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Mapping as a Critical Making Practice in International Relations

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How “critical” is mapping as a method in international relations (IR)? Critical approaches have fundamentally changed the practices of mapmaking in IR. They have replaced geopolitical representations of a world divided into territorial states with notions of fields, networks, flows, rhizomes, and assemblages. This shift is both conceptual and methodological: It has led to the introduction of new methods of representation, such as multiple correspondence analysis and network analysis. These new methods have, however, been subjected to a strong critique. They are accused of reproducing the very logics of power that they aim to question, and flatten the knowledge they aim to represent. There would be, as the argument goes, an inescapable theoretical and political bias embedded in these methods. This article engages with this debate, which is ultimately about the ontological and epistemological status of mathematical methods of visual representation and, more broadly, about the role of “making” in IR. It argues that practices of mapmaking can still be designed to function as critical tools. To illustrate this argument, this article draws on ongoing research on biometric mass surveillance as part of the Security Vision project.

Dans quelle mesure la cartographie est-elle une méthode “critique” en relations internationales (RI) ? Les approches critiques ont fondamentalement modifié les pratiques de cartographie en relations internationales. Elles ont remplacé les représentations géopolitiques d’un monde divisé en États territoriaux par des notions de champs, réseaux, flux, rhizomes et dispositifs. Cette transformation est à la fois conceptuelle et méthodologique: elle a conduit à l’introduction de nouvelles méthodes de représentation, comme les analyses des correspondances multiples et les analyses de réseau. Néanmoins, ces nouvelles méthodes ont fait l’objet de vives critiques, car elles reproduiraient la logique de pouvoir qu’elles souhaitent pourtant remettre en question et aplatiraient les connaissances qu’elles désirent représenter. Ainsi, il existerait un biais théorique et politique incontournable intégré dans ces méthodes. Cet article prend part à ce débat, qui porte sur le statut ontologique et épistémologique des méthodes mathématiques de représentation visuelle et, plus largement, sur le rôle des pratiques esthétiques en relations internationales. Il affirme que les pratiques de cartographie peuvent tout de même être conçues pour fonctionner comme des outils critiques. Pour illustrer cette hypothèse, cet article se fonde sur une recherche en cours sur la surveillance biométrique de masse dans le cadre du projet Security Vision.

¿En qué medida la cartografía es un método de “crítica” en las relaciones internacionales (RI)? Los enfoques críticos han cambiado fundamentalmente las prácticas en materia de cartografía en las relaciones internacionales. Estos enfoques han reemplazado las representaciones geopolíticas, consistentes en un mundo dividido en Estados territoriales, por nociones de campos, redes, flujos, rizomas y dispositivos. Este cambio ha ocurrido tanto a nivel conceptual como a nivel metodológico. Por un lado, ha provocado la introducción de nuevos métodos de representación, como el análisis de correspondencias múltiples y el análisis de redes. Por otro lado, sin embargo, estos nuevos métodos han sido objeto de una fuerte crítica con el argumento de que reproducen las mismas lógicas de poder que pretenden cuestionar y de que reducen el conocimiento que pretenden representar. Entonces, siguiendo este argumento, existiría un sesgo teórico y político ineludible dentro de estos métodos. Este artículo aborda este debate, que en última instancia trata sobre el estado ontológico y epistemológico de los métodos matemáticos de representación visual y, en mayor medida, sobre el papel de «construir» en las relaciones internacionales. El artículo argumenta que las prácticas en materia de mapeo todavía pueden diseñarse para funcionar como herramientas críticas. Con el fin de ilustrar este argumento, este artículo se basa en la investigación, todavía en curso, sobre la vigilancia biométrica masiva como parte del proyecto «Security Vision».

Introduction

“Mapping,” understood either metaphorically as the practice of establishing a sense of what is going on in a specific field or as the more concrete practice of visualizing people, places, and institutions in a space, has become a hallmark of critical international relations (IR) scholarship. [Aradau and colleagues \(2015, 25\)](#) trace the interest in “mapping” in critical IR to the end of the Cold War and the demise of geopolitics that accompanied the domination of state-centered theories. The waning belief that global power dynamics should be understood through the analysis of sovereign entities, primarily defined by their contiguous territory, accompanied a renewed research agenda on transnational relations ([Keohane and Nye 1973](#); [Strange 1976](#); [Risse-Kappen 1995](#)), networks ([Keck and Sikkink 1998](#)), and non-state actors

([Appadurai 1991](#)). Drawing on theoretical advancements in geography, and especially John Agnew’s critique of the “territorial trap” (1994)—i.e., the illusion that states can exert exclusive power over their territory, that domestic and foreign realms are separate, and that the boundaries of the states are the boundaries of society—critical scholarship in IR went searching for alternative spatial imaginaries.

Relational dynamic maps and diagrams, grounded in the study of processes of social interactions and practices of power below the level or through the structure of the state appeared as natural alternatives to the state-centered determinism of geography, implicit in the territorial maps of “geopolitics” ([Campbell 1999](#)). Scholarly authority moved from simplified renderings of Sun-Tzu, Hobbes, and Machiavelli (for a systematic critique, see [Walker 1993](#)) to the

philosophical writings of Foucault, Deleuze, and Guattari, or the relational sociological theories of Bourdieu, Goffman, and later Latour (Salter and Walters 2016; Basaran et al. 2017). The geographical map of positivist IR was substituted by the new statistical and diagrammatic renderings of critical scholarship: multiple correspondence analysis (MCA) of positions and position-takings within social fields (Bigo, Bonditti, and Olsson 2010; Hagmann et al. 2018; Martin-Mazé 2018) or the diagrammatic and graph visualizations of actor-networks and controversies (Venturini 2012; Schouten 2014; Baird 2016). The topology of flat, Euclidian space, was replaced with the topology of the Moebius ribbon or the Klein bottle (Bigo 2001).

The reflection on the epistemological and political status of mapping that underpins this paper started in March 2021 with the beginning of the collaborative Security Vision Research Project. The project explores the ways in which computer vision technologies are used in the field of security, and how they shape our understanding of security and surveillance. With two PhD students and a postdoctoral researcher in addition to myself as the principal investigator, the project's initial phase entailed a "mapping" task. The aim was to create, in the tradition of sociological approaches in critical security studies, one or more maps of businesses, institutions, individuals, and their discourses to generate insights about present patterns and absent connections in the data. The data types and their geographical scope during this preliminary phase were deliberately kept broad. After the first round of exploratory quantitative and qualitative data gathering (collected in a dataset), the goal was to lay the groundwork for two primary visualization techniques. The first was a Bourdieu-influenced MCA of the "field" or "subfield" of computer vision in security applications. The second was a social network analysis (SNA) of discourses and controversies, in a more Latourian tradition.

This initial plan, which initially seemed quite unproblematic, sparked an intense discussion within the team, which we documented in a recent collective publication (Plájás et al. 2020). The gist of the argument was as follows: While there were strong arguments for the heuristic benefits of the mapping exercise, equally strong concerns were raised about the risks that the mapping project would reproduce what Donna Haraway, and a certain feminist critique, has identified as the "god trick of seeing everything from nowhere" (Haraway 1988, 581), meaning that it would reproduce a language of authority that we aimed to disrupt, flatten the knowledge we were gathering, and lack reflexivity (Plájás et al. 2020; van de Ven and Plájás 2022).

These discussions highlighted the need to clarify key arguments about the relationship among methods, epistemologies, and politics when discussing mapping and methods of data visualization. It appeared indeed that these positions not only influenced the team's discussions, but also formed part of a broader set of debates that permeated critical security studies and critical IR more broadly. One strand of scholarship (de Goede 2012; Coward 2018) has indeed raised urgent questions about these practices of mapping, and the extent to which they demarcate themselves from the practices of security and surveillance they claim to unveil. This is exemplified in the critique of "network thinking" brought about by SNA, a key technology of knowledge for security agencies in the Global War on Terror. As the argument goes, the affordances of the method (i.e., how it forces into some implicit assumptions about what can be known about its objects of research) inevitably lead researchers to produce tainted knowledge that cannot escape the logics

of securitization, surveillance, etc., that it aims to critique. These authors raise fundamental questions about the relationship between methods—and in particular, what can be broadly defined as methods of mathematical data visualization¹—and critique² in our discipline. If all practices, including those of mapping, are forms of power, can the critique remain "pure" when the makers get their hands dirty? Can there be a map, a network, a visualization, or a diagram that is not complicit with forms of securitization? Where does one draw the boundary between critique and intervention or reproduction of logics of power?

This paper is a defense of mapmaking, and especially the mathematical visualization of data, as a critical practice. It is part of a broader push in the discipline of IR to think critically about "making" as a form of "thinking and feeling" to "produce new social scientific knowledge and more effectively normatively and politically engage with the state of contemporary world politics in many different ways" (Austin and Leander 2021, 48). Within these debates, this paper develops two arguments. The first is that the epistemological and ontological politics of practices of making,³ such as mapmaking and data visualization, can never be determined a priori by the affordances, be they methodological, intellectual, or technical, of the method. As several traditions in critical geography and digital humanities have shown, mapping can precisely work as a fruitful site for the encounter of multiple contradictory epistemologies. The second argument posits that as a form of "making," mapping affords different forms of knowing, both during the process of research, and in the reading/viewing/experience of the final map. Artifacts such as maps are both argumentative and aesthetic, and thus always the starting point for a coproduction of meaning between authors and readers/viewers, which cannot be determined in advance.

The paper is organized in three sections. I first review some of the main practices of mapping in Critical Security Studies, showing how they have supported and generated conceptual insights for the study of international politics. Second, I lay out the arguments against mapping that have emerged in the IR literature and put them in parallel with very similar discussions in geography and digital humanities. This allows me to pinpoint the critique to the question of mathematical visualization. In a third section, I come back to the empirics of the Security Vision project, and I make the case for "making" as a critical practice, revisiting, and offering alternatives to the critique.

Mapping in CSS: An Unproblematized Practice

What do we mean by mapping in the field of IR? Why map in the first place? And what does mapping do for research in critical approaches to international politics? In this section, I address these three questions by looking at two main ways of doing maps in critical IR: Bourdieusian MCA and Latourian controversy analysis. My aim here is to explore the

¹I use the broad term *mathematical data visualization* to designate methods that aim to represent, in visual form and through mathematical methods, relations between entities codified in datasets. The main forms of mathematical data visualization discussed in this paper are (i) graph visualizations, which are calculated via force algorithms; (ii) two-dimensional plots, calculated via MCA, and (iii) cartographic projection, calculated via plane trigonometry.

²On the notion of critique in security studies, see C.A.S.E. Collective (2006); on critique and *International Political Sociology*, see Bigo and Walker (2007).

³This paper examines a particular form of making within the broad spectrum of possible meanings that this special issue explores.

methodological dimension of these forms of mapping; I will thus only touch upon their theoretical underpinnings.⁴

Bourdieu and MCA

Critical IR of the 1980s and 1990s established themselves against the positivist and quantitative paradigms of the neo-neo debates. Located firmly at a conceptual and epistemological level, critical scholars were interested in providing an alternative to what they considered the behavioral movement's intellectual poverty in the study of international politics (Ashley 1984). Primarily interested in the performativity of language, the Critical Security Studies project (Aberystwyth School) and the Securitisation School (Copenhagen School) de facto rejected any attempt at quantification, lumping any such method with the positivist baggage that the discipline had attached to it. It is thus with a certain degree of suspicion that critical IR audiences received the first attempts at "mapping" produced by scholars around Didier Bigo and the Paris School (Amicelle et al. 2004; Bigo 2007; Bigo, Bonditti, and Olsson 2010). In fact, to date, the "mapping" articles, books, and chapters are among the least cited of the Paris School texts.

The mapping project of the Paris School is grounded in the theoretical premises of Bourdieusian relational sociology (Bourdieu and Wacquant 1992). In contrast to the Austinian "securitizing actor" of the Copenhagen School (Wæver, Wilde, and Buzan 1998), Bigo argues with Bourdieu that the authority of security actors, and thus their ability to perform successful speech acts, is unequally distributed among security professionals (Bigo 2006). These are indeed equipped with uneven amounts of capital (social, cultural, economic, and field-specific) within their professional environment or field. If one wants to understand why certain speech acts or practices are more successful and authoritative than others, or why security actors engage in them, one must look at the social determinants of the actor's position-taking.

Although Bourdieu and the scholars who worked around him always used a variety of methods, including ethnography, Bourdieusian sociology has—in a conscious effort to demarcate itself from philosophy and the humanities—relied emphatically on statistics. The challenge was how to quantitatively reveal the sociological logics of a field. Such an enterprise required objectivizing—i.e., capturing in continuous or categorical variables—the various kinds of capital that each actor of the field possesses, and representing them in relation to their discourses.

Methodologically, this poses two questions: First, how to render intelligible relations, and find the main lines of demarcation between individuals who can be characterized by dozens of social characteristics? Some actors might have a large amount of capital, but few diplomas, while others might have little economic capital but a very large social network. Second, how to put in relation the structure of social characteristics (or positions) with the variety of discourses that these individuals hold?

This is precisely what MCA offered Bourdieu. The technique, developed in collaboration with mathematician Jean-Paul Benzécri, allows simplification of the extremely complex structure of relations between individuals based on their multiple social characteristics into the most meaningful distributions, and project them on multiple two-dimensional plots. In addition, by superimposing the pro-

jections of positions onto the one of discourses, it generates interpretations as to which social characteristics correlate the most with which discourses. In the Bourdieusian–Benzécrian tradition, the purpose of mapping through projection is thus two-fold: first, to literally "see" what is in the data in a way that would otherwise not be accessible; and second, to generate the starting point for interpretations.

Latour and Network Analysis

The second theoretical strand in critical IR to refer to mapping is influenced by STS (Science and Technology Studies), and particularly by the scholarship around Bruno Latour. Actor–network theory (ANT), after all, is about *networks*. Yet the introduction of Latourian STS in critical IR is marked by an ambiguous relation to data, statistics, and mathematical data visualization.

One might consider that Latourians are fundamentally opposed to the logic of cartography, plotting, or techniques such as social network or graph analysis. Indeed, the objective of ANT is to "map heterogeneous entanglements that constitute security assemblages," rather than uncover a supposedly preexisting structure of a specific social field (Loughlan, Olsson, and Schouten 2015, 24). The Latourian network is not a "snapshot" of a social field that can help understand social actors' practices; it is a metaphor for the relations that can be traced by the ethnographic practice of "following the actors" (whether human beings or things) as they constitute their social environment through associations).

This has a few methodological corollaries. First, the network cannot be determined a priori, externally, by the researcher: It is the actors themselves that describe the "connections, passage points, inequalities and imbalances that make up the actor-network" (Loughlan, Olsson, and Schouten 2015, 38). Second, the Latourian network is always in the making. As a "slideshow," it is unstable and constantly in process. Cartography, in this context, seems more of an object of study than a method for research. Latour famously took the very practice of mapping by sailors and geographers as the example of an object that needs problematization, "unmaking," when he discussed the role of mapmaking in the Portuguese, French, and Dutch history of colonization (Latour 2011).

For the IR scholar, the impression of discomfort with mapping is reinforced by the way in which STS has been practiced by those who have introduced it. Critical IR scholars drawing on STS do not engage, for the most part, in any representation of networks or plots in their work. Tellingly, in their chapter on "mapping," Loughlan, Olsson, and Schouten (2015) are at pains to find one single STS-inspired IR scholar who actually uses visualizations. In his most recent book, Peer Schouten, a key figure of Latourian approaches to IR, uses many cartographic maps, but not a single representation of a network (Schouten 2020).

Interestingly, however, many Latourians, such as Tommaso Venturini or Latour himself, have been very interested in developing mathematical visualizations in the context of what they define as "qualiquantitative methods" of "controversy mapping." Venturini and Latour argue that the dichotomy between micro-level ethnographies and macro-level statistical aggregates has obscured the process by which social structures emerge (Venturini and Latour 2010, 90). Digital methods, as developed in Sciences Po's Médialab (Sciences Po 2022) and the University of Amsterdam's Digital Methods Initiative (University of Amsterdam 2022), pre-

⁴For an exhaustive discussion of precisely this, see Loughlan, Olsson, and Schouten (2015).

cisely do what they claim by allowing every micro-interaction to be traced, stored in datasets, and represented. Software engineers such as Mathieu Bastian, Mathieu Jacomy and many other programmers of the graph visualization tool (Gephi 2022), have been instrumental in implementing, in code, the methodological and epistemological premises of Latourian theory. Through web scraping or Twitter mining, large datasets have been constituted, cleaned, analysed, and ultimately represented in graphs, heatmaps, Sankey diagrams, and many other forms (see, among many others, Marres and Gerlitz 2014).

The Case against Mapping

The Case against Mapping in Critical IR

The case against the use in critical IR scholarship of the methods of mapping we just discussed—which has informed several parts of the internal discussions in the Security Vision team—was arguably formulated in the most sophisticated manner by Marieke de Goede in 2012. This work has then led to a burgeoning literature that has proposed similar arguments (see, for example, Amicelle 2014; Krasman 2016; Coward 2018; Kurki 2019; Strausz and Heath-Kelly 2019).

de Goede's central claim is that it is a failed methodological device for critical scholarship because of its epistemological shortcomings, and its inherent affinity with security logics. She argues that “network thinking” has emerged as a key “knowledge practice” in security circles, roughly since the September 11 attacks. In global counter-terrorism, cybersecurity, and counter-organized crime, security agencies worldwide have come to think of their opponents as decentralized, nonhierarchical, and interconnected entities that require a new type of knowledge in order to lead new types of security policies (de Goede 2012, 216). She first shows how networks permeate a wide range of policy institutions, from the US government to the EU internal strategy documents (de Goede 2012, 216). She then proceeds to trace the academic roots of social network theory, from the seminal works of Krebs and Granovetter to applied terrorism studies, which are the basis of operational network theory in security circles today.

For de Goede, thinking and representing networks is problematic for any number of reasons. She sees the network as a complex knowledge practice which is more than just a way to see the world. Networks are risk technologies, she argues, “devices that render the world actionable and amenable to intervention. (. . .) (M)ore than a metaphor for capturing threat discursively, the network is a device for calculating and classifying security risks and acting upon them” (de Goede 2012, 216). This is what allows her to make her central claim, which ties the practices of network thinking in security practices with the features and flaws of the network methodology itself. This claim can be summed up in two points.

First, the problem with networks is that they are an oversimplification of reality: One always represents “a” network with a definite number of nodes—but the world is always a multiplicity of networks with no clear boundaries. Taking the example of the reconstituted network of the 2004 Madrid bombings, she argues that the map is only a fragment of what social relations between actors could be. Network thinking forces us to think in terms of nodes and “hops” but gives no solution to their unbounded nature (de Goede 2012, 225). Second, de Goede argues, networks do not represent, but perform—what they are supposed to rep-

resent, or as she calls them “performative visualizations,” that “bring into being the very coherent totality they claim to simply map out” (de Goede 2012, 226).

The problem, she argues, is not merely one of the interpretations of the network. The link between knowledge and violence is embedded in the method of mathematical visualization itself: “The knowledge techniques of nodes, density, path lengths, and cluster coefficients aim to transform the network into an actionable technique. They seek to generate targets in advance of attack, crime, or violence” (de Goede 2012, 222). And so, as a logical conclusion, she warns critical security scholars who use or would like to use network analysis (or any kind of projection method we can argue) of the dangers they incur. To be clear, the danger does not lie in the *potential uses* of the method by security actors, but *in the methods themselves*, at an epistemological level:

Within the contemporary social science conjunction, it is difficult to critique the network as a knowledge technique and render visible its specific governing effects. This is because the network trope has great currency within critical social science research. Influential critical thinkers as for example Mark Duffield deploy the network trope in their own analyses of contemporary conflict. (...) But he seems unaware, or at least unreflective, of the fact that the “deepening securitisation of everyday life” that he warns against in conclusion (Duffield 2002, 162) is partly enabled precisely through the particular deployments of the network as a knowledge technique within contemporary security imaginations. (de Goede 2012, 228)

In other words, there is no escaping the security logic once the network method is mobilized.

Plots, Networks, Maps: A General Critique of Mathematical Visualization

The points made by de Goede would sound very familiar to a geographer (it might not be coincidental that de Goede is a geographer by training) — as they very closely follow the lines of discussion around another form of mapping through mathematical visualization: quantitative cartography, broadly captured under the umbrella of geographic information systems (GIS). By mobilizing these debates, I want to show that regardless of the technique, be it MCA, SNA, or GIS, the debates all come down to the question of the mathematical techniques of data visualization: the representation of statistical data relations onto space.

The critique of traditional cartography emerged in 1960s, but intensified around the 1990s with the work of Harley (1989), Pickles (1995), Wood and Fels (1992), and others. The arguments we find are again about power relations and the flattening of knowledge.

The first line of critique revolves around two points. As Wood argued in 1992, geographical maps represent an accomplished objective series of truths, but in fact represent the discourse of the dominant political structures. Harley (1989) had previously introduced a similar, yet somewhat different, idea: that maps should always be read in the context of the power relations, ideologies, and forms of surveillance in which they were embedded. For these authors, “scientific” maps, “by privileging accuracy and technical authority, promote their naturalisation as well as forming a dividing practice of scientific and nonscientific maps, but in doing so ‘contain a dimension of “symbolic realism” which is no less a statement of political authority than a

coat-of-arms or a portrait of a queen placed at the head of an earlier decorative map” (Harley 1989, 9). This critique was reinforced by feminist writings, especially inspired by Donna Haraway’s critique of the decorporealized vision in modern technoscience, which represents, according to her, the “male gaze from nowhere” (Haraway 1991, 188; see also Kwan 2002a, 648). The cartographical practices based on GIS and mathematical visualization in general are presented as one more illustration of the “god’s eye view.”

Second, similarly to de Goede’s critique, critical voices in geography have argued that traditional cartographic maps produce a flat, oversimplified rendering of the world. The complexity of human, social, and political interactions is problematically lost because of the very affordances of the method, and in particular, the simplification of social life produced by the encoding of datasets, and their projection on certain types of space. Harvey (1969), for example, pinpoints the role of a specific choice of representation. “Deciding the future distribution of socio-economic activity on the basis of a physical Euclidean spatial system does not seem a very realistic way to proceed when there is a considerable probability that socio-economic spatial interaction is best mapped into a non-Euclidean geometry” (Harvey 1969, 376 cited in Bergmann and Lally 2021, 2–3).

And finally, again in resonance with de Goede’s critique, maps are presented as performative rather than descriptive. Here, the work of John Pickles (2003) is of particular relevance. As he puts it, “instead of focusing on how we can map the subject. . . [we could] focus on the ways in which mapping and the cartographic gaze have coded subjects and produced identities” (Pickles 2003, 12). In other words, a map “is not a representation of the world but an inscription that does (or sometimes does not do) work in the world” (Crampton and Krygier 2005, 15).

Where did the debates in geography go from there? On the one hand, many geographers started distancing themselves from mapmaking, while others became alarmed by what they understood as “mapphobia” (Wheeler 1998). Some feminist scholars, similarly to what de Goede hints at, “not only highlight(ed) the objectifying power of GIS-based visualisations, but also call[ed] into question the suitability of GIS methods for feminist research” (Kwan 2002a, 648–49). On the other hand, under the auspices of the “GIS and Society” discussions in the 1990s (Elwood 2008, 177), which led to the emergence of “Critical GIS,” numerous scholars proposed an alternative approach. Feminist, Marxist, and poststructuralist scholars started to adopt quantitative analysis, and quantitative scholars began looking at qualitative methods to complement their approaches (Pavlovskaya 2009; D’Ignazio and Klein 2020, 17). The question remains: Does this interest in reconciliation exist in critical IR? What would it look like? Given the problems related to mathematical visualization highlighted by critics of mapping, plotting, and network representations, can we, or should we, still engage in it? Or should we abandon it altogether, as de Goede, Coward, and others suggest?

In Defense of Mathematical Data Visualization: Mapping Security Vision

Within the context of the Security Vision project,⁵ a key argument against the data collection and visualization project echoed de Goede’s idea that the affordances of the method

⁵Details on the project can be found at www.securityvision.io. For a prototype of the interactive data visualization project: <https://edu.nl/4hwww>. Please note that the interface is still under construction at the moment of publication of the article, and will be finalized in the coming months.

(MCA, SNA, and GIS) would trap us into a logic of power that escapes us, and that is at risk of reproducing, as de Goede argues, logics of surveillance, suspicion, colonialism, or patriarchy. This critique is indeed grounded in the idea that such politics are contained in the method, meaning that the politics of surveillance, suspicion, or colonialism would be “coupled” in both the method—graph mathematics, trigonometry, or factor analysis—and the visual artifact—the map, the plot, the network—itsself.

The problem with this stance, some of us argued, is that it implies a double denial. In the process of making the map, it assumes that the mapmaker is always in a position of methodological inferiority to the affordances of the method. From this perspective, the maker is denied the agency to tweak, disrupt, or reverse-engineer the method to make it work differently or counter-purpose. It also assumes that the artifact’s politics exist in and of themselves, independently of the practices through which they are made to exist, thus denying the agency of the viewer/reader/spectator. In the coming sections, I address these claims by building on two subsets of literature: the work on “GIS and Society” and “Critical GIS” in geography and the work on “Critical Data Visualization” in digital humanities. I then show how, by designing the data production and data visualization process, we tried, with Jo Kroese and Ruben van de Ven, to address these points through formal choices in mapmaking.

Pluralizing Epistemologies

MIXED METHODS AND PLURAL EPISTEMOLOGIES

The initial argument we tackled within the Security Vision mapping project was the “locked-in” or “coupled” relationship between methods, epistemology, and politics. The visualization of mathematical data, from our standpoint, is not bound to a unique epistemological framework but can serve as a space for “productive tensions of colliding epistemologies,” as stated by Brown and Knopp in their 2008 study on queer activism. In their paper, the authors acknowledged that while their research was grounded in queer epistemology and ontology, it necessitated a negotiation with various forms of positivism, realism, pragmatism, and Cartesian rationality that subtly infiltrated their map production algorithms, hardware, and ongoing interpretation. In such epistemological interactions, no singular rationality prevailed; rather, the work emerged from a collective process of negotiation (Brown and Knopp 2008, 48).

Visualization has been recognized as a crucial platform for such interactions. As suggested by Knigge and Cope (2009), visualization is the “glue” in mixed-methods research, enabling different methodologies and evidence forms to interact productively. This perspective has become central to critical GIS, where various methods intersect and interact to reveal new ways of comprehending phenomena like “boundaries, nodes, clusters, flows, patterns, and scale” (Cope and Elwood 2009, 175). These insights allow researchers to yield more fluid, contextualized, nuanced outcomes and construct rich, process-based explanations.⁶ The scope of quantitative, mathematical, and cartographic methods has thus been broadened beyond singular association with positivist epistemologies (Sheppard 2001, 2014; Schuurman and Pratt 2002; Wyly 2011), and opened up to wider exploration (Poon 2005; Elden 2008; O’Sullivan, Bergmann, and Thatcher 2018).

⁶For more examples, see Pavlovskaya (2009, 26) as well as O’Sullivan, Bergmann, and Thatcher (2018, 133).

This argument has been made forcefully in the debates around critical GIS, but in fact, it has implicitly underpinned mapping methods in *International Political Sociology*. While in Bourdieusian logic there are few doubts about the “objective” claim of the representation—the plots are mathematical constructions that follow a strict statistical logic based on “objectified data”—those who have most developed the method acknowledge it through and through as an interpretative practice (Le Roux and Rouanet 2009). The database of agents and their properties is constituted through an “objectivation” of messy social features into neatly demarcated continuous or categorical variables. The MCA converts this dataset into an infinite number of dimensions along which agents can be distributed—and it is up to the researcher to determine which ones and how many are relevant for the analysis (generally the first 3 or 4). Finally, the position of the points on the plot is rarely used as a confirmation (although that is a possibility), but rather as a starting point for interpretation.

Similarly, in the Latourian sphere, graph visualizations are based on the constitution of a corpus (either of websites, tweets, or other social media content), which is stored in a dataset, cleaned, and visualized through force algorithms onto a two-dimensional or three-dimensional space. The distribution and the relation of the nodes and edges in the network are strictly based on their place within the dataset. Statistical analysis of nodes (e.g., average degree, network diameter, graph density, and centrality) can be carried out, similarly to other plot-specific calculations in MCAs. Such network visualizations are used as the starting point of an analysis—empirical evidence that the research can start from to explore a research topic. There is, however, a fundamental tension with the ANT: Graph visualizations are not fully in line with many assumptions of the ANT theoretical precepts. Network visualizations seem at odds with the idea that the network is always in the making, that they are never finished nor stabilized, or that the network is not a structure—yet graphs and other forms of visualization have been central to many of the important works of Latour and his collaborators in recent years.

SECURITY VISION: IMPERFECT DATA AND MULTIVOCALITY

In Security Vision, these considerations translated into two dimensions. First, while data production was admittedly a “simplification of the world,” we designed a data production strategy that allowed us to retain elements of complexity and roughness. We faced quite a few challenges: the blurry boundaries of Security Vision broadly defined, the difficulty of reducing complex situations to a delimited number of variables, and the difficulty of generating data for technologies, contracts, and actors of security that often prefer to remain invisible to public scrutiny. Rather than consider these elements as obstacles, we embraced them as specific features of our project. To set the parameters of our research, for practical purposes, we decided to narrow the scope to deployments of biometric remote identification in both the public space (i.e., smart CCTVs) and in forensic uses (i.e., biometric police databases). This choice was guided by the urgency of debates in the European Union in which we had participated as a group through policy work (Ragazzi et al. 2021). To avoid a dichotomy between quantitative and qualitative data generation, we stored the data collected through online searches in a Semantic MediaWiki database—which allows both the storage of structured and unstructured data (figure 1). Finally, when it came to the question of secrecy, we encoded it in the dataset itself: Unknown entities were

registered as such, and so were uncertain relations. The result is thus a dataset of institutions (e.g., companies, governments, and cities), products (software, hardware, and integrated systems), and deployments (the use of products by institutions in determined locations). These elements allowed to attend to the considerations outlined in the previous section.

Our second concern was to undermine an aesthetic of authority and the production of “truth,” often conveyed by the singularity of the map. We wanted to emphasize that maps are only one way to look at the data. There is thus no “optimal” unambiguous map; there are always partial maps that work within polysemic and multiple frameworks. Maps are always be considered not in one—but multiple forms. They exist in data, in qualitative description, and in graphs, both in two- and three-dimensional space. We devised an interface that presents these dimensions through multiple panes. The idea behind this multiplicity is that these modalities of accessing the data are available simultaneously. For the two-dimensional map (figure 2), we projected the network on a two-dimensional geographical map in a three-dimensional space. This revealed the artifice of the two-dimensional map and exploited the third dimension. Both the two-dimensional map (figures 2 and 3) and the three-dimensional map or graph (figure 4) can be manipulated, turned, and interacted with.

Visualization as Critical Making

KNOWING DIFFERENTLY AND THE “SECOND MAP”

The second element we tackled is the epistemological status of the map, which led us to formulate design choices that would work as a practical argument in defense of mathematical data visualization as a form of “making.” This implies two dimensions. First, we wanted to show that, as Johanna Drucker puts it, “the affordances of our senses and the capacities of cognition together construct the impression of a visual world” (Drucker 2014, 19). Our aim was to develop a form of mapping that exemplified how mapping works as a “different way of knowing” that appeals in part to rational cognition, but in part to sensorial, aesthetic perception. Second, as an aesthetic object, the goal was to emphasize that maps always contain a “second map,” an implied meaning, which means that the map only ever comes into existence in the moment in which it is interpreted. The meaning is never fixed in the map itself.

From the perspective of the reader/viewer, if we think about the main denominator of MCA, SNA, or GIS, it is that it allows, by transposing tabulated quantitative data (i.e., a simple dataset such as a spreadsheet or a complex relational database) into visual representations, to present the interpretation patterns, structures, or characteristics inherent to the mathematical relations of the data in a way that would not be possible by reading the values of rows and columns of the dataset. It is a way to get a *feel* for the main components of a broader phenomenon, to *see* the data, to understand what the main structures of opposition are, the main concentrations, and the main relations are beyond individual cases or observations (Avila et al. 2022, 7; Dávila 2022). As Pavloskaya states in relation to GIS, “visualization is powerful because it provides opportunities for heuristic (non-logical) understanding of data and processes. While an important component of human decision-making, this understanding cannot be achieved by rational analysis but complements it. The visual impact of GIS also depends upon emotions and other irrational sentiments (Kwan 2002a, 2007)

The authorities of the Karaganda region advised to add facial recognition technology to the cameras installed in the region. So far there are 6586 in the region, but it is not clear how many of them will have the facial recognition.

- Камеры видеонаблюдения - это один из самых эффективных способов раскрытия преступлений. В частности, краж, которые составляют 46% от всех правонарушений в области. К примеру, благодаря камерам минувшим летом удалось быстро раскрыть угон автомобиля LandCruiser200. Нужно увеличивать количество систем на выездах и въездах в город. Это поможет оперативно раскрывать случаи, когда краденые машины и скот вывозят в другие регионы или даже страны для перепродажи, - сказал заместитель руководителя Департамента полиции по Карагандинской области Абиль Абильдин на заседании межведомственной комиссии в режиме онлайн.

Всего в регионе имеется 6 586 камер видеонаблюдения. Часть из них установлена в дошкольных учреждениях, местах общественного пользования и на дорогах. В местах массового скопления людей - на автобусных остановках, в парках и скверах - расположено чуть больше тысячи систем видеонаблюдения. Оборудование предложили обновить и установить современные камеры с системой распознавания лиц. [1]

Figure 1. Semantic MediaWiki Snapshot shows the qualitative excerpt of a deployment in Karaganda, Kazakhstan. The interface allows the storage of both quantitative and qualitative data.

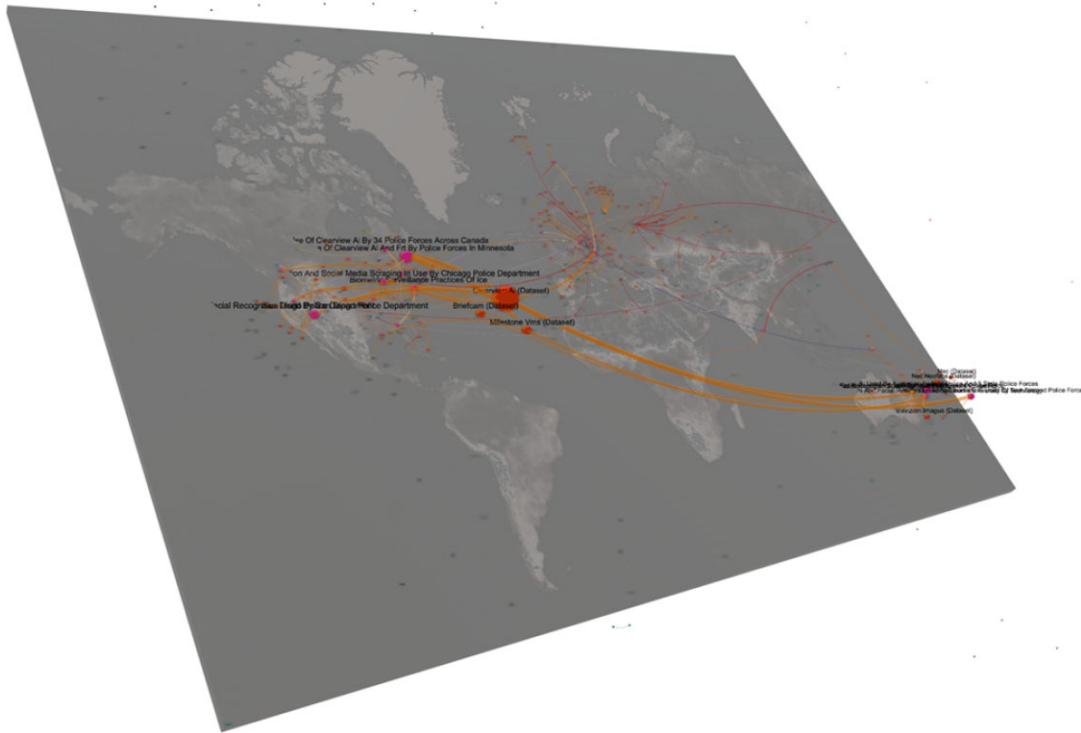


Figure 2. Two-dimensional geographical map of the computer vision deployments graph, represented in a three-dimensional space. In the interactive interface, the viewer can move the map around. Unknown entities are located under the cartographic map. See also figure 4. (Jo Kroese and Francesco Ragazzi).⁷

that run counter to the dry logic of quantification. In short, visualization is the most telling nonquantitative functionality of GIS” (Pavlovskaya 2009, 23). This, of course, does not mean that data is considered as a natural or direct representation of the world. It is always produced, generated with specific intentions, and thus biased. However, its systematic production—for example, the systematic survey of incomes, social relations, or diplomas of a specific social group—allows the gaining of unique insights on such groups, and mathematical visualization allows us to make sense of a large number of such observations quickly.

A second important corollary to this point is that as any aesthetic object, mathematical data visualization always lends itself to multiple readings. The challenge is then to “break the literalism of representational strategies and engage with innovations in interpretative and inferential modes that augment human cognition” (Drucker 2014, 71). This implies that the politics of a map can never be located in the map itself. Maps always work denotatively and connotatively at the same time (Kitchin and Dodge 2007, 334). They always contain a “second text within the map,” as Harley (1989, 9) puts it. This second dimension, connotation, an inherent feature of how the map comes to exist, depends entirely on the relation between the artifact and its context of existence: Maps are being used, manipulated, and inter-

⁷This data visualization was developed in collaboration with Jo Kroese from Radical Data (<http://www.radicaldata.org>). Please note that the visualizations presented in the paper at the moment of publication might evolve over time.

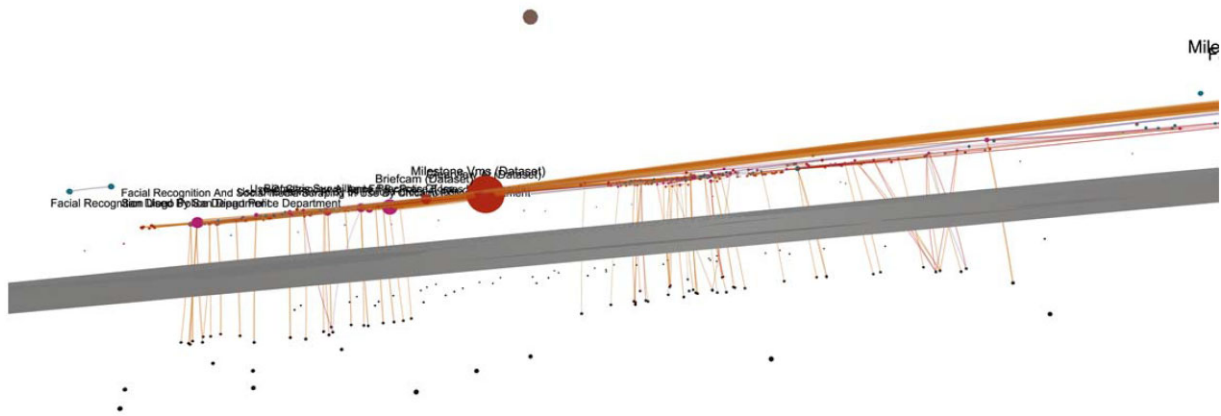


Figure 3. Two-dimensional visualization of the network projected onto a map in three-dimensional space. The gray layer is the map seen from the front. The unknown entities are represented under the map.

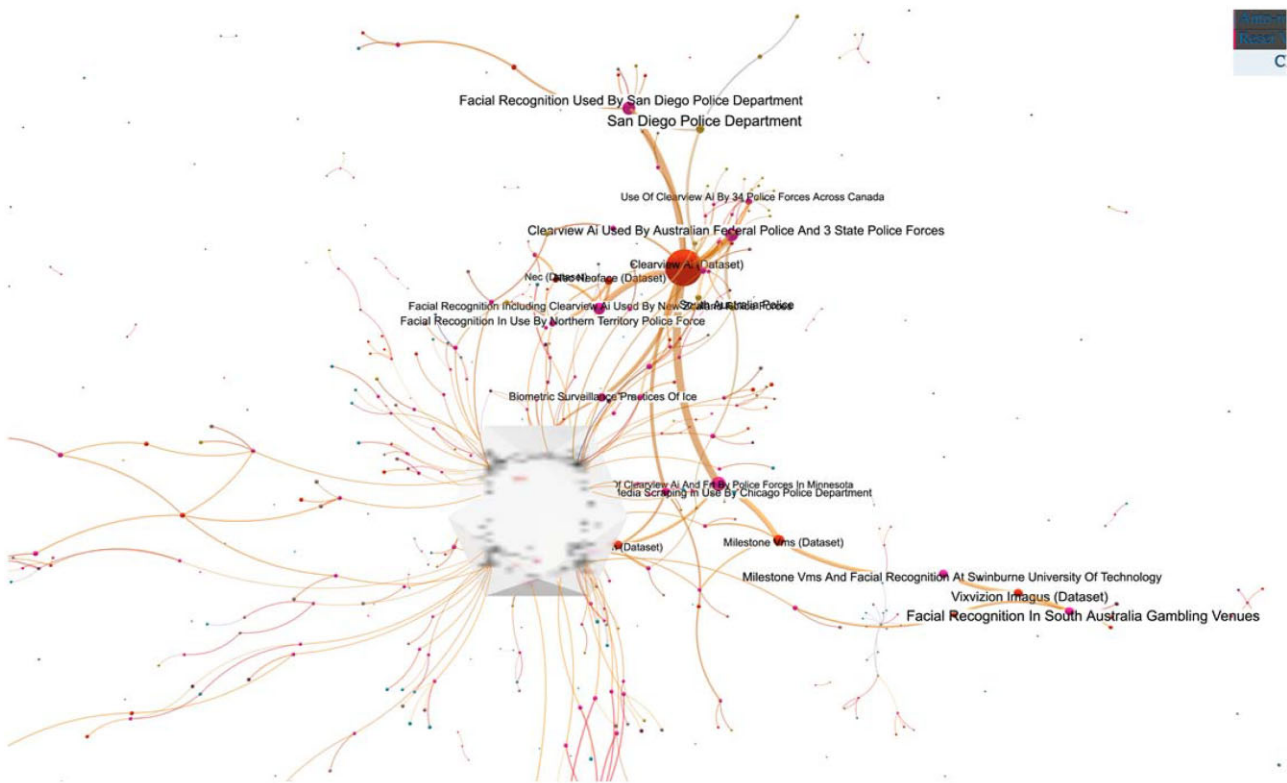


Figure 4. Graph of the computer vision deployments in three-dimensional space. A white “black box” contains all unknown entities. In the interactive interface, the viewer can zoom in and explore the unknowns (Jo Kroese and Francesco Ragazzi).

preted in the context of specific practices. As Catherine Nash (1996, 153) argues, “there is no inherently bad or good looking.” What is important, thus, is not only the quality of the method and the artifacts that it produces but also the political context in which these artifacts come to exist (Kwan 2002a).

The second part of the argument relates to the researcher—or the “maker.” In addition to the “rational” part of the visualization, the maker must make indirect assumptions about how the different choices of fonts, force algorithms, colors, layout, and any other aesthetic consideration will generate specific experiences in the mind of the reader/viewer—i.e., how connotations will be produced.

While these choices will have implications for the methodological, theoretical, and ultimately political purchase of the visualization, they force the maker into a different mode of “knowing” the material, which works in parallel with the rational work. As McPherson explains, “this curiosity about the material, this desire to understand what things can do, operates in a different register from critique” (McPherson 2018, 21). And when discussing the work of her lab, she explains, “we did not build projects or tools to test the theories as much as we laboured to create work that brought theory into a productive tension with tool design and project creation” (McPherson 2018, 23). The work of making, programming, and designing could thus be defined as a work

of “knowing through making with the idea of creating an experience,” which again works in dialogue with theoretical and propositional arguments and through choices of form. And it is precisely this discussion of “form” as a site of theoretical work that makes the specificity of mathematical data visualization a particular way of knowing.

SECURITY VISION: VISUALIZING MISSING DATA AND TOPOLOGICAL SPACE

For our project, this implied that an important feature of the visualization consisted in rendering visible what is often hidden in a dataset: the missing data. Maps should be treated as a method of exploration of data-as-a-process rather than a presentation of data-as-a-result. As Jeremy Crampton puts it, “maps are transient (neither printed nor saved, but created and erased many times over), rather than near-permanent (Crampton 2001, 238). Rather than “hypothesis-testing” and “pattern confirmation,” maps should serve as the starting point for inductive or “abductive” relations to the data—something that has recently been taken over by critical geography. In many respects, this is the principal use of MCA for Bourdieu: a hypothesis-generating device that allows to explore further paths through other methods, highlighted by the features of the data. Thus, we did not want our map to work as a discourse of authority, but rather as a tentative draft or blueprint for future directions. In order to embed in the cartographic production a reminder of its processual nature—processes of data collection, cleaning, pruning, processing, projection, and representation—efforts can be made to make the scaffolding and the contingent nature of the selection process apparent. Some geographers suggest emphasizing the errors, uncertainty, and subjectivity in the final product (Holler 2020, 487).

In our case, we were faced with the problem of what is unknown and uncertain. In the data, unknowns are described by a label and a number, and uncertain ones are marked by degrees of certainty (rumor, speculation, and certainty). Following Drucker, our aim was not to “have a standard map with a nuanced symbol set,” but instead to “create a non-standard map that expresses the constructedness of space” (Drucker 2014, 127). We thus opted for two visual strategies of representation. In the two-dimensional map, we located the unknowns on the Z axis, literally “under” the two-dimensional map, to signify parts of the network that are buried and inaccessible. In the three-dimensional visualization, we opted to concentrate the unknowns in a central “black box” to symbolize that which is part of the network but remains inaccessible to sight. Uncertain relations are represented by dotted lines. Through these visualization choices, the intention is double: to disrupt both the aesthetics of totality and exhaustivity of the data by visualizing the incompleteness of the dataset, and to disrupt the aesthetics of certainty by signifying that what is shown is not a “truth” by data that is based on heterogeneous practices of verification.

One additional intention when designing our interface was to disrupt the traditional understanding of Euclidian space, to move from a topographic to a topological conceptualization. Traditional maps use various possible projections of geographical space—Mercator being the dominant one—as an immutable background on which to map social interactions. This Euclidian/Newtonian representation of space as the frame of social interaction participates to naturalize our understanding of (political) geography as a “given,” “neutral” frame. Critical mapmakers such as Waldo Tobler (1961), William Bunge (1966), and more recently Bergmann and Lally (2021) have suggested moving away

from this principle, especially to show that cartography is, as any social construct, the product rather than the neutral frame of relations of power. Far from impressionistic methods, topological maps, such as cartograms, are based on mathematical representations of data but are used to distort rather than reproduce our traditional understandings of space (Lally 2022, 2).

We thus made three choices. First, “mapping” is a network grounded in the logics of the data rather than on the constraints of a geographical map. In the three-dimensional visualization, only the logic of the network organizes the space. Second, in the two-dimensional map, the network is artificially constrained by geolocation data. As discussed earlier, the map itself is presented as an arbitrary plane within a three-dimensional space, thus denaturalizing it as a “natural container” of social interactions. Third, and perhaps more importantly, we devised an interaction by which, when clicking on any point of the node, not only the close network of that node is revealed (i.e., the companies and technologies used in a deployment), but also the physical geography of that node is stretched to match the features of the network. A very local deployment thus “pulls” only nearby cities and countries, where as a deployment based on large transnational relations generates a much more stretched representation of the physical world. In other words, each subsection of the network carries its own topology; the social interactions make the map, and not the other way around.⁸

Reclaiming the Critical Politics of Data Visualization

These two key dimensions of mapping were grounded in a third concern, which serves as a conclusion to this paper: the political importance of embracing mathematical data visualization as a critical method. Mapping should not be abandoned we argue, because its epistemological possibilities—and in particular its status as a part-rational, part-aesthetic object—make it particularly powerful politically. This is possible because representations of messy facts, especially if they have gone through various stages of data processing, inherently carry an aura of authority and a set of assumptions about a claim to truth and evidence.

“How can we fire back if we lay down some of our weapons? Even worse, how can we fight when we discard precisely those weapons that have been used so effectively by our opponents in the past?” (Wyly 2009, 316). Wyly argues that while methodology, epistemology, and politics are always intertwined, these arrangements are operational only within specific historically and socially determined circumstances, which can change (Wyly 2009, 314). As Pavlovskaya (2009) reminds us, feminist scholars emphasized the importance of GIS in promoting gender equality and understanding women’s experiences in different geographical contexts (Kwan 2002b; McLafferty 2002, 2005; Pavlovskaya 2002; Schuurman 2002; Schuurman and Pratt 2002). It made sense to contest quantification in the “golden years” of security studies of the 1960s and 1970s, when the RAND Corporation used mathematical methods as a justification for militaristic and expansionist policies. Yet quantification and the visualization of databases, as they presents themselves today, are needed to counteract dominant discourses of power. This is exemplified by the efforts of a number of initiatives located at the opposite end of the political spec-

⁸This feature of the map is still in testing at the moment of publication of the article.

trum, such as the Iraq Body Count project⁹ (cited in Wylie 2009, 316) or in a more playful yet nonetheless important “White Collar Crime Risk Zones” project by Sam Lavigne, Brian Clifton, and Francis Tseng (2017).¹⁰

Some critical data visualization projects, such as Forensic Architecture (Weizman 2017), precisely use this truth-value of mathematical visualization to present their work both in artistic spheres—due to the aesthetic research that lies behind their representations—and legal contexts—in which they use formats such as the timeline, the 3D-model rendering, and the audio-spectrogram to challenge and subvert the dominant language of authority in a logic known in critical GIS as “counter-mapping.” Adopting a similar strategy to what the Aberystwyth School Critical Security Project did with the concept of “security” (Krause and Williams 1997), they do not question the authority of maps in general; they question the authority of some maps and claim to offer other, more authoritative maps. It is precisely the fact that they are mathematical visualizations—and not mere impressionistic diagrams—that allows them to position them in such a way. We see here affinities with Spivak’s proposal of “strategic essentialism”: the idea that the political power of uncompromising positions might trump the requirements of epistemological doubts and complexity.

In our collective discussions, we saw the merits of this position. But we were uncomfortable with the tacit power-truth nexus conveyed in such straightforward uses of it, and with the tendency of some of these projects to erase the process through which each visualization is a construction, and then again, only a specific, possible construction of the facts they claim to represent. We thus searched for alternative paths that which would allow us to retain the strengths of the mathematical visualization method, but also question its naturalizing dimension. It became clear to us that without dedicated efforts in the setup of the visualization itself to make sure that this sense of undisputed truth is contextualized or questioned, the default reading of mathematical visualization was likely to reproduce this undesirable aesthetics of authority. Ultimately, whether this worked will be a decision of the readers/viewers and what they decide to make with the map.

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⁹<https://www.iraqbodycount.org/>.

¹⁰<https://whitecollar.thenewinquiry.com/>.

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