
Philosophical concerns of Visual Representation and Interaction

Søren Knudsen

University of Calgary
Calgary, AB, Canada
sknudsen@ucalgary.ca

Sarah Storteboom

University of Calgary
Calgary, AB, Canada
sarah.storteboom@ucalgary.ca

Wesley Willett

University of Calgary
Calgary, AB, Canada
wesley.willett@ucalgary.ca

Jagoda Walny

University of Calgary
Calgary, AB, Canada
jkwalny@ucalgary.ca

Jo Vermeulen

University of Aarhus
Aarhus, Denmark
jo.vermeulen@cs.au.dk

Sheelagh Carpendale

Simon Fraser University
Vancouver, BC, Canada
sheelagh@sfu.ca

ABSTRACT

In creating visualization for the general public, we have concerns relating to visual representations and data provenance, trust, and truth. We briefly outline the context of our work, describe our concerns and their relation to philosophy. We end by formulating a list of questions we seek to shed light on in our future work.

CCS CONCEPTS

• **Human-centered computing** → **Information visualization**; Human computer interaction (HCI);

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KEYWORDS

Information visualization; Philosophy.

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INTRODUCTION

Visualizations are becoming commonplace as a form of modern media. Accepting the premise that visual representations are a form of language, much of the knowledge from media studies should hold for visualization. As a new form of media, visualizations are ripe for many of the same issues that surrounded other new forms of media at their infancy.

In this position paper, we discuss issues and concerns that we encountered in creating visualizations for the general public through a three year project with the National Energy Board (NEB) of Canada. In this project, we have collaborated with the energy board to create visualizations of a variety of their data that they wish to make open and accessible to the general public. Examples include projections of Canadian energy demand, data about pipeline incidents (see Figure 1), and energy import and exports [2].

When dealing with these data sets, we face questions about how data has been created, who have created it, when it has been created, and what information is included in the data set (or conversely, what is excluded). For example, the mandate of the energy board defines which pipeline incidents should be reported and monitored. Likewise, only a fraction of Canadian pipelines are regulated on a national level (the majority falls under provincial legislation). This leads to only a fraction of the pipeline incidents that occur in Canada to be reported to the board, and thus included in the data set.

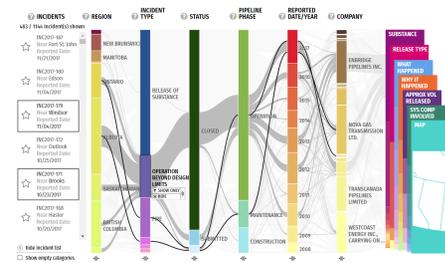


Figure 1: The Pipeline Incidents visualization, here showing 3 dimensions: incident type, what happened, and an estimated reason for the incident.

¹Here, provenance should be read in a broad sense to refer to the full context that led to the data in its current form—and not considered as in the visualization literature, where visualization provenance refers to what an analyst does to a data set while analysing it

DATA AS CAPTA

In our work, we see, over and over, examples of the broadly conceived notion that data is never a given, but should be considered as capta [1]. When put through the lens of visualization, this might be problematic. People tend to read visualizations as truth even though data might be collected through ambiguous processes. This issue bears semblance to perspective drawing and photography when they were new forms of media, which we discussed elsewhere [3].

Seeing data as capta, it is crucial to understand its provenance¹. For example: who created it? when was it made? What were the circumstances? and what technology was used? While understanding these concerns, we look to other disciplines that have considered these questions, such as media and communication studies, arts history and restoration, and archival science. We use these other

disciplines to gain insights into how these issues have been considered before, and potentially, how to address them in concrete visualization products. Understanding the provenance of a data set might reveal implicit assumptions in the data collection phase. For instance, while gender is now often considered a non-binary value, this has not always been the case. Thus, knowing the date of a data set's collection might affect how it is perceived.

POWER AND KNOWLEDGE

These concerns relate to the philosophical discourse on the relationship between power and knowledge, within the broader topic of epistemology. For example, who gets to tell the story of the pipeline incidents? While the recorded data is available online (mandated by Justin Trudeau's Directive on Open Government [4]), not everyone has the technical expertise to create interactive visualizations, which in turn creates a power imbalance for who might be able to tell the story of Canadian energy data through visualizations. To Lyotard [6], "in the computer age the question of knowledge is now more than ever a question of government". While Lyotard is concerned with information *storage* and *access* from a technical standpoint, the main concern in dealing with visualization is that of holding the power of how information is represented visually. Even within our visualization design group, we have seen how factors of technical expertise can be powerful tools for constructing an argument in a design process. Without careful consideration, tech-savvy members of our team (those with programming skills) can take over the design process.

However, we think visualization can be a strong tool for understanding our society. This makes it even more problematic if this tool is only in the hands of the few. Just as the written language is a powerful mechanism for democracy, the visual representation of data (i.e. visualization) considered as a language, is likely so. However, if the general public is blind to its persuasive and deceptive power, what does that mean for the creation of meaning, and for the society at large?

FORMING, CAPTURING, AND REPRESENTING CATEGORIES

Lucy Suchman warns that "categories have politics" [5] — that *any* form of categorising bears the risk of politicizing, with which minds can be formed and opinions made. In an HCI context, this speaks to directing people to specify, in a scoped manner, their information to a machine. In the context of visualization, we do not consider interaction as "engendering politics", but perhaps we should? More often, the representation of data in visual form has higher risks of being deceptive (without considering purposefully deceiving visualizations).

In our work, the question of representing inaccurate data comes up frequently. When information is captured through systems that force people to adhere to rigid entry requirements, the collected data might reflect reality very poorly. For example, the data about pipeline incidents describe the approximate volume released. But the level of uncertainty for this information is never captured, and

varies depending on the type of leak (e.g., gas or liquid). The requirement to provide this information may lead to inaccurate reporting (and following inaccurate visualizations). Thus, while there are clear issues in how the data has been captured, a similar issue arises in how to represent this data.

RELATIONSHIP TO PHILOSOPHY

All of the above mentioned points have a strong relationship to the concept of truth, power, and knowledge. In this regard, turning to philosophy can provide us a grounding to move forward. We are interested in discussing the following questions:

- What does philosophy have to say about truth that can guide the design of interactive systems, and more specifically for our goals, interactive visualizations?
- How can the writings of Latour, Lyotard, and Habermas inform how we view power distribution in the creation and communication of visual representations? And how might we think about knowledge creation and dissemination from the perspective of visualization?
- We notice that constructivism has been fruitfully applied in designing interactive visualizations for visualization novices. We wonder what other schools of philosophy might bring as positive inspiration for visualization.
- What is the extent of the responsibility of the visualization designer, to for example, reveal the intricacies of the represented data. Who's responsible for the truthfulness of a visual representation? Can philosophical writings of truth help guide this answer?

CONCLUSION

We briefly outlined our position in terms of issues relating to representation and interaction, focusing on the nature of how data is captured, and distribution of power arising from the skills needed to read and create visualizations.

In the workshop, we are interested in gaining a stronger foundation in the intersection of Philosophy and HCI, in discussing our concerns for visualizations outlined above, and in being part of community that considers philosophy in human-computer interaction more broadly.

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AUTHOR BIO (FIRST AUTHOR)

Søren Knudsen is a Marie Curie post-doctoral research fellow at the Department of Computer Science at University of Calgary. He received his PhD in 2015 from University of Copenhagen in Denmark. His research interests centers on Human–Computer Interaction and Information Visualization, with particular focus on multiple views in visualizations, and how this might facilitate individual and shared data understanding. Working with the National Energy Board of Canada, the notions of truth, trust, and provenance, became crucial in discussing visualizations for the general public. This conceptual understanding now underpins much of his research on in information visualization.