data yet to be collected.

The objective of **Phase Two** was the collection of the local contracts and the evaluation of our first prototype. G2A organized a campaign to collect contracts from all 130 municipalities, which often involved filing Rights-to-Know requests (Section 4.2). For the user study, we obtained IRB and conducted user studies composed of a population affected by police violence. [7] Users were compensated ($35 for the one-hour study). Participants were read a scenario constructed out of community members' actual experiences and asked to answer questions about the police before and after using the tool(e.g *Can the passenger file a complaint as a witness?*). Feedback revealed the need for interactive maps, municipal police information, and misconduct complaint guides.

In **Phase Three**, we built a second prototype based on feedback on the first prototype. To evaluate the updated version of our system, we ran an expert user study in Spring 2021 with community leaders in this space and developed what became our current public platform (details in Section 6.1).

Phase Four, which followed the deployment of the tool, was dissemination within the community. The team invited community members to the talks they gave within the university setting and gave talks and demonstrations at venues where they could reach relevant community members, such as at 1Hood Media Power Hour and the Pittsburgh Racial Justice Summit. (details in Section ??). From hereon, we continuously iterate between Phase 3 (user studies, platform improvements) and Phase 4 (dissemination). For example, in Summer 2022, we conducted a 26-person user study with a coalition of local community organizations active in police accountability, and Fall 2022, we will implement their requested changes.

4.2 Data Collection

4.2.1 Contract data collection. Our contract collection process was initially complicated by our affiliation with a university that works closely with many local governments in Allegheny County. Commonwealth of Pennsylvania allows the public to request information from the government through its Right-to-Know Law signed into law in 2008.[8]; however, there was an impression that submitting formal RTK requests would be adversarial. Fortunately, this issue was resolved through volunteering campaigns where members submitted the RTKs as individuals.

---

[7]For our first user study we were only able to recruit less than five participants, but we deemed the trade-off worthwhile due to the specific needs of this underrepresented population.

[8]Office of Open Record https://www.openrecords.pa.gov/RTKL/About.cfm

We began by contacting each government agency and asking if they would share their contracts with us. We submitted RTK requests for the remaining agencies. Initially, we modeled requests after language used by Campaign Zero, gathered via MuckRock in 2015.[9] As we began to gather responses from municipalities, we tailored RTK language to Allegheny County based on the responses themselves. Only 2 of 108 departments failed to acknowledge our requests.

4.2.2 Municipal & police dept data collection. To fully understand the context and landscape in which these contracts exist, we gathered data on the municipalities they represent. This includes the number of full/part time officers, municipal budgets, geographical size of the area of governance, the size of that municipality's city council, which school district it interfaced, and other related statistics. This data collection process was laborious, involving locating the individual websites of police departments and public records of city council meetings in order to identify the relevant information.

4.2.3 Misconduct complaint steps data collection. Studies have shown that lowering the administrative burden of filing complaints led to better police accountability.[10] We, therefore, identify the police misconduct complaint process as a specific area of police accountability where we can take the next step in utilizing the information in the police contract library to create a practical and beneficial tool for citizens.

We first collected public information on the misconduct complaint process. For Pittsburgh residents, a brief internet search directs them to the websites of the Citizen Police Review Board and/or the Office of Municipal Investigations (OMI)[11]. The pages provide forms to complete but do not describe the full process or even the implications of each step in the process-such as who can see the complainant's submitted information or what omission will disqualify their complaint. We worked with our community partners to create an FAQ (frequently asked questions) of the misconduct complaint process out of these open questions.

4.3 Data Analysis

4.3.1 Basis of Contract Analysis. As legal documents, these CBAs can at first seem impenetrable to the layperson. After our first expert user study in Summer 2021 (Phase 3 in Section 4.1), we realized that even community leaders in the area of police reform needed help to come up with the legal keywords that correspond to the areas they are interested in.

As a starting point, we built off the contract analysis performed by national police accountability nonprofit Campaign Zero in their "Check the Police" initiative. Under the Check the Police campaign, Campaign Zero first gathered and then analyzed police CBAs for 81 of the United States's 100 largest cities. They identified six types of problematic contract categories: legal clauses that are frequently

found within CBAs and make it more difficult to hold police accountable. These categories are: disqualifying complaints due to statute of limitation, delaying interrogation of police officers after an incident, giving officers unfair access to information, requiring the city to pay for misconduct, erasing misconduct records, and limiting disciplinary consequences.

To identify these keywords, we first tried the statistical analysis with a machine learning approach. We contacted Campaign Zero and received their police CBA dataset, which consisted of 1,367 phrases from police union contracts from 81 different cities. These phrases were annotated with one of the six problematic language categories. Different types of classifiers using various techniques, like Support Vector Machine, Supervised Latent Dirichlet Allocation, and Random Forest, were trained on the corpus with n-gram features (n=1,2) (i.e., contiguous sequences of one or two words). Word association revealed phrases that were exclusively used in a specific category; however, we ran into problems when we attempted to use these phrases as a signal to detect problematic categories in Allegheny County. For example, "disciplinary action" was identified by the machine learning approach as the phrase most frequently associated with disqualifying misconduct complaint. Yet, these phrase emerge in the Allegheny County mostly in the contract of claiming benefits fraudulently ("Claiming benefits under any conditions other than those permitted by this Agreement may be cause for disciplinary action"). The same was true for other phrases, such as "officer involved" which brought benefits related clauses in the local contract instead of clauses related to delaying interrogation. The reason for this failure appears to be the skewed distribution of the corpus towards contracts phrases from certain states (CA, FL, and TX consisting of 72.5% of entire instances) and certain categories. 60% instances belong to the 3 most popular categories (erasing records, delaying interrogation, and giving unfair access to information), while the least popular category, Disqualifies Complaints, is only represented by 2.7% of the phrases in corpus.

For this reason, we pursue qualitative analysis as a first step towards a larger and more systematic annotation project of our local contracts that will allow us to re-employ machine learning techniques. We study the specific phrases that Campaign Zero had marked as problematic in an older version of the PBP's CBA and cross-referenced each of the problematic clauses with the most recent version of the Pittsburgh CBA. We began to compile recurrent words and phrases into a list of potential "keywords" associated with the various categories and manually tested their ability to identify these problematic phrases in our full sample of nearly 100 local contracts. This method is time-consuming and not error-proof, but it resulted in output that was highly relevant to the categories and easily explainable to our community users.

4.3.2 Misconduct complaint steps data analysis. Our community conversations, user studies, and reading of the CPRB and OMI websites provided us with a list of open questions (FAQ) regarding the process and implication of civilians' misconduct complaints. We organized these questions into five stages of the complaint process: interaction, complaint, review, investigation, and result. With the guidance of representatives from a number of local racial justice and police accountability organizations, we then compiled answers

---

[9]Example: https://www.muckrock.com/foi/pittsburgh-130/police-union-contract-pittsburgh-bureau-of-police-18486/

[10]Following the signing of the consent decree which made complaint filing procedure more transparent, citizen complaints increased dramatically from 250 in 1996 to 450 in 1998. The rate of sustained complaints also went up, indicating a higher rate of correctly filed complaints [15].

[11]These organizations are responsible for coordinating the receipt, analysis, and investigation of citizen complaints of civil and/or criminal misconduct alleged against employees of the City of Pittsburgh.

to the FAQ by analyzing webpages from ACLU, the US Department of Justice, the OMI and CPRB websites, and the Pittsburgh police contracts.

5 SYSTEMS

5.1 System Requirements

Our community-engaged problem scoping and data collection process prepared us to design a web-based application for citizens to access data on local policing. Given the challenges outlined earlier (**C1-C4** Section 3.1), we designed the system to satisfy the following requirements:

Requirement 1. Organize disparate information into a relational database. To address the challenge of incident-driven information needs, the collected data had to be organized as a relational database. This allows the information to be organized by geographical proximity for mapping legal categories to compare across municipalities and to be organized by municipalities for in-depth study of an individual police department.

Requirement 2. Provide entry points for better browsing and understanding of police union contracts. The application should allow users multiple ways to access the contracts: through maps, a list of municipalities, or search results. Users should also be allowed to search the entire contract directly, which means providing a text version of scanned contracts that are not directly searchable. In response to the challenges in navigating legal jargon revealed in our user study, users should also be able to explore the contracts through suggested search keywords.

Requirement 3. Provide a geospatial overview of police unions. A map provides an intuitive way to understand hyper-fragmentation of policing. Users should be able to see how spatial regions of interest - such as paths travelled in one's daily life - intersect with the jurisdictions of multiple police departments, exposing them to differing rules in citizen-police interaction. The system should, therefore, allow the map to be color-coded based on the potential presence of problematic legal provisions.

Requirement 4. Provide an interactive flowchart to bring transparency to the process of filing a complaint. As discussed earlier, the opacity of the complaint process forces communities to bear enormous transaction costs when attempting to keep police accountable through the official process (ie. by filing misconduct complaints). The system should, therefore, aid individuals through this process by providing an intuitive visual representation of the process and commonly asked questions.

5.2 Database Architecture

Our data collection process encompassed a variety of sources with differing data formats, which are accessed for various purposes. We therefore employ the use of a relational database to consolidate this data and define relationships between the records. We use SQLite as the default database management system provided by Django's object-relational mapping layer. This database serves as an general map of how all pieces of local policing information relate to each other in a structured manner, thus satisfying **Requirement 1** and providing the basis of a modular design of the platform. A list of

tables in our database are described in details below, which also can serve as the database schema of local policing data in general.

- **Location:** The Location table serves as the root for other tables, and is referenced throughout both the contract search tool and the interactive map. Location records exist for each included municipality, and contain information related to the region of the map, police budget, and number of officers.
- **Contract:** The Contract table contains records for each municipality with an available police contract. In theory, this table has a one-to-one relationship with the Location table, but in practice some municipalities do not have available union contracts, or multiple municipalities are represented by the same contract.
- **Sentence:** The Sentence table contains records for every sentence of every contract. This information is used later for searching in the contract tool, as well as future uses for other natural language processing tasks. Sentence records contain a text field, which includes a single sentence or line from a contract.
- **Search Query:** The Search Query table is used for storage of search queries conducted by users on the contract search tool . This information is used to track commonly searched queries, and in the future may help identify relevant keywords to highlight or suggest for other users' searches.
- **Question:** The Question table is used for questions on the Misconduct Complaint tool. It allows the team to modify the text within the application's administration panel in the web browser.

5.3 Contract Search Tool

The contract search tool (Fig. 3A) allows users to search all contracts from all of the county's municipalities with available police contracts. The corpus includes 100 out of 106 available contracts for Allegheny County. This tool is central to the purpose of application as it allows users to obtain information related to the standards and procedures of their local police departments.

When viewing the contract search page, the user is first shown a description of the categories identified by Campaign Zero as relevant to police misconduct violations. Within each category's description is a selection of keywords and a corresponding button, which auto-fills the search engine with that specific keyword. Alternatively, the user may go directly to the search bar and input a word or phrase to search the contracts for that input.

Search results of the contract tool include all contracts in which the search phrase appears at least once. Each result includes the name of the resulting municipality, as well as the sentences in which it occurs. The result for each municipality may include up to three sentences/sections of the contract's full text in which the searched phrase occurs. The user may then click on any of the resulting municipalities, which redirects them to a detail view page for the municipality where they may view and download the full text of the contract in either raw text or PDF format (**Requirement 2**).
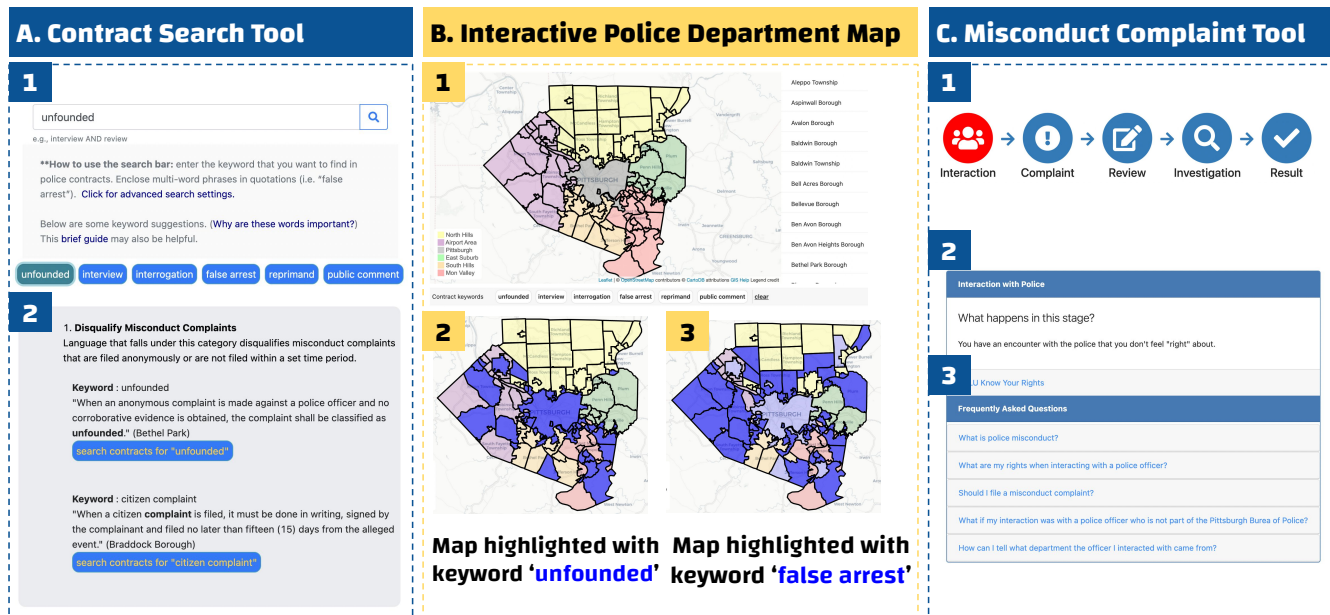
Figure 3: System overview. Our system consists of three parts: (A) Contract search tool - 1) a search bar with representative keywords: users can do a initial search activity with a list of carefully curated keywords by our team, 2) Keyword guide: a guide describing six categories of problematic languages provides a detailed context of their meaning and relevant keywords. (B) Interactive police department map - 1) Interactive map: users may explore the map when they find it easy to spatially locate a region, 2) Region list: users can also find out a region by its name in this list. When selecting a region, a tooltip with metadata about local policing in the municipality is displayed. 3) The map is also associated with a set of representative keywords. Once selected, municipalities whose contracts contain the keyword are all highlighted. Two screenshots present how two keywords are widely distributed over contracts. (C) Complaint process module - 1) A process diagram gives users a overview of 5 steps comprising of complaint filing process in general. For each step being represented as a circle, once selected, 2) the details about the step are described as a response of "what will happen in this stage", and 3) a list of frequently asked questions are also presented.

5.4 Interactive Police Department Map

The Interactive police department map (Fig. 3B) enables users to explore how police departments over the Pittsburgh area are geospatially distributed (**Requirement 3**), and closely examine a specific department and contract. This module allows users to locate their municipality using the map (colored by the six main regions of Pittsburgh) or through a sidebar menu. After selecting a municipality, information about the police department (force size, budget, and presence of keywords) is provided on the tooltip. A keyword bar allows users to highlight regions whose police union contracts include the selected keyword, which allows users to spatially gauge the potential presence of a problematic provision.

5.5 Misconduct Complaint Tool

The Misconduct complaint tool (Fig. 3C) allows users to overview the process of filing a complaint and acquire the information about the rights and actions of citizens (**Requirement 4**). This module is centered around the flow diagram consisting of five steps from "Interaction" to "Result", which were derived as an analytic result of the complaint process as described in 4.3.2. The circles, when clicked, present an extended pane that depicts frequently asked questions about the step. The diagram allows those who do not have prior knowledge about the process to get an overview and inform those beginning the filing process on what to expect.

6 FEEDBACK AND FUTURE WORK

6.1 Stakeholder evaluation

In keeping with the principles of Community-Based Participatory Research, we presented our work to community members and asked for feedback throughout the process. We conducted three virtual sessions throughout 2021-22 with 4-26 stakeholders per session to evaluate the utility and usability of our tool. Through the help of our community partners and their coalitions, we were able to recruit a broad range of stakeholders, such as community organizers of varying seniority, judicial candidates and law professionals, local government officials, and university diversity and equity staff.

In each feedback session, participants were given a short introduction to the website and its functionalities then separated into breakout rooms where they explored the website with two members of our research team serving as facilitator and recorder. The

facilitator followed a script that encouraged participants to articulate the goal of their information search and share their screen as they navigated the site.

We found that there was a general lack of familiarity with police union contracts even amongst passionate advocates for police reform. This posed a barrier to engagement with our website across all three sessions but highlighted the possibility that our website can also serve as an educational tool. Users were at first unsure what kinds of information were included in these contracts, but once they were familiar with the form and purpose of a union contract, they were able to articulate goals that could be answered by information contained in the site (e.g hiring and firing policies). What became obvious was how critical it was to have a keyword guide that linked the everyday language around police accountability with the legal terminology of the contract.

6.2 Future Work

As mentioned earlier, the G2A team is planning on more local adoption activities, such as the creation of additional interactive flowcharts to educate the public on accountability procedures that have thus far been opaque and pre/post user tests to measure how the platform improves understanding of police accountability in Allegheny County. However, the team has also been contacted by other counties that are interested in having their own police contract library platform, and, thus, we will conclude this by discussing some of the ongoing technical work that we are doing to allow other communities to deploy, customize, and own their own platforms.

Our members' experiences with their own organizations imbued our project with the knowledge of the challenges nonprofits have in accessing technical expertise. For that reason, we are working on modularizing and "containerizing" our tool, such that dependencies are removed and the platform can be installed with less technical knowledge and components can be customizable through a web-based administrator panel. We are also currently creating configuration files and standardizing input procedures to simplify county-specific data collection and uploading. We aim to achieve three primary goals:

- **Package the application:** Our tool must be "packaged" in a way that allows for easy deployment by other community groups. Currently, setting up and running our application is cumbersome. It requires technical knowledge that cannot be expected of every community group that may wish to deploy a version of our application. One potential fix includes utilizing Docker, an open platform that allows an application to be packaged in a virtual environment, to eliminate issues related to dependencies and operating systems when running applications.
- **Standardize input procedures:** Current information input for the application is done using a variety of different files and formats. Furthermore, redundant input files have the potential to create conflicts and create discrepancies within the site across its various tools. We are currently working on creating a master input file that links all the data for the platform in a standardized format. This allows community organizations to separate the work on data collection and platform deployment: as long as the master file is correctly

completed, the platform can be deployed with the organization's data. This eases the workload and adoption costs of the community organizers and allows data collection to proceed independently of platform deployment.
- **Create testing suite:** The implementation of a testing suite ensures site integrity and consistent display of its features and information. By allowing community groups to edit the site's information and data to fit the needs of their own counties, we must provide a testing suite to ensure that data is being inputted correctly and that the site is performing as expected.

7 CONCLUSION

The lack of effective police reform in the face of highly visible police misconduct has strained the relationship between police departments and the communities they serve. We believe a crucial component of effective reform movements is a public that is fully informed about the current state of police procedures. We also recognize that different communities have different needs from their local government. As a result, we approached the problem of police accountability with a focus on community engagement and providing transparency to the rules that govern local police departments so that community members and organizations are not excluded from the process.

We began by holding weekly, ongoing community meetings to establish where our efforts should be focused to achieve this goal. Once that was determined, we started collecting over 100 police union contracts in Allegheny County, containing valuable information on the rules and procedures governing police departments. We then designed a web platform where these contracts can be accessed through a search tool and an interactive map, focusing on effective interactive design to help guide users through these legal documents. Through our analysis of these contracts, we created a novel keyword guide that builds upon work by legal scholars and Campaign Zero. We used the information from the PBP contract to create a misconduct complaint tool that uses an interactive interface to guide individuals through the complaint process, accompanied by a frequently asked questions page collected from our community partners.

While relationships between research institutions and the communities they research are often fraught, working with our local partners has consistently provided us with focus and motivation. It was essential to us that we build tools that would be valuable to the community, and our continued collaboration has created an iterative design process that ensures our work is accomplishing this goal.

REFERENCES

[1] Yongsu Ahn and Yu-Ru Lin. 2020. PolicyFlow: Interpreting Policy Diffusion in Context. *ACM Transactions on Interactive Intelligent Systems (TiiS)* 10, 2 (2020), 1–23.

[2] Mehwish Alam, Aldo Gangemi, Valentina Presutti, and Diego Reforgiato Recupero. 2021. Semantic role labeling for knowledge graph extraction from text. *Progress in Artificial Intelligence* 10, 3 (2021), 309–320.

[3] Geoffrey P Alpert and John M MacDonald. 2001. Police use of force: An analysis of organizational characteristics. *Justice quarterly* 18, 2 (2001), 393–409.

[4] Bocar Ba, Patrick Bayer, Nayoung Rim, Roman Rivera, and Modibo Sidibé. 2021. *Police Officer Assignment and Neighborhood Crime.* Technical Report. National Bureau of Economic Research.

[5] Bocar A Ba. 2020. Going the Extra Mile: the Cost of Complaint Filing, Accountability, and Law Enforcement Outcomes in Chicago. (2020).

[6] Bocar A Ba, Dean Knox, Jonathan Mummolo, and Roman Rivera. 2021. The role of officer race and gender in police-civilian interactions in Chicago. *Science* 371, 6530 (2021), 696–702.

[7] Bocar A Ba and Roman Rivera. 2019. The effect of police oversight on crime and allegations of misconduct: Evidence from chicago. *U of Penn, Inst for Law & Econ Research Paper* 19-42 (2019).

[8] Saurabh Bhargava and Dayanand Manoli. 2015. Psychological frictions and the incomplete take-up of social benefits: Evidence from an IRS field experiment. *American Economic Review* 105, 11 (2015), 3489–3529.

[9] Travis Campbell. 2021. Black Lives Matter's Effect on Police Lethal Use-of-Force. *Available at SSRN* (2021).

[10] James Carmody and Ruth A Baer. 2008. Relationships between mindfulness practice and levels of mindfulness, medical and psychological symptoms and well-being in a mindfulness-based stress reduction program. *Journal of behavioral medicine* 31, 1 (2008), 23–33.

[11] Nuno Ramos Carvalho and Luís Soares Barbosa. 2018. Transforming legal documents for visualization and analysis. In *Proceedings of the 11th International Conference on Theory and Practice of Electronic Governance.* 23–26.

[12] Damir Cavar, Joshua Herring, and Anthony Meyer. 2018. Case law analysis using deep NLP and knowledge graphs. In *Proceedings of the LREC.*

[13] Aaron Chalfin and Jacob Kaplan. 2021. How many complaints against police officers can be abated by incapacitating a few "bad apples?". *Criminology & Public Policy* 20, 2 (2021), 351–370.

[14] Suat Çubukçu, Nusret M Sahin, Erdal Tekin, and Volkan Topalli. 2021. *Body-Worn Cameras and Adjudication of Citizen Complaints of Police Misconduct.* Technical Report. National Bureau of Economic Research.

[15] Robert C Davis, Christopher W Ortiz, Nicole J Henderson, Joel Miller, and Michelle K Massie. 2002. Turning necessity into virtue: Pittsburgh's experience with a federal consent decree. *Vera Institute of Justice* (2002).

[16] Alex DiChristofano, Michael L Hamilton, Sera Linardi, and Mara F McCloud. 2021. Project 412Connect: Bridging Students and Communities. In *Equity and Access in Algorithms, Mechanisms, and Optimization.* 1–12.

[17] Giovanni Facchini, Brian G Knight, and Cecilia Testa. 2020. *The franchise, policing, and race: Evidence from arrests data and the Voting Rights Act.* Technical Report. National Bureau of Economic Research.

[18] Amy Finkelstein and Matthew J Notowidigdo. 2019. Take-up and targeting: Experimental evidence from SNAP. *The Quarterly Journal of Economics* 134, 3 (2019), 1505–1556.

[19] Catherine L Fisk and L Song Richardson. 2017. Police unions. *Geo. Wash. L. Rev.* 85 (2017), 712.

[20] Jacob Goldin, Tatiana Homonoff, Rizwan Javaid, and Brenda Schafer. 2022. Tax filing and take-up: Experimental evidence on tax preparation outreach and benefit claiming. *Journal of Public Economics* 206 (2022), 104550.

[21] Felipe Goncalves. 2021. *Do police unions increase misconduct.* Technical Report. Working Paper.

[22] National Lawyers Guild. 2022, (accessed 2022-04-11). National Police Accountability Project - Issue Area: Transparency. https://www.nlg-npap.org/ia-transparency/#trans-q7.

[23] Dan Hendrycks, Collin Burns, Anya Chen, and Spencer Ball. 2021. Cuad: An expert-annotated nlp dataset for legal contract review. *arXiv preprint arXiv:2103.06268* (2021).

[24] Pamela Herd and Donald P Moynihan. 2019. *Administrative burden: Policymaking by other means.* Russell Sage Foundation.

[25] Justin E Holz, Roman G Rivera, and Bocar A Ba. 2020. *Peer effects in police use of force.* Technical Report. Working Paper.

[26] Colleen Kadleck. 2003. Police employee organizations. *Policing: An International Journal of Police Strategies & Management* (2003).

[27] Jörn Kohlhammer, Kawa Nazemi, Tobias Ruppert, and Dirk Burkhardt. 2012. Toward visualization in policy modeling. *IEEE computer graphics and applications* 32, 5 (2012), 84–89.

[28] Rich Lord. 2020. Black activist collective demands Pittsburgh and county commit to a dozen changes on policing within a week. https://www.publicsource.org/black-activist-collective-demands-pittsburgh-and-county-commit-to-a-dozen-changes-on-policing-within-a-week/

[29] Scott McLachlan and Lisa C Webley. 2021. Visualisation of law and legal process: An opportunity missed. *Information Visualization* 20, 2-3 (2021), 192–204.

[30] Akshay Minocha and Navjyoti Singh. 2018. Legal document similarity using triples extracted from unstructured text. In *1st Workshop on Language Resources and Technologies for the Legal Knowledge Graph.* 15.

[31] The Department of Labor. 2022, (accessed 2022-03-01). Department of Labor Contract Search Tool. https://www.dol.gov/agencies/olm/cba

[32] President's Task Force on 21st Century Policing. 2015. Final report of the president's task force on 21st century policing. *Office of Community Oriented Policing Services* (2015).

[33] Stefania Passera. 2018. Flowcharts, swimlanes, and timelines: alternatives to prose in communicating legal–bureaucratic instructions to civil servants. *Journal of Business and Technical Communication* 32, 2 (2018), 229–272.

[34] Alexander Popov and Jennifer Sikos. 2019. Graph embeddings for frame identification. In *Proceedings of the International Conference on Recent Advances in Natural Language Processing (RANLP 2019).* 939–948.

[35] Washington Post and ABC News. 2021. April 18-21, 2021, Washington Post-ABC News poll. https://www.washingtonpost.com/context/april-18-21-2021-washington-post-abc-news-poll/72d8dab8-8a54-4468-a964-b7326876814d

[36] Deepak Premkumar. 2019. Public Scrutiny and Police Effort: Evidence from Arrests and Crime After High-Profile Police Killings. *Available at SSRN 3715223* (2019).

[37] A Treatment Improvement Protocol. 2014. Trauma-informed care in behavioral health services. *Rockville, USA: Substance Abuse and Mental Health Services Administration* (2014).

[38] Abdul N Rad. 2018. Police institutions and police abuse: Evidence from the US. *Available at SSRN 3246419* (2018).

[39] R Ray. 2020. How can we enhance police accountability in the United States. *The Vitals: Policy* (2020).

[40] Nayoung Rim, Roman Rivera, Andrea Kiss, and Bocar Ba. 2020. *The Black-White Recognition Gap in Award Nominations.* Technical Report. Human Capital and Economic Opportunity Working Group.

[41] Jonathan C Roberts, Peter Butcher, Ann Sherlock, and Sarah Nason. 2021. Explanatory journeys: Visualising to understand and explain administrative justice paths of redress. *IEEE Transactions on Visualization and Computer Graphics* 28, 1 (2021), 518–528.

[42] Adam L Rosman. 2013. Visualizing the law: Using charts, diagrams, and other images to improve legal briefs. *J. LegaL educ.* 63 (2013), 70.

[43] Kyle Rozema and Max Schanzenbach. 2019. Good cop, bad cop: Using civilian allegations to predict police misconduct. *American Economic Journal: Economic Policy* 11, 2 (2019), 225–68.

[44] Stephen Rushin. 2016. Police union contracts. *Duke LJ* 66 (2016), 1191.

[45] K Sabrina and P Axel. 2021. Knowledge Graphs for Analyzing and Searching Legal Data. (2021).

[46] Benjamin Sachs. 2020. Police Unions: It's Time to Change the Law and End the Abuse. *On Labor* (2020).

[47] Dominic Seyler, Paul Bruin, Pavan Bayyapu, and ChengXiang Zhai. 2020. Finding Contextually Consistent Information Units in Legal Text.. In *NLLP@ KDD.* 48–51.

[48] S Sinyangwe, D McKesson, and J Elzie. 2021. Mapping police violence database.

[49] Pennsylvania Treasury. 2022, (accessed 2022-03-03). Pennsylvania Treasury: e-library. https://www.patreasury.gov/transparency/e-library/

[50] Campaign Zero. 2022. Police Union Contract Project.

[51] Karen Zgoda, Pat Shelly, and Shelley Hitzel. 2016. Preventing retraumatization: A macro social work approach to trauma-informed practices and policies. *The New Social Worker* (2016).

[52] Ping Zhang. 1996. The impact of information visualization on human problem-solving performance in a complex business domain. In *Proceedings of the Second Americas Conference on Information Systems (AIS'96),* Vol. 16. 674.