

Risk the Drift! Stretching Disciplinary Boundaries through Critical Collaborations between the Humanities and Visualization

Uta Hinrichs¹, Mennatallah El-Assady², Adam James Bradley³, Stefania Forlini⁴, and Christopher Collins³

ABSTRACT

In this paper, we discuss collaborations that can emerge between humanities and visualization researchers. Based on four case studies we illustrate different collaborative constellations within such cross-disciplinary projects that are influenced as much by the general project goals as by the expertise, disciplinary background and individual aims of the involved researchers. We found that such collaborations can introduce productive tensions that stretch the boundaries of visualization research and the involved humanities fields, often leaving team members “adrift” trying to make sense of findings that are the result of a mixture of different (sometimes competing) research questions, methodologies, and underlying assumptions. We discuss inherent challenges and productive synergies that these drifts can introduce. We argue that greater critical attention must be brought to the collaborative process itself in order to facilitate effective cross-disciplinary collaborations, and also enhance potential contributions and research impact for all involved disciplines. We introduce a number of guiding questions to facilitate critical awareness and reflection throughout the collaborative process, allowing for more transparency, productive communication, and equal participation within research teams.

1 INTRODUCTION AND BACKGROUND

Recent years have seen an increase in collaborative projects between researchers from (broadly speaking) the humanities and visualization (see [14] for an overview), often leading to interesting and valuable research outcomes for one or more of the involved fields. Such cross-disciplinary collaborations—projects that involve thinking and working across multiple disciplines where different expertise and methods are not only shared but applied, combined and expanded beyond the boundaries of the involved disciplines (more about related terminology in [1, 19])—often generate new research questions and directions that would not emerge from any one disciplinary perspective alone. While the issue and value of cross-disciplinary collaboration has been generally discussed in visualization (e.g., [15, 16, 20, 21]) and humanities research (e.g., [17]), case studies at the intersection of humanities and visualization often touch upon collaborative practices only lightly, favoring tangible outcomes and contributions. Only recently has this “*balancing act*” [13]—which uniquely crosses scientific and humanistic, quantitative and qualitative research thinking and approaches—been addressed specifically [6, 13].

It is vital to reflect on the collaborative processes that shape such cross-disciplinary projects beyond tangible research outcomes, in order to characterize the role of visualization as part of humanities research and, vice versa, how visualization research is furthered by humanities’ practices. Every discipline has its blind-spots—some of which it actively works to eliminate as it evolves, some of which it (often inadvertently) creates by virtue of its very focus and particular history. In the process of collaboration and—in interaction with members of a different discipline—de-familiarization, we will likely encounter some of our own disciplinary blind-spots and assumptions embedded in our discipline’s theories, practices, and terminology.

A specific focus on the nature of cross-disciplinary collaborations is also important to overcome potentially unproductive assumptions. For example, a typical expectation might be that the humanities

scholar provides the data and research questions, while the visualization expert on the project will design and implement an adequate visualization prototype that facilitates the exploration of these questions. From our experience, these roles that define such “collaborative constellations” cannot simply be assumed based on disciplines, nor do they remain stable throughout the project. Instead, these roles are influenced by the project aims and by the individual interests of each team member, and they can change as the project progresses.

Shifting roles and “drifting” away from the familiarity of one’s core research discipline and practices can cause discomfort, even tension among team members and complicate the project’s progress, but it almost always leads to more attentive, potentially innovative, approaches and outcomes. “Drift” can result in improved engagement and communication, work processes, research questions, and novel results—including not only concrete research contributions to the involved disciplines but also a critical reflection on what the cross-disciplinary process reveals about the unique nature (including limitations or blind-spots) of each participating discipline.

In this position paper, we illustrate based on four case studies different constellations of cross-disciplinary collaborations between humanities and visualization scholars and the “drifts” that can occur as part of these. Our reflections show that this spectrum of collaborative constellations is vast and each comes with its own values and challenges. Following these examples, we (1) invite researchers and practitioners to critically reflect on their collaborative processes and how these push (or not) the roles within their projects as well as the boundaries of their own disciplines. We (2) call on researchers and practitioners to “risk the drift”—to allow for more open-ended collaborative processes and approaches that enable learning from interactions with disciplines that are profoundly and meaningfully different from one’s own, and to be open to (when appropriate) changing perspectives and practices according to what is learned. To facilitate this, we provide a set of guiding questions that may support such critical reflections at different points of a collaborative project.

2 HUMANITIES & VISUALIZATION: 4 CASE STUDIES

We present four case studies that each represent different approaches of working at the intersection of visualization and the humanities. While these can only represent a small subset of possible “collaborative constellations”, they begin to illustrate the unique drifts that can occur between researchers working within such collaborations.

2.1 Case Study 1: DocuBurst

Visualization for digital humanities projects can be purely data-driven, introducing novel visualization techniques or general purpose text analysis tools without a direct collaboration with humanities researchers. Instead, the visualization is driven by the dataset and open-ended goals such as facilitating exploration. The DocuBurst document visualization [3] follows this a method. It allows the visual portrayal of any uploaded plain text.

The DocuBurst project was an attempt to bring linguistic structure to the layout of word clouds, using the WordNet hyponymy (IS-A relation) ontology. DocuBurst reveals the contents of a text through the brightness of sectors of a tree which is based on WordNet. The overarching goal was to see a document’s content, with the motivating argument that the tool could be useful for humanities scholars to quickly get a feel for an unknown document.

¹ Uta is with the University of St Andrews, UK.

² Mennatallah is with the University of Konstanz, Germany.

³ Adam and Christopher are with the University of Ontario, Canada.

⁴ Stefania is with the University of Calgary, Canada.

Collaborative Process. During the development no humanities domain experts were involved with the design. That is, the constellation of researchers included computer scientists specializing in computational linguistics and visualization, but no members of the target user community. DocuBurst succeeds as an easy-to-understand and general purpose tool, accepting texts from political debates to the Bible. It has been repurposed to analyze passwords and to teach English as a second language. It has provided an interesting entry point to untapped collections due to the ease of importing data and the general purpose views. The resulting visualization has been relatively successful, with users continuing to visit the site after 7 years. However, despite attempts to provide mechanisms to annotate views, embed them in other websites, and share them, the impact on humanities scholarship has been minimal.

On reflection, we believe this stems from our focus on exploration and overviews: humanities scholars do not seek a “quick overview” of a single text. When working with a text of interest, the most common and preferred approach is to deeply read the text. Word-counting and overviews, even those structured by semantics, do not meet a specific need in the humanities. Our tool did not integrate well with the task of close reading, despite providing a reading panel which displays the full text. Additionally, challenges with word sense disambiguation, in which a polysemous word may be represented incorrectly in the view, have a strong effect on humanities research, where interpretation of meaning is of central importance.

Shifting Research Roles. While this data and technique-driven method for creating visualizations has been successful at creating a well-known general purpose text analysis tool, as observed through usage logs over many years, the system could facilitate the process of humanities research better. The “drift” in this case moved the visualization researchers toward engaging with humanities scholars as collaborators rather than data providers. As highlighted in the context of visualization design studies [20], a deeper understanding of humanities research goals and practices, we can avoid pitfalls, such as creating views that are not needed to answer real questions.

2.2 Case Study 2: VisArgue

The VisArgue project [5] was a collaboration between political scientists, linguists, and computer scientists, focused on analyzing communication in political debates and motivated by theories of political science. The theory of deliberative communication in political discourse has been extensively researched by political scientists as one ideal for political debate. However, previous research was mainly on a theoretical level, using smaller manually annotated corpora. By bringing together the unique competencies of the VisArgue team in a cross-disciplinary collaboration, we performed a data-driven analysis of the political science theories with the objective of automating the measurement of deliberation in political discourse.

The project relied on an automatic linguistic annotation of the data that uses a bottom-up rule-based approach to identify micro-linguistic features. These annotations were categorized using the theory of deliberative communication. From a computer science perspective the challenge was to bridge this gap between the bottom-up analysis and the top-down theory to develop a visual analytics framework that allows multiple perspectives on the data and to facilitate the exploration of research questions. For example, in order to verify a hypothesis about speaker behavior in a debate, we constructed a visualization showing the interaction of different speakers over the course of the debate [4, 7]. We also included other views that focus on a deeper content analysis of the conversations, and a visualization that shows the relation of the extracted micro-linguistic features to different speakers, topics, and political parties to suggest the degree of deliberation of a debate [9, 10].

Collaborative Process. The role of the different disciplines in this collaboration was dictated by their expertise. The political scientists

provided the theoretical construct and their broad research question, the linguists were mainly concerned with the annotation of the data, and the computer scientists were challenged with abstracting the given data and theories into a general data structure that built the basis for the automatic analysis and for the development of the visual analytics framework. However, after the initial phase of contributing to separate working packages, all team members realized through discussions that we had to establish our own cross-disciplinary definitions, concepts, and mental models beyond those given by each discipline. For example, in discussing the definition of an argument, we realized that every discipline had an exclusively different understanding of the concept. The linguists understood an argument as a linguistic construct, neglecting the content, while for the political scientists the argument’s content is more essential than its phrasing. In order to advance the research of all involved disciplines, we had to become more familiar with the competing motivations of the project in order to create common ground. This conceptualization phase was integral to the success of the project.

Shifting Research Roles The visualization experts experienced the most radical drift. Early on, their focus was on developing novel visual interfaces for the analysis of the data provided by the other disciplines. However, throughout the collaboration, they felt obliged to mediate between the two other disciplines in order to generate a common ground between the top-down and bottom-up approaches taken by the humanities and social scientists, respectively. To fill this role, the visualization researchers had to familiarize themselves with the concepts and theories of each domain. This led them to iteratively create a commonly accepted data model that incorporates the domain knowledge of both disciplines to bridge the gap between them. In contrast, the political scientists and computational linguists shifted their research roles more towards abstraction and systemization, thinking about how different processes would be automated and combined within the framework. Noticeably, the humanists and social scientists turned toward a more visual way of thinking. After the first visualization prototypes, a collaborative, iterative design process was established that was driven by discussions, sketching sessions, and alternative visualization suggestions.

2.3 Case Study 3: The Stuff of Science Fiction

The Stuff of Science Fiction project involves researchers in English literature and visualization to characterize a unique, unknown collection of science fiction (SF) writing and illustrations originally published in literary periodicals and compiled by the collector into handcrafted fanzine-like booklets. For literary studies, the Bob Gibson Anthologies of Speculative Fiction raise questions about the evolution of SF in popular periodicals. For visualization, the collection provokes new research on how to facilitate the exploration of its content and visual features. We approached these questions in an intertwined process that combined archival work and visualization.

The archival work included the reading of SF items, the extraction of metadata such as author, title, publication year and source magazine, as well as the manual classification of items through established SF keywords. This metadata was compiled in digital form through a database interface. At the same time, visualization designs were developed to explore ways to visually represent the emerging metadata to help characterize the Gibson anthologies

While the archival work and visualization design were conducted simultaneously, both processes were closely intertwined and informed each other: the work in the archives led to discoveries and new research questions which informed new visualization ideas. Likewise, the visualization prototypes triggered new questions that were directly explored in the archives. For example, the visualizations first focused on Gibson’s own symbol system through which he classified the SF items he collected, but were expanded with additional views to accommodate for additional points of interest

(e.g., author gender) identified through archival work. The visualizations brought to the fore hypotheses that could then be verified through archival work. Even shortcomings of the most recent visualization prototype further informed our research process: the Speculative W@nderverse [12]—a first “translation” of this unique print-based collection into digital media—represents mostly content-related metadata in an abstract, visual way, without reflecting on the physical features that necessarily shape the interpretation of these unique artifacts. In response, we have since started to classify and, through visualization, reflect on the anthologies’ material qualities.

Collaborative Process. We decided early to collaborate in a way that would enable an understanding of each others’ disciplines and research processes, and to produce valuable research contributions to both fields. We therefore engaged in regular meetings where we would discuss the progress and insights we gained through our archival work and visualization design. These discussions, documented in written form, were vital in understanding each other’s research interests and in facilitating our collaboration. At the same time, sharing and discussing our evolving insights and data through visualization sketches and interactive prototypes in an open-ended way, allowed for new questions and ideas to emerge and evolve.

Shifting Research Roles. The drift in this project is visible in the evolution of our research questions and in the design of our visualization prototypes. Our research questions have become more finely attuned to the Gibson anthologies, which will help us make richer research contributions in the long run. However, our open-ended process is resource-intensive and requires much flexibility. For example, the (re-)design of ever-changing, highly customized non-standard visualizations led to a range of prototypes which provided rich insights and valuable reflections visible our publications [8, 11, 12], but also required a considerable engineering effort.

The drift also shows in the change of our individual roles as researchers on the project. Initially, our individual contributions to the project were defined by our respective disciplines (as suggested in [20]). However, after four years of collaboration, our roles have become more hybrid and our perspectives on our own research disciplines have shifted. Our different backgrounds are still vital to our work, but our collaboration has modulated our research thinking and research questions; as researchers we act less and less from “within” our respective disciplines and more from a hybrid space that embraces both literary and visualization thinking as intertwined research processes. This is also visible in our writing styles which blend highly structured scientific forms with the precise and argument-driven style of humanistic writing.

2.4 Case Study 4: Metatation

The Metatation team [18] consisted of a researcher in both literary studies and visualization, two visualization and one HCI researcher. Motivated by the lack of adoption of digital tools developed for literary analysis, the project revealed that there is a misunderstanding of the workflow of literary scholars in relation to literary analysis.

We ran a study with literary scholars working on poetics and asked them to “work on their poems” using digital pens and paper while being observed. In essence, within this collaborative constellation, humanities researchers were participants of an observational study. We discovered that each participant employed a complex idiosyncratic cognitive shorthand in form of paper annotations. This posed problems for automated disambiguation of annotation purpose. We also found that each participant had their own system for how these marks related spatially to other marks on the page. The same symbols could mean different things if separated by enough space. The subsequent tool design was truly collaborative in that the intuition of our literary scholar about the kinds of knowledge being sought after needed to be reconciled with the design process employed in HCI and visualization. We found that the literary scholars needed time to reflect on their work as they did it, and the moment of interaction needed to be shifted as a result. These requirements

created a tension between the usual goals of digital tool design, which often attempt to reduce the time of a task, and the needs of the literary analysis. Our participants also demonstrated a need to create their own annotations, limiting our interactive modalities to pen, stylus, or possibly touch interaction with a single finger.

Collaborative Process. Previous literature on annotation suggests that digital affordances could substitute for handwriting, but manual annotations help literary scholars to access semantic levels of a text, a process that digital tools can hamper. Our study participants were *thinking by annotating*, not simply note-taking. The experience and intuition of our in-team literary scholar, together with our study findings, facilitated a focused, collaborative design process with the HCI and visualization team members. The final solution supports the existing pen-based workflow within the tool and augments the marks of the literary analysts with a type of meta-dictionary that is available for reflection after the work had been done. In this way we created individualized reference material for each participant. Studying the workflow of our participants in-situ allowed us to collaboratively define a hybrid problem space that engineers and digital humanists alone had yet to demonstrate—a direct result of our cross-disciplinary collaboration.

Shifting Research Roles. In this project the drift occurred in two different ways. First, the translation of ideas between a computer science and humanities context had a lasting effect on the approaches of scholars from both sides. This was facilitated by one of our team members who works in both domains (a *Liason* [21]). The ability to speak the languages of both fields expedited what we call “drift”. Second, while not directly collaborating on the project, the work practices of our study participants—all experts in humanities fields—strongly influenced how both our in-team literary scholar and the computer scientists understood the workflow and the individual task in focus. Specifically, the of open coding was the real catalyst to this shift in thinking as our expectations (from both sides) had to be re-aligned due to the nature of our participants’ work. Cohen’s Kappa [22] (inter-rater reliability) became a surrogate measure for the drift between the researchers on our team. During the first iteration our humanities scholar was coding with an understanding of the existing workflow and our visualization scholar with an understanding of previous work in HCI and visualization. As the Kappa came into a reasonable range, so too did our understandings of each other’s disciplines drift towards a new, common ground.

3 THE SPECTRUM OF COLLABORATIVE CONSTELLATIONS

The collaborative constellations outlined above illustrate parallels as well as distinct differences in terms of collaborative approaches, aims, and “drift” within and across the involved research fields, spanning a complex spectrum across many dimensions.

Drift Induced by Observing Humanities’ Practices

We consider the first case study (C1), which lacks the direct involvement of humanities scholars, an extreme case where the collaborative “humanities” aspect is merely included in form of the targeted data sets, audiences and potential usage scenarios. Successful as a novel visualization technique to represent text in a compact way, subsequent reflections on the project’s approach reveal that a collaboration with humanities scholars and/or study of their practices may have led to better uptake in the targeted domain and, hence, more impact.

The latter approach is reflected in C4 where the study of annotation practices of poetry scholars revealed rich insights into the idiosyncratic practices involved in the close reading of poetry. The study findings guided the design of a digital annotation tool that enhances these existing interpretative approaches instead of dictating new tool-driven workflows. Like C1, C4 aimed at designing a digital tool to enhance humanities (research) practices, but, in contrast, it closely considered the practices of the target audience (as important for visualization “design studies” in general [20]). In addition to the involvement of poetry scholars as study participants, C4 also illustrates a close collaboration between scholars in visual-

ization, HCI and literary studies. It is this collaboration, mediated through open coding as a classic qualitative research method in HCI, which led the involved researchers to gain insights, disrupt their previous domain-specific knowledge and assumptions, and create an innovative approach to facilitating close reading.

Resisting, then Risking the Drift

In contrast to C1 and C4, C2 aimed at creating an interactive tool to help answer political scientists' research questions and verify hypotheses, rather than facilitating particular practices. This process was directly guided by the involved political scientists rather than a study of practitioners in the field. Initially, the roles in this multi-disciplinary project were defined by the researchers' disciplines, where the political scientists provided the data sets and research questions, and linguists and visualization scholars would abstract the given data to form the basis for visualizations that would facilitate answering these given questions. Practice revealed the need for a more cross-disciplinary research process. The team members realized that they had to learn about each other's academic domain, respective research processes and terminologies in order to—collaboratively—develop sensible visualization solutions. Sketching possible visual representations together was found to be a valuable way to facilitate this process, not only moving all involved researchers beyond their disciplinary boundaries, but even motivating a new field of automatic, visual analysis of verbatim text transcripts.

Embracing the Drift as Process

Similar to C4, researchers in C3 engaged in a highly collaborative process early on in the project in order to gain insights into each other's research interests and practices. Like in C2, visualization was found to be an important mediator that facilitated their collaboration and expanded their knowledge beyond their respective disciplines. This process, deliberately open to changes in research questions and to embracing different discipline-specific methods, was particularly suitable for this project that focused on characterizing a little-known, specific literary collection through visualization, rather than on the development of generalizable tools that would facilitate particular practices or help explore specific research questions. Researchers in C3 deliberately embraced a drift into a hybrid cross-disciplinary space. This enabled them to engage in research thinking attuned to the collection in ways that would not be possible from within either one of the involved disciplines (literary studies or visualization) and facilitated a collaborative framing of the project and research questions, rather than having (multiple) discipline-specific foci. However, this form of process is resource intensive and can leave researchers in a disciplinary limbo that is at once highly promising and ill-fitted to current assessment and funding structures.

4 CRITICAL REFLECTION ON COLLABORATIVE PROCESS

While some of the above reflections parallel guidelines on conducting visualization design studies in general [20], they highlight that valuable insights require an active and critical engagement between the involved disciplines. We intend this position paper to encourage an awareness and critical reflection on collaborative processes between visualization and humanities researchers, rather than prescribing particular approaches. As we have shown, the character of such projects is quite diverse and complex. Initially we tried to align the collaborative constellations and inherent "drifts" on a linear spectrum that was defined by *visualization-driven research* (without a humanities researcher being directly involved) at one extreme, and *humanities-driven research* (where the visualization becomes an engineering task in the service of the humanities) on the other. However, in examining our case studies, we found that many nuances exist between these extremes, and that the often observed changes in collaborative constellations let researchers arrive in hybrid spaces informed by but outside of the initial disciplinary boundaries. As such, collaborative approaches—also depending on funding and time constraints—have to be decided upon on a case-by-case basis. However, if we assume this "drift" as productive in enabling inno-

vative ideas and critical reflection on underlying assumptions and established practices within the involved disciplines, how can we promote this and critical reflections on collaborative process within cross-disciplinary projects between humanities and visualization? We present here a set of questions, organized in four themes, that have helped us to characterize our (finished and ongoing) case studies and may help others negotiate collaborative roles and project aims that seem mutually valuable to all involved disciplines.

Finding a Common Denominator & Appreciating Differences

1. What are the project's main research questions?
2. Which of these questions are common to more than one discipline? Which are unique to one specific discipline?
3. What are the possible overlaps and distinct areas of inquiry?
4. To what extent do these research questions matter to each discipline and why? How have these been treated in the past?

These questions are meant to help establish a "common denominator" across the disciplines involved, but also to help team members understand what is unique; what matters to each different discipline, and why. In addition to building a shared foundation from which to work, these questions can also identify potential audiences who might be impacted by one or more aspects of the research.

Knowledge Brokering

1. What are the key terms of this project?
2. What do these key terms mean to each discipline?
3. How is the current project employing these terms?

Negotiating an effective collaborative space involves understandings of key terms and theories, and developing a sensitivity to how different disciplines might inflect the same terms and theories differently [2]. Participants become knowledge brokers and translators, communicating across disciplinary divides to situate their own perspectives within their own field and within the current collaboration.

Negotiating and Evaluating Workflow

1. What kind of a project workflow do you envision and why?
2. How often will you evaluate the workflow and how?
3. What roles are shared or unique to specific researchers?

These questions are meant to help initiate critical discussion and evaluation of a workflow to ensure that it is effectively attuned to the specific, and potentially shifting, needs of a cross-disciplinary project, without automatically defaulting to discipline-based divisions of labour and without subordinating one discipline to any other.

Risking the Drift

1. How much do you think your research thinking has changed while working collaboratively? Can you describe the changes?
2. How do these changes manifest themselves in your research thinking, methods, practical approaches, writing, research interests, research questions and/or directions?
3. How would you describe the benefits and challenges that come with these changes?

If, as this paper suggests, cross-disciplinary research can have an impact beyond the results produced for one or more disciplines, critical reflection on the collaborative process and its effect on disciplinary boundaries has to become a key part of the collaborative work itself.

Through these questions that emerged from our own work, we invite researchers in visualizations and the humanities to engage in the kind of critical collaborations that promise to produce unprecedented innovations in multiple fields, while risking the drift towards new or, at the very least, reinvigorated disciplinary formations. As visible in just the four case studies presented here, the spectrum of collaborative constellations at the intersection of humanities and visualization research is vast and defined by many dimensions. Building a body of work that critically discusses processes and lessons learned from such collaborative experiences, will eventually lead toward a more descriptive model to facilitate and promote productive synergies between humanities and visualization research that produce valuable contributions to all involved disciplines.

REFERENCES

- [1] M. Blessing and M. Punt. Transdisciplinarity: Challenges, Approaches and Opportunities at the Cusp of History. *Transtechnology Research; OpenAccess Papers*, 2013.
- [2] L. J. Bracken and E. A. Oughton. what do you mean? the importance of language in developing interdisciplinary research. *Transactions of the Institute of British Geographers*, 31(3):371–382, 2006. doi: 10.1111/j.1475-5661.2006.00218.x
- [3] C. Collins, S. Carpendale, and G. Penn. Docuburst: Visualizing document content using language structure. *Computer Graphics Forum*, 28(3):1039–1046, June 2009.
- [4] M. El-Assady, V. Gold, C. Acevedo, C. Collins, and D. Keim. ConToVi: Multi-Party Conversation Exploration using Topic-Space Views. *Computer Graphics Forum*, 35(3):431–440, June 2016. doi: 10.1111/cgf.12919
- [5] M. El-Assady, V. Gold, A. Hautli-Janisz, W. Jentner, M. Butt, K. Holzinger, and D. A. Keim. VisArgue : A Visual Text Analytics Framework for the Study of Deliberative Communication. In *Proc. Int. Conf. Adv. Comput. Anal. Polit. Text*, pp. 31–36. Zagreb, 2016.
- [6] M. El-Assady, V. Gold, M. John, T. Ertl, and D. A. Keim. Visual Text Analytics in Context of Digital Humanities. In *Work. Vis. Digit. Humanit. as part IEEE VIS 2016, Oct. 24th, Balt. Maryland, USA*, pp. 1–10, 2016.
- [7] M. El-Assady, R. Sevastjanova, B. Gipp, D. Keim, and C. Collins. NEREx: Named-Entity Relationship Exploration in Multi-Party Conversations. *Computer Graphics Forum*, 36(3):213–225, June 2017. doi: 10.1111/cgf.13181
- [8] S. Forlini, U. Hinrichs, and B. Moynihan. The Stuff of Science Fiction: An Experiment in Literary History. *Digital Humanities Quarterly (DHQ)*, 10(1), 2015.
- [9] V. Gold, M. El-Assady, T. Bögel, C. Rohrdantz, M. Butt, K. Holzinger, and D. Keim. Visual Linguistic Analysis of Political Discussions: Measuring Deliberative Quality. *Digit. Scholarsh. Humanit.*, 32(1):141–158, Sept. 2015. doi: 10.1093/lc/fqv033
- [10] V. Gold, A. Hautli-Janisz, K. Holzinger, and M. El-Assady. VisArgue: Analysis and Visualization of Deliberative Political Communication. *Political Communication Report*, 26(1):1–2, 2016.
- [11] U. Hinrichs and S. Forlini. In Defense of Sandcastles: Research Thinking through Visualization in DH. In *Proceedings of Digital Humanities 2017 (DH'17)*, 2017. (forthcoming).
- [12] U. Hinrichs, S. Forlini, and B. Moynihan. Speculative Practices: Utilizing InfoVis to Explore Untapped Literary Collections. *IEEE Transactions on Visualization and Computer Graphics*, 22(1):429–438, 2016.
- [13] S. Jänicke. Valuable Research for Visualization and Digital Humanities: A Balancing Act. In *Workshop on Visualization for the Digital Humanities, VisWeek, 2016.*, 2016.
- [14] S. Jänicke, G. Franzini, M. F. Cheema, and G. Scheuermann. Visual text analysis in digital humanities. *Computer Graphics Forum*, 2016.
- [15] R. M. Kirby and M. Meyer. Visualization collaborations: What works and why. *IEEE Computer Graphics and Applications*, 33(6):82–88, 2013.
- [16] D. Lloyd and J. Dykes. Human-centered approaches in geovisualization design: Investigating multiple methods through a long-term case study. *IEEE Transactions on Visualization and Computer Graphics*, 17(12):2498–2507, 2011.
- [17] L. McGrath, ed. *Collaborative Approaches to the Digital in English Studies*. Computers and Composition Digital Press, 2011.
- [18] H. Mehta, A. J. Bradley, M. Hancock, and C. Collins. Metatation: Annotation as implicit interaction to bridge close and distant reading. in *(TOCHI) ACM Transactions on Computer-Human Interaction (forthcoming)*, 2017.
- [19] A. F. Repko. *Interdisciplinary Research: Process and Theory*. Sage, 2008.
- [20] M. Sedlmair, M. Meyer, and T. Munzner. Design Study Methodology: Reflections from the Trenches and the Stacks. *IEEE Transactions on Visualization and Computer Graphics*, 18(12):2431–2440, 2012.
- [21] S. Simon, S. Mittelstädt, D. Keim, and M. Sedlmair. Bridging the Gap of Domain and Visualization Experts with a Liason. In *Eurographics Conference on Visualization (EuroVis) – Short Papers*, 2015.
- [22] N. C. Smeeton. Early history of the kappa statistic. *Biometrics*, 41(3):795–795, 1985.