

Definitions and Aspects of Visualization Literacy: A Survey

Mara Solen

solen@cs.ubc.ca

Introduction

Visualizations are becoming more accessible to the public through their increasingly common use by organizations with large audiences like news outlets and social media pages. They're used for a variety of reasons such as catching users' eyes and quickly communicating summaries of data. However, it is unclear whether these visualizations are understood consistently across a variety of backgrounds and levels of experience. Visualization researchers are interested in this topic, called visualization literacy, as it could help improve understanding of how to visually communicate data.

Research in this topic is still young, but it is growing quickly. Existing research does not use a standard definition of visualization literacy and what is used can be vague and typically does not give a clear example of what makes a person literate in information visualization. Definitions range from as vague as "an individual's ability to read, comprehend, and interpret data visualizations" [3] to as specific as "the ability to confidently use a given data visualization to translate questions specified in the data domain into visual queries in the visual domain, as well as interpreting visual patterns in the visual domain as properties in the data domain" [2]. What is similar about these definitions? Can a standard definition be formulated that accommodates each of them?

Furthermore, different aspects of the topic are being explored. Peck et al [1] looked at how attitudes and perceptions of visualization are molded by people's backgrounds with special attention paid to which charts are preferred and deemed useful by participants. Meanwhile, Boy et al [2] take a different approach: assessing visualization literacy based on a person's ability to understand a visualization whether they find it useful or not. Are there multiple aspects to visualization literacy? Are they individual skills that a person learns or are they learned together?

This research ties into my potential future research. I chose this project because I was recently exposed to the topic of visualization literacy, and I would like to learn more about it as well as give myself a strong understanding of what has been done should I decide to investigate it further.

Related Work

I was unable to find any existing survey papers that focus on this topic. However, there are papers that are not primarily survey papers with significant background sections which I will discuss here.

Boy et al [2] constructed their definition for visualization literacy by starting with the definition of the general term *literacy*, defined in the Oxford dictionary as “the ability to read and write”, and modifying it to be specific to the subject. They discuss earlier work in the field, such as that in the cognitive processes involved in reading graphs and how it is an iterative process rather than a straight-forward serial process. An interesting finding to come out of this past work is that a person’s understanding of a visualization depends on their expertise in the area but that this is less common in more visually literate people.

As discussed briefly in the introduction, Peck et al [1] explore different meanings of visualization literacy. They discuss what makes people pay attention to certain charts and not others and how attention can be improved without displaying biased or ineffective visual encodings. These biases may be different or more pronounced in populations that are less literate in visualization than in environments such as universities or large urban centers where design studies are commonly done, even for tools meant for novice users like LineUp [4].

Milestones

- Oct. 30th: Find as many potentially relevant papers as possible. Skim each one to get a better understanding of what each of them is about and how relevant they are to the survey. Choose about 25 papers to use in the survey. (15 hours)
- Nov. 10th: Read all papers fully and take notes on each one, including the most relevant sections from each paper. (30 hours)
- Nov. 16th: Use the notes to generate preliminary findings and create a framework for the paper. (10 hours)
- Dec 5th: Flesh out the sections to complete the draft. (15 hours)
- Dec. 12th: Create presentation of survey and findings. (5 hours)
- Dec. 17th: Finish the paper. (5 hours)

Bibliography

- [1] Peck, E. M., Ayuso, S. E., & El-Etr, O. (2019). Data is Personal: Attitudes and Perceptions of Data Visualization in Rural Pennsylvania. arXiv [cs.HC]. Opgehaal van <http://arxiv.org/abs/1901.01920>
- [2] Boy, J., Rensink, R. A., Bertini, E., & Fekete, J.-D. (2014). A Principled Way of Assessing Visualization Literacy. *IEEE Transactions on Visualization and Computer Graphics*, 20(12), 10. doi:10.1109/TVCG.2014.2346984
- [3] Lee, S., Kim, S.-H., & Kwon, B. C. (2017). *VLAT*: Development of a Visualization Literacy Assessment Test. *IEEE Transactions on Visualization and Computer Graphics*, 23(1), 551–560. doi:10.1109/TVCG.2016.2598920

- [4] Gratzl, S., Lex, A., Gehlenborg, N., Pfister, H., & Streit, M. (2013). LineUp: Visual Analysis of Multi-Attribute Rankings. *IEEE Transactions on Visualization and Computer Graphics (InfoVis '13)*, 19(12), 2277–2286. doi:10.1109/TVCG.2013.173